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SAP HANA Smart Data Integration and SAP HANA Smart Data Quality

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# Configuration Guide for Other SAP HANA Scenarios

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# 1 Configuration Guide for Other SAP HANA Scenarios

This guide describes the main tasks and concepts necessary for the initial installation and configuration of SAP HANA smart data integration and SAP HANA smart data quality.

## Note

This guide covers only configuration scenarios other than SAP HANA Cloud. For example, it includes information about configuration with SAP HANA on-premises, SAP Datasphere, the SAP HANA service for SAP BTP, and so on.

For complete information about configuring SAP HANA smart data integration and SAP HANA smart data quality with SAP HANA Cloud, see the [Configuration Guide for SAP HANA Cloud](#).

For information about the capabilities available for your license and installation scenario, refer to the Feature Scope Description (FSD) for your specific SAP HANA version on the [SAP HANA Platform](#) page.

This guide includes the following content:

- Architecture, components, deployment, and tools
- Configuration tasks to enable functionality
- Configuration tasks for data provisioning adapters
- Security
- SQL syntax and system views

For information about the ongoing administration and operation of SAP HANA smart data integration and SAP HANA smart data quality, see the *Administration Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality*.

For information about administration of the overall SAP HANA system, refer to the *SAP HANA Administration Guide*.

## Related Information

[Overview \[page 8\]](#)

[Architecture and Connections \[page 8\]](#)

[Components to Install, Deploy, and Configure \[page 12\]](#)

[Deployment Options \[page 14\]](#)

[Administration Tools \[page 19\]](#)

[SAP HANA Administration Guide for SAP HANA Platform](#)

[Administration Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality](#)

[SAP HANA Administration Guide](#)

## 1.1 Overview

SAP HANA smart data integration and SAP HANA smart data quality provide tools to access source data and provision, replicate, and transform that data in SAP HANA.

SAP HANA smart data integration and SAP HANA smart data quality let you enhance, cleanse, and transform data to make it more accurate and useful. You can efficiently connect to any source to provision and cleanse data for loading into SAP HANA, and for supported systems, writing back to the original source.

Capabilities include:

- A simplified landscape; that is, one environment in which to provision and consume data
- Access to more data formats including an open framework for new data sources
- In-memory performance, which means increased speed and decreased latency

| Feature area                    | Description  |
|---------------------------------|--|
| SAP HANA smart data integration | <p>Real-time, high-speed data provisioning, bulk data movement, and federation. Provides built-in adapters plus an SDK so you can build your own adapters.</p> <p>Includes the following features and tools:</p> <ul style="list-style-type: none"><li>• Replication Editor in SAP Web IDE and SAP HANA Web-based Development Workbench, which lets you set up batch or real-time data replication scenarios in an easy-to-use web application</li><li>• Transformations presented as nodes in SAP Web IDE and SAP HANA Web-based Development Workbench, which let you set up batch or real-time data transformation scenarios</li><li>• Data Provisioning Agent, a lightweight component that hosts data provisioning adapters, enabling data federation, replication, and transformation scenarios for on-premise or in-cloud deployments</li><li>• Data Provisioning adapters for connectivity to remote sources</li><li>• An Adapter SDK to create custom adapters</li><li>• Monitors for Data Provisioning Agents, remote subscriptions, and data loads</li></ul> |
| SAP HANA smart data quality     | <p>Real-time, high-performance data cleansing, address cleansing, and geospatial data enrichment. Provides an intuitive interface to define data transformation flowgraphs in SAP Web IDE and SAP HANA Web-based Development Workbench.</p>  |

## 1.2 Architecture and Connections

The architecture for using smart data integration and smart data quality generally includes the same core components. However, the connections and protocols used between components vary based on the protocol you use to connect to SAP HANA.



## 1.2.1 Connecting with JDBC

The Data Provisioning Agent connects via JDBC in most scenarios. For example, it can use JDBC when you connect to SAP HANA on-premise, SAP HANA Cloud, SAP Datasphere, or the SAP HANA service for SAP BTP in the Cloud Foundry environment.

When you configure the agent to use JDBC, the agent initiates all communication with SAP HANA. The agent polls the server to see if there are any messages for the agent to act upon.

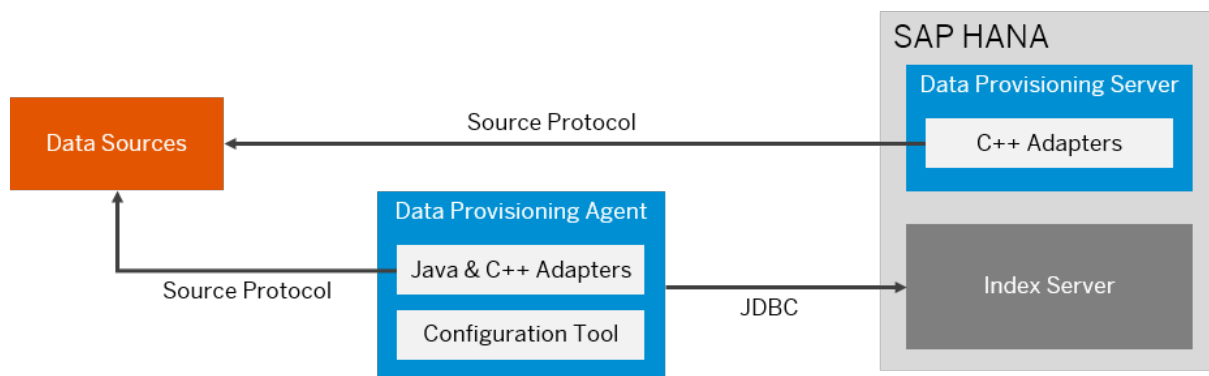


Figure 1: Connecting to SAP HANA via JDBC

Table 1: Connections

| Client                  | Protocol | Default Port | Additional Information   |
|-------------------------|----------|--------------|--|
| Data Provisioning Agent | JDBC     | Varies       | <p>The default port depends on the service endpoint. For services such as SAP HANA Cloud and SAP Datasphere, the port is typically <b>443</b>.</p> <p>For SAP HANA on-premise, the port is the SAP HANA SQL port.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>When you use JDBC, the <code>AGENTS</code> view within the SAP HANA database displays the protocol as <code>HTTPS</code>.</p> </div> |
| Sources                 | Varies   | Varies       | <p>The connections to external data sources depend on the type of adapter used to access the source.</p> <p>C++ adapters running in the Data Provisioning Server and Java adapters deployed on the Data Provisioning Agent connect to the source using a source-defined protocol.</p>  |

## Related Information

[Using SAP HANA Smart Data Integration with SAP HANA Cloud Connect to SAP Datasphere \[page 41\]](#)

## 1.2.2 Connecting with HTTP(S)

The Data Provisioning Agent connects via HTTP(S) when SAP HANA is behind a firewall or when you're connecting to the SAP HANA service for SAP BTP in the Neo environment.

When you configure the agent to use HTTP(S), the agent initiates all communication with SAP HANA. The agent polls the server to see if there are any messages for the agent to act upon.

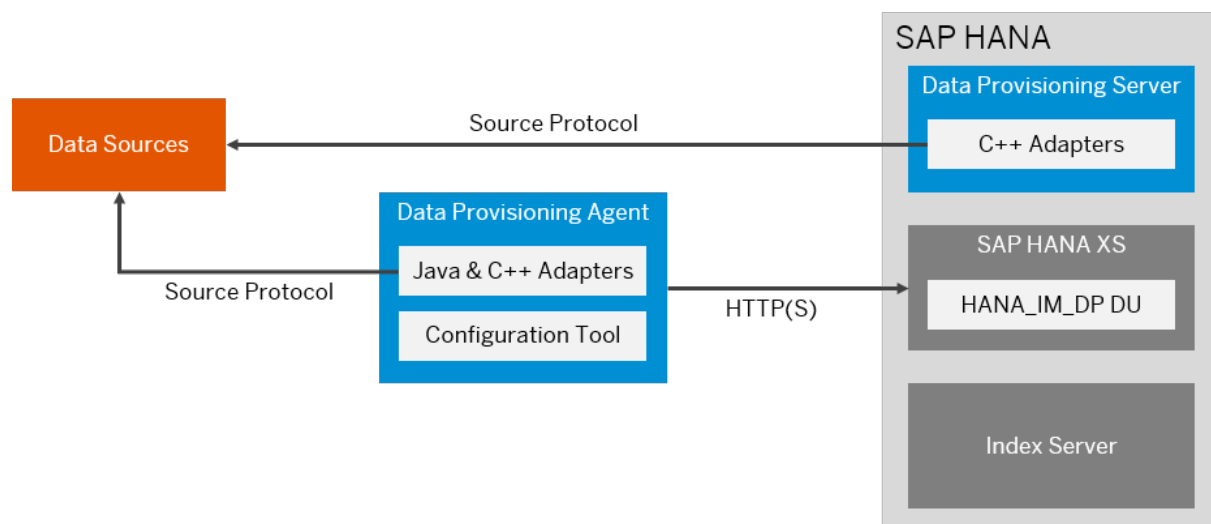


Figure 2: Connecting to SAP HANA via HTTP(S)

Table 2: Connections

| Client                  | Protocol | Default Port       | Additional Information  |
|-------------------------|----------|--------------------|---|
| Data Provisioning Agent | HTTPS    | 80<xx> /<br>43<xx> | <p>When the agent connects to SAP HANA over HTTPS, data is automatically gzip compressed to minimize the required network bandwidth.</p> <p>For information about configuring the HTTPS port used by SAP HANA, see the <i>SAP HANA Administration Guide</i>.</p>                      |
| Sources                 | Varies   | Varies             | <p>The connections to external data sources depend on the type of adapter used to access the source.</p> <p>C++ adapters running in the Data Provisioning Server and Java adapters deployed on the Data Provisioning Agent connect to the source using a source-defined protocol.</p> |

## Related Information

[Connect to the SAP HANA service for SAP BTP, Neo Environment via HTTP \[page 50\]](#)

## 1.2.3 Connecting with TCP/IP

The Data Provisioning Agent can connect via TCP/IP when the SAP HANA system is deployed on-premise.

When you configure the agent to use TCP/IP, the SAP HANA data provisioning server initiates all communication with the agent. The server sends messages to the agent directly.

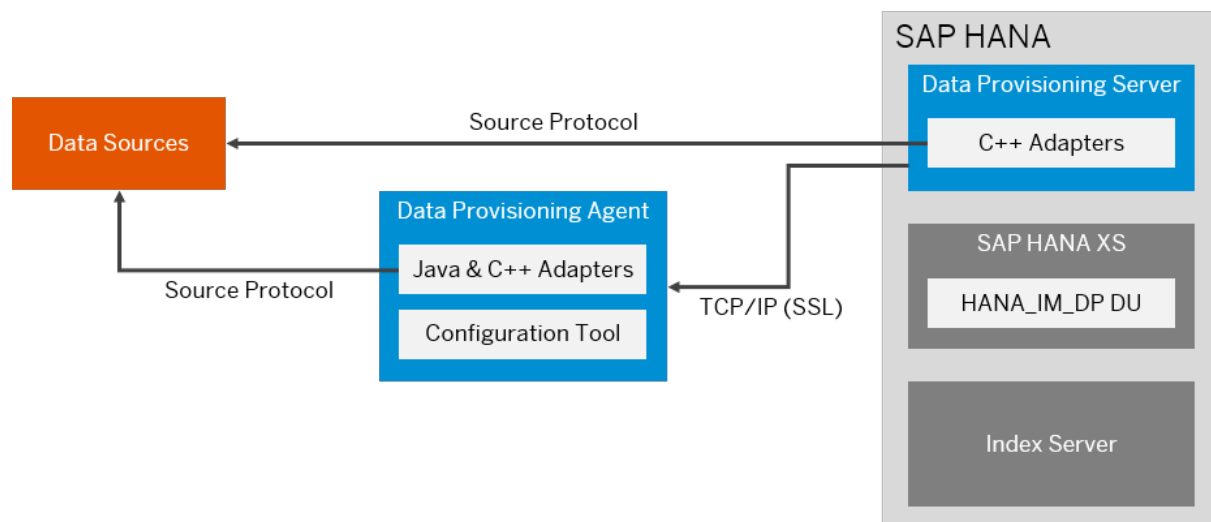


Figure 3: Connecting to SAP HANA via TCP/IP

Table 3: Connections

| Client                  | Protocol | Default Port | Additional Information  |
|-------------------------|----------|--------------|---|
| Data Provisioning Agent | TCP/IP   | 5050         | To manage the listening port used by the agent, modify the <code>framework.listenerPort</code> agent configuration parameter with the Data Provisioning Agent Configuration tool.   |
| Sources                 | Varies   | Varies       | <p>The connections to external data sources depend on the type of adapter used to access the source.</p> <p>C++ adapters running in the Data Provisioning Server and Java adapters deployed on the Data Provisioning Agent connect to the source using a source-defined protocol.</p> |

## Related Information

[Connect to SAP HANA On-Premises via TCP \[page 62\]](#)

[Agent Configuration Parameters \[page 112\]](#)

## 1.3 Components to Install, Deploy, and Configure

SAP HANA smart data integration and SAP HANA smart data quality include a number of components that you must install, deploy, and configure.

Within this guide, the steps to install and deploy the components appear in the sections [Configure Smart Data Integration \[page 20\]](#) and [Configure Smart Data Quality \[page 165\]](#).

| Component                | Description   |
|--------------------------|---|
| Data Provisioning Server | <p>The Data Provisioning Server is a native SAP HANA process. It's built as an index server variant, runs in the SAP HANA cluster, and is managed and monitored just like other SAP HANA services. It provides native connectivity for many sources and connectivity to the Data Provisioning Agent.</p> <p>The Data Provisioning Server is installed with, but must be enabled in, the SAP HANA server.</p>  |
| Data Provisioning Agent  | <p>The Data Provisioning Agent is a container running outside the SAP HANA environment, and it's managed by the Data Provisioning Server. The agent provides connectivity for all those sources where the driver can't run inside the Data Provisioning Server. Through the agent, the preinstalled Data Provisioning Adapters communicate with the Data Provisioning Server for connectivity, metadata browsing, and data access. The agent also hosts custom adapters created using the Adapter SDK.</p> <p>The Data Provisioning Agent is installed separately from SAP HANA server or client.</p> |

| Component                | Description   |
|--------------------------|---|
| HANA_IM_DP delivery unit | <p>The HANA_IM_DP delivery unit bundles monitoring and administration capabilities. It also includes the Data Provisioning Proxy for connecting to the SAP HANA Service for SAP BTP in the Neo environment.</p>   |
|                          | <div style="background-color: #f0f0f0; padding: 10px;"> <p><b>Note</b></p> <p>This component is relevant only for SAP HANA on-premise and the SAP HANA Service for SAP BTP in the Neo environment.</p> </div>   |
|                          | <p>The delivery unit includes the following functionality:</p>  |
|                          | <p><b>Data Provisioning administration application</b> The Data Provisioning administration application is an XS application that manages the administrative functions of the Data Provisioning Agent.</p>  |
|                          | <p><b>Data Provisioning Proxy</b> The Data Provisioning Proxy is an XS application that acts as a proxy to provide communication between the Data Provisioning Agent and the Data Provisioning Server when you use the SAP HANA Service for SAP BTP in the Neo environment. In this scenario, the agent uses HTTP(S) to connect to the Data Provisioning Proxy in the XS Engine, which eliminates the need to open more ports in corporate IT firewalls.</p>  |
|                          | <p><b>Data Provisioning monitor</b> The Data Provisioning monitor is a browser-based interface that lets you monitor agents, tasks, and remote subscriptions created in the SAP HANA system. To view the monitors, enter the URL of each monitor into a web browser or access the smart data integration links in the SAP HANA cockpit, a web-based launchpad that is installed with the SAP HANA server.</p> <p>Create the statistics tables and deploy the HANA_IM_DP delivery unit to enable agent, data load, and remote subscription monitoring.</p> |
| Replication Editor       | <p>The Replication Editor allows you to set up replication tasks that replicate data from several objects in a remote source to tables in SAP HANA.</p> <p>Replication editor functionality is delivered in the following tools:</p> <ul style="list-style-type: none"> <li>• SAP Business Application Studio</li> <li>• SAP Web IDE</li> <li>• SAP Web IDE for SAP HANA</li> <li>• SAP HANA Web-based Development Workbench</li> </ul> <p>The tools available depend on your deployment scenario.</p>  |

| Component        | Description  |
|------------------|--|
| Flowgraph Editor | <p>The Flowgraph Editor provides an interface to create data provisioning and data quality transformation flowgraphs.</p> <p>Replication editor functionality is delivered in the following tools:</p> <ul style="list-style-type: none"> <li>• SAP Business Application Studio</li> <li>• SAP Web IDE</li> <li>• SAP Web IDE for SAP HANA</li> <li>• SAP HANA Web-based Development Workbench</li> </ul> <p>The tools available depend on your deployment scenario.</p> |

## 1.4 Deployment Options

Common deployment options for SAP HANA systems, Data Provisioning Agents, and source systems are described.

There are two common deployment landscapes that we recommend:

| Landscape             | Description   |
|-----------------------|---|
| Distributed landscape | <ul style="list-style-type: none"> <li>• System 1: SAP HANA Server</li> <li>• System 2: Data Provisioning Agent</li> <li>• System 3: Source system</li> </ul> |
| Combined landscape    | <ul style="list-style-type: none"> <li>• System 1: SAP HANA Server</li> <li>• System 2: Data Provisioning Agent and the source system</li> </ul>              |

### SAP HANA Service for SAP BTP, Neo Environment

If your deployment includes the SAP HANA Service for SAP BTP in the Neo environment and a firewall between SAP HANA and the Data Provisioning Agent, the following requirements apply:

- The Data Provisioning Proxy must be deployed. To deploy the proxy, download and deploy the HANA\_IM\_DP delivery unit.
- The Data Provisioning Agent must be configured to communicate with SAP HANA using HTTP. Configure the Agent by using the Data Provisioning Agent Configuration tool.

### SAP HANA Service for SAP BTP, Cloud Foundry Environment

If your deployment includes the SAP HANA service for SAP BTP in the Cloud Foundry environment, configure the Data Provisioning Agent to connect via JDBC.

For more information about connecting to the SAP HANA service for SAP BTP, see [Connect to the SAP HANA service for SAP BTP, Cloud Foundry Environment via JDBC \[page 43\]](#).

## SAP HANA Cloud

If your deployment includes SAP HANA Cloud, configure the Data Provisioning Agent to connect via JDBC.

For complete information about configuring the Data Provisioning Agent for SAP HANA Cloud, see the [Configuration Guide for SAP HANA Cloud](#).

## Other Deployment Considerations

When planning your deployment, keep the following in mind:

- You can't have one Data Provisioning Agent registered in multiple SAP HANA instances.
- You can have multiple instances of the Data Provisioning Agent installed on one or more machines. For example, a developer could install a Data Provisioning Agent on their computer to work on a custom adapter.

## Related Information

[Deployment in High Availability Scenarios \[page 15\]](#)

[Deployment with the SAP HANA Service for SAP BTP \[page 17\]](#)

### 1.4.1 Deployment in High Availability Scenarios

In addition to installing SAP HANA in a multiple-host configuration, you can use agent grouping to provide automatic failover and load balancing for SAP HANA smart data integration and SAP HANA smart data quality functionality in your landscape.

#### Auto-failover for the Data Provisioning Server

In a multiple-host SAP HANA system, the Data Provisioning Server runs only in the active worker host. If the active worker host fails, the Data Provisioning Server is automatically started in the standby host when it takes over, and any active replication tasks are resumed.

#### Note

The Data Provisioning Server does not support load balancing.

For more information about installing SAP HANA in a multiple-host configuration, see the *SAP HANA Server Installation and Update Guide*.

## Auto-failover for the Data Provisioning Agent

Agent grouping provides automatic failover for connectivity to data sources accessed through Data Provisioning Adapters.

When an agent that is part of a group is unreachable for a time longer than the configured heart beat time limit, the Data Provisioning Server chooses a new active agent within the group, and it resumes replication for any remote subscriptions active on the original agent.

Initial and batch load requests to a remote source configured on the agent group are routed to the first available agent in the group.

### ⚠ Restriction

Fail-over is not supported for initial and batch load requests. Restart the initial load following a failure due to agent unavailability.

## Load balancing for the Data Provisioning Agent

Agent grouping provides load balancing for initial loads only.

For example, with multiple agents in the group, you can choose to have the agent for the initial load selected randomly, or selected from the list of agents in a round-robin fashion.

### ⚠ Restriction

Load balancing is not supported for change data capture (CDC) operations.

For complete information about configuring agent groups, see the *Administration Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality*.

## Related Information

[SAP HANA Server Installation and Update Guide](#)

[Load Balancing in an Agent Group \[page 96\]](#)

[Failover Behavior in an Agent Group \[page 95\]](#)



## 1.4.2 Deployment with the SAP HANA Service for SAP BTP

Understand the landscape and deployment and configuration process when using SAP HANA smart data integration with SAP HANA service for SAP BTP.

### Context

When you're using the SAP HANA service for SAP BTP, you can use SAP HANA smart data integration with tools such as SAP Web IDE on SAP BTP to transform and replicate data into the SAP HANA database.

#### ⚠ Restriction

SAP HANA service doesn't support SAP HANA smart data quality functionality.

### Procedure

1. Ensure that you're using an SAP HANA service instance that has the SAP HANA Data Provisioning Server capability enabled.
  - To create an instance with the SAP HANA Data Provisioning Server capability, use the SAP BTP cockpit.  
For more information, see [Create an SAP HANA Service Instance Using the Cloud Cockpit](#).
  - To enable the SAP HANA Data Provisioning Server capability on an existing instance, use the SAP HANA Service Dashboard.  
For more information, see [Enable and Disable Capabilities](#).

2. Ensure that the flowgraph and replication task editors are available in SAP Web IDE.

To use the flowgraph and replication task editors in SAP Web IDE on SAP BTP, you must first enable the SAP EIM Smart Data Integration Editors extension. For more information, see [Enable Additional Features \(Extensions\)](#).

#### 📘 Note

SAP HANA smart data quality functionality, including the Cleanse, Geocode, and Match nodes, isn't available in the SAP EIM Smart Data Integration Editors extension in SAP Web IDE on SAP BTP.

3. Connect the Data Provisioning Agent to the SAP HANA service instance via JDBC.

For information, see [Connect to the SAP HANA service for SAP BTP, Cloud Foundry Environment via JDBC \[page 43\]](#).

4. Configure adapters for your data sources.

The Data Provisioning Agent includes adapters that allow SAP HANA smart data integration to connect to your data sources. You may need to perform configuration steps on your source system to prepare your source for use with a data provisioning adapter.

For more information, see [Register Data Provisioning Adapters \[page 142\]](#) and [Configure Data Provisioning Adapters \[page 181\]](#).

5. Create remote sources in SAP HANA that connect to your data sources.

Use the SAP HANA database explorer to create remote sources in the SAP HANA service.

- a. In the SAP HANA database explorer, right-click the *Remote Sources* object in your database catalog and click *New Remote Source*.
- b. Specify the remote source name, adapter name, and **dpserver** for *Source Location*.
- c. Fill in the other required connection property fields as required for your adapter and data source.
- d. Click *OK*.

For more information about the connection properties for each adapter, see [Configure Data Provisioning Adapters \[page 181\]](#).

6. Configure a grantor service for the HDI container.

Before SAP Web IDE users can create and execute flowgraphs and replication tasks, you must configure grantor privileges for the HDI container.

For more information, see [Configure a Grantor for the HDI Container \[page 151\]](#).

7. Design flowgraphs and replication tasks to retrieve data from your remote data sources, transform it, and persist it in SAP HANA database tables.

The *Modeling Guide for SAP Web IDE and SAP Business Application Studio* addresses SAP HANA smart data integration features and tools to accomplish these tasks:

- The Replication Editor is for creating real time or batch replication scenarios for moving data into SAP HANA.
- Transformation nodes can be used for pivoting tables, capturing changed data, comparing tables, and so on.

For more information, see the [Modeling Guide for SAP Web IDE and SAP Business Application Studio](#).

8. Execute and monitor your SAP HANA smart data integration flowgraphs and replication tasks.

Access the Data Provisioning Monitors from the *Catalog* folder in the SAP HANA database explorer:

| Option                                    | Description   |
|---|---|
| <b>Agents Overview</b>                    | Right-click ► <i>Data Provisioning Agents</i> ► <i>Show Data Provisioning Agents</i> ►.   |
| <b>Remote Sources Detailed View</b>       | Right-click ► <i>Remote Sources</i> ► <i>Show Remote Sources</i> ►. Click a remote source.  |
| <b>Remote Sources Overview</b>            | Right-click ► <i>Remote Sources</i> ► <i>Show Remote Sources</i> ►.   |
| <b>Remote Subscriptions Detailed View</b> | Open a system node such as SYSTEM, or a container. Right-click ► <i>Remote Subscriptions</i> ► <i>Show Remote Subscriptions</i> ►. Click a remote subscription. |
| <b>Remote Subscriptions Overview</b>      | Open a subfolder of the system, or a container. Right-click ► <i>Remote Subscriptions</i> ► <i>Show Remote Subscriptions</i> ►.                                 |
| <b>Task Detailed View</b>                 | Open a system node such as SYSTEM, or a container. Right-click ► <i>Tasks</i> ► <i>Show Tasks</i> ►. Click a task.  |

ⓘ **Note**

Also, you may access the tasks monitor from the flowgraph editor by opening the flowgraph and choosing ► *Tools* ► *Launch Tasks Overview* ►.

| Option        | Description  |
|---------------|--|
| Task Overview | Open a system node such as SYSTEM, or a container. Right-click ► <b>Tasks</b> ► <b>Show Tasks</b> ►. |

**Note**

Also, you may access the tasks monitor from the flowgraph editor by opening the flowgraph and choosing ► **Tools** ► **Launch Tasks Overview** ►.

For more details about the information provided in each monitor, see [Monitoring Data Provisioning in the SAP HANA Web-based Development Workbench](#).

## 1.5 Administration Tools

Several tools are available for the administration of SAP HANA smart data integration and SAP HANA smart data quality.

| Tool  | Description  |
|---|--|
| SAP HANA studio   | The SAP HANA Administration Console perspective of the SAP HANA studio is the main tool for general system administration and monitoring tasks.  |
| Data Provisioning Agent Configuration tool                | This tool manages Data Provisioning Agents and adapters, and connections to SAP HANA.  |
| SAP HANA cockpit  | <p>The SAP HANA cockpit is an SAP Fiori Launchpad site that provides you with a single point-of-access to a range of Web-based applications for the administration of SAP HANA. You access the SAP HANA cockpit through a web browser.</p> <p>Through the SAP HANA cockpit, you can monitor Data Provisioning Agents, tasks, and remote subscriptions.</p> |
| SAP HANA Enterprise Semantic Services Administration tool | The SAP HANA Enterprise Semantic Services Administration user interface is a browser-based application that lets you manage artifacts for semantic services. To launch the SAP HANA Enterprise Semantic Services Administration tool, enter the following URL in a web browser: <code>http://&lt;your_HANA_instance:port&gt;/sap/hana/im/ess/ui</code>     |

## 2 Configure Smart Data Integration

Complete the high-level tasks needed to set up SAP HANA smart data integration.

1. [Assign Roles and Privileges \[page 21\]](#)  
Add roles and privileges for users to perform various tasks.
2. [Configure the Data Provisioning Server \[page 28\]](#)  
Enable the Data Provisioning Server to use SAP HANA smart data integration.
3. [Download and Deploy the Data Provisioning Delivery Unit \[page 34\]](#)  
Download the Data Provisioning delivery unit and deploy it to obtain monitoring, proxy, and administration applications.
4. [Installing the Data Provisioning Agent \[page 37\]](#)  
The Data Provisioning Agent provides secure connectivity between the SAP HANA database and your on-premises and other sources.
5. [Configure the Data Provisioning Agent \[page 37\]](#)  
You must configure the Data Provisioning Agent before you can use adapters to connect to data sources, create remote sources, and so on.
6. [Register Data Provisioning Adapters \[page 142\]](#)  
After configuring the Data Provisioning Agent, register adapters.
7. [Create a Remote Source \[page 147\]](#)  
Using SAP HANA smart data integration, set up an adapter that can connect to your source database, and then create a remote source to establish the connection.
8. [Set Up Data Provisioning Monitoring \[page 154\]](#)  
After you install SAP HANA smart data integration, you must take several actions to enable and access the monitoring user interfaces for Data Provisioning Agents, remote subscriptions, and tasks.
9. [Enabling Enterprise Semantic Services \[page 155\]](#)  
Enterprise Semantic Services provides an API to enable searching for publication artifacts or run-time objects based on their metadata and contents. It is optional for SAP HANA smart data integration.
10. [Enable SAP HANA Smart Data Integration REST API \[page 163\]](#)  
Use the SAP HANA smart data integration REST API to programmatically execute and monitor flowgraphs and to process data for interactive data transformation within your application.

### Related Information

## 2.1 Assign Roles and Privileges

Add roles and privileges for users to perform various tasks.

The following tables list common tasks and roles or privileges that an administrator requires to assign to complete those tasks.

### Note

All privileges and roles starting with `sap.hana.im.dp` are delivered via the HANA\_IM\_DP delivery unit and are applicable only for cloud environments where xsengine is available, such as the SAP HANA service for SAP BTP in the Neo environment.

## Data Provisioning Agent and Data Provisioning Adapter Tasks

Users need specific roles and privileges to accomplish tasks when installing and configuring the Data Provisioning Agent and Data Provisioning Adapters.

### Note

Users also require permissions for accessing a particular database through a data provisioning adapter. See the “Data Provisioning Adapters” section for more information.

| Task  | Roles and Privileges  | Description  |
|---|---|--|
| Register a DP Agent                           | System privilege: <ul style="list-style-type: none"><li>AGENT ADMIN</li></ul>               |  |
| Register an adapter                           | System privilege: <ul style="list-style-type: none"><li>ADAPTER ADMIN</li></ul>             |  |
| Configure the DP Agent to connect to SAP HANA | Role: <ul style="list-style-type: none"><li>sap.hana.im.dp.proxy::Agent-Messaging</li></ul> | Required to configure the Data Provisioning Agent to use HTTP in the Data Provisioning Agent Configuration tool. |

### Note

This role is required only for the SAP HANA service for SAP BTP in the Neo environment or other cloud environments where xsengine is available to import the DP delivery unit.

| Task   | Roles and Privileges   | Description   |
|--|--|---|
|  | Object privilege: <ul style="list-style-type: none"> <li>AGENT MESSAGING</li> </ul>                          | Required for the HANA User for Agent Messaging used to communicate between the DP Agent and SAP HANA over JDBC. <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>This privilege is required only for scenarios that use JDBC to connect the DP Agent and SAP HANA, such as SAP HANA Cloud, the SAP HANA service for SAP BTP, Cloud Foundry environment, and SAP HANA on-premises.</p> </div> |
| Create an Agent or adapter when SAP HANA is in the cloud               | Application privilege: <ul style="list-style-type: none"> <li>sap.hana.im.dp.admin::Administrator</li> </ul> | Needed when an administrator wants to create adapters and agents from the monitoring UI when SAP HANA is on the cloud (or the agent uses HTTP protocol).  |
| Import a delivery unit using SAP HANA Application Lifecycle Management | Role: <ul style="list-style-type: none"> <li>sap.hana.xs.lm.roles::Administrator</li> </ul>                  | This role is necessary if you're using SAP HANA Application Lifecycle Management to import the data provisioning delivery unit.   |
| Import a delivery unit using SAP HANA studio                           | Role: <ul style="list-style-type: none"> <li>sap.hana.xs.lm.roles::Transport</li> </ul>                      |   |

## Monitoring Tasks

Users need specific roles and privileges to access and perform various tasks through the Data Provisioning monitors, which can be accessed from the SAP HANA cockpit.

| Task       | Roles and Privileges   | Description  |
|------------|--|--|
| Monitoring | Role: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor.roles::Monitoring</li> </ul> Application privilege: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor::Monitoring</li> </ul> | The Monitoring role includes the following application privileges: <ul style="list-style-type: none"> <li>sap.hana.ide::LandingPage</li> <li>sap.hana.im.dp.monitor::Monitoring</li> </ul> |

| Task                                   | Roles and Privileges   | Description  |
|--|--|--|
|  | Role: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor.roles::Operations</li> </ul>   | The Operations role includes the following application privileges (sap.hana.im.dp.monitor::*): <ul style="list-style-type: none"> <li>AddLocationToAdapter</li> <li>AlterAgent</li> <li>AlterRemoteSource</li> <li>AlterRemoteSubscription</li> <li>CreateAgent</li> <li>DeleteSchedule</li> <li>DropAgent</li> <li>DropRemoteSubscription</li> <li>ExecuteDesignTimeObject</li> <li>NotificationAdministration</li> <li>ProcessRemoteException (This privilege includes both remote source and remote subscription exceptions.)</li> <li>RemoveLocationFromAdapter</li> <li>ScheduleDesignTimeObject</li> <li>ScheduleTask</li> <li>StartTask</li> <li>StopTask</li> <li>UpdateAdapter</li> </ul> |
| Enable users to schedule a task        | Role: <ul style="list-style-type: none"> <li>sap.hana.xs.admin.roles::JobSchedulerAdministrator</li> </ul>   |  |
| Schedule a task                        | Role: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor.roles::Operations</li> </ul> Application privilege: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor::ScheduleTask</li> </ul> |  |
| Start a task                           | Application privilege: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor::StartTask</li> </ul>   |  |
| Stop a task                            | Application privilege: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor::StopTask</li> </ul>  |  |
| Process remote subscription exceptions | Object privilege: <ul style="list-style-type: none"> <li>PROCESS REMOTE SUBSCRIPTION EXCEPTION</li> </ul>  | Must be explicitly granted for a remote source created by another user.  |

## Remote Source and Remote Subscription Tasks

Users need specific roles and privileges to create and manage remote sources and remote subscriptions.

| Task                                    | Roles and Privileges  | Description   |
|---|---|---|
| Create a remote source                  | System privilege: <ul style="list-style-type: none"> <li>CREATE REMOTE SOURCE</li> </ul>                      | <p>When a user can create a remote source (has the CREATE REMOTE SOURCE system privilege), that user automatically has the following privileges for remote sources they create:</p> <ul style="list-style-type: none"> <li>CREATE VIRTUAL TABLE</li> <li>DROP</li> <li>CREATE REMOTE SUBSCRIPTION</li> <li>PROCESS REMOTE SUBSCRIPTION EXCEPTION</li> </ul> <p>For remote sources created by other users, those privileges must be assigned for each remote source in order to perform those tasks.</p> |
| Alter a remote source                   | Object privilege: <ul style="list-style-type: none"> <li>ALTER</li> </ul>                                     | <p>To alter a remote source, a user must have the ALTER object privilege on the remote source. Examples of altering a remote source include:</p> <ul style="list-style-type: none"> <li>ALTER REMOTE SOURCE <code>&lt;remote_source_name&gt;</code> SUSPEND CAPTURE</li> <li>ALTER REMOTE SOURCE <code>&lt;remote_source_name&gt;</code> RESUME CAPTURE</li> </ul>  |
| Drop a remote source                    | Object privilege: <ul style="list-style-type: none"> <li>DROP</li> </ul>                                      | This privilege must be explicitly granted for a remote source created by another user.  |
| Search for an object in a remote source | Object privilege: <ul style="list-style-type: none"> <li>ALTER on the remote source to be searched</li> </ul> | To search for remote objects such as tables in a remote source, a user must have the ALTER object privilege on the remote source so the system can create a dictionary of objects for the user.   |
| Add a virtual table                     | Object privilege <ul style="list-style-type: none"> <li>CREATE VIRTUAL TABLE</li> </ul>                       | This privilege must be explicitly granted for a remote source created by another user.  |
|   |   | <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 10px;"> <p><b>Note</b></p> <p>When you use SAP Web IDE for SAP HANA, the internal ObjectOwner of the HDI project must have privileges to create virtual tables on the remote source.</p> </div>   |
| Create a remote subscription            | Object privilege: <ul style="list-style-type: none"> <li>CREATE REMOTE SUBSCRIPTION</li> </ul>                | This privilege must be explicitly granted for a remote source created by another user.  |



## Replication Task and Flowgraph Tasks

Users need specific roles and privileges to create and run flowgraphs and replication tasks from SAP Web IDE for SAP HANA, SAP HANA Web-based Development Workbench, or the SAP HANA studio.

| Task                                    | Roles and Privileges  | Description   |
|---|---|---|
| Create a flowgraph                      | <p>For SAP HANA Web-based Development Workbench and SAP HANA studio:</p> <p>Role:</p> <ul style="list-style-type: none"> <li>sap.hana.xs.ide.roles::Editor-Developer</li> </ul> <p>Object privilege:</p> <ul style="list-style-type: none"> <li>EXECUTE on "_SYS_REPO"."TEXT_ACCESSOR" and "_SYS_REPO"."MULTI_TEXT_ACCESSOR"</li> </ul> | <p>Allows creation of .hdbflowgraph.</p> <div style="background-color: #f0f0f0; padding: 5px; border: 1px solid #ccc;"> <p><b>→ Tip</b></p> <p>When you use SAP Web IDE for SAP HANA, specific roles or privileges aren't required to create flowgraphs.</p> </div> |
| Create a flowgraph of type Task         | <p>Object privilege:</p> <ul style="list-style-type: none"> <li>SELECT (for input/output schema)</li> </ul>   |   |
| Create a replication task               | <p>Role:</p> <ul style="list-style-type: none"> <li>sap.hana.xs.ide.roles::Editor-Developer</li> </ul>  | Allows creation of .hdbreptask.   |
| Activate replication task (.hdbreptask) | <p>Object privileges:</p> <ul style="list-style-type: none"> <li>SELECT on the source schema</li> <li>CREATE VIRTUAL TABLE on REMOTE SOURCE (Initial Load Only)</li> <li>CREATE REMOTE SUBSCRIPTION on REMOTE SOURCE (for real-time scenarios)</li> </ul>   | Must be granted to _SYS_REPO.   |

| Task   | Roles and Privileges   | Description   |
|--|--|---|
| Activate flowgraph<br>(.hdbflowgraph)          | Object privileges: <ul style="list-style-type: none"> <li>• SELECT on the source table</li> <li>• INSERT, UPDATE, and DELETE on the target table</li> <li>• SELECT on the target schema (only when using a Template Table as a target)</li> <li>• If sequence is used, then GRANT SELECT on sequence</li> <li>• History Table:               <ul style="list-style-type: none"> <li>• GRANT INSERT on History Table</li> <li>• GRANT SELECT on Target Table</li> </ul> </li> </ul> | Must be granted to _SYS_REPO.<br><br><b>→ Tip</b><br>When you use SAP Web IDE for SAP HANA, the ObjectOwner automatically has all necessary privileges for flowgraph activation. When using synonyms, the granter service must manage the privileges.   |
| Execute a stored procedure                     | Object privilege: <ul style="list-style-type: none"> <li>• EXECUTE</li> </ul>  | Needed on the schema where the stored procedure is located.<br><br><b>→ Tip</b><br>When you use SAP Web IDE for SAP HANA, the ObjectOwner automatically has all necessary privileges for executing stored procedures. When using synonyms, the granter service must manage the privileges.  |
| Execute a task                                 | Object privilege: <ul style="list-style-type: none"> <li>• EXECUTE</li> <li>• INSERT</li> <li>• UPDATE</li> <li>• SELECT</li> <li>• DELETE</li> </ul>  | Needed on the schema where the task is located.<br><br><b>→ Tip</b><br>When you use SAP Web IDE for SAP HANA, the ObjectOwner automatically has all necessary privileges for executing tasks.   |
| Use the JIT (just-in-time) Data Preview option | Object privilege: <ul style="list-style-type: none"> <li>• SELECT and EXECUTE with GRANT OPTION</li> </ul>   | Must be granted to _SYS_REPO. Needed on the schema where the task or stored procedure is located.<br><br><b>⚠ Restriction</b><br>The JIT (just-in-time) Data Preview option isn't supported in SAP Web IDE for SAP HANA. If you want to use the JIT Data Preview option, consider using SAP HANA Web-based Development Workbench. |

| Task   | Roles and Privileges  | Description |
|--|---|-------------|
| Use the AFL node or the Predictive Analysis node | <p>For AFL node in SAP HANA Web-based Development Workbench and Predictive Analysis node in SAP Web IDE:</p> <p>Role: XSA_DEV_USER_ROLE and <code>_&lt;SYS&gt;_DI_OO_DEFAULTS</code></p> <ul style="list-style-type: none"> <li>AFL_AREAS</li> <li>AFL_FUNCTION_PARAMETERS</li> <li>AFL_FUNCTION_PROPERTIES</li> <li>AFL_FUNCTIONS</li> <li>AFL_PACKAGES</li> <li>AFL_TEXTS</li> </ul> <p>For execution, <code>_&lt;SYS&gt;_DI_OO_DEFAULTS</code></p> <ul style="list-style-type: none"> <li>AFL__SYS_AFL_AFLPAL_EXECUTE</li> </ul> |             |

## Access to SAP Web IDE for SAP HANA

Although specific authorizations aren't required to use the flowgraph editor, you need to configure users if they don't already have access to SAP Web IDE in general. For example, they need the following roles or permissions:

- A role collection containing the *WebIDE\_Developer* role template
- A role collection containing the *WebIDE\_Administrator* role template
- The *SpaceDeveloper* role for the space in which they need to work

For complete information about granting users access to SAP Web IDE, see the necessary configuration tasks described in [Post-Installation Administration Tasks](#).

**Parent topic:** [Configure Smart Data Integration \[page 20\]](#)

**Next:** [Configure the Data Provisioning Server \[page 28\]](#)

## Related Information

[Grant Roles to Users \[page 155\]](#)

[Developer Authorization in the Repository \(SAP HANA Security Guide\)](#)

[SAP HANA Web-based Development Workbench: Editor \(SAP HANA Developer Guide\)](#)

## 2.2 Configure the Data Provisioning Server

Enable the Data Provisioning Server to use SAP HANA smart data integration.

By default, the Data Provisioning Server is disabled when you install SAP HANA.

[Enable the Server in a Multi-Database Container Scenario \[page 28\]](#)

To enable the Data Provisioning Server on tenants in a multi-database container environment, use the `ALTER DATABASE SQL` command.

[Enable the Server in a Scale-Out SAP HANA Database Scenario \[page 29\]](#)

In a scale-out SAP HANA database scenario, you **must** enable the Data Provisioning Server only on the host that runs the master index server.

[Enable the Server for the SAP HANA Service for SAP BTP \[page 30\]](#)

To use SAP HANA smart data integration with the SAP HANA service for SAP BTP, you must use an instance with the SAP HANA Data Provisioning Server capability enabled.

[Data Provisioning Server Configuration Parameters \[page 30\]](#)

The Data Provisioning Server configuration parameters provide advanced configuration options for the operation of the data provisioning server.

**Parent topic:** [Configure Smart Data Integration \[page 20\]](#)

**Previous:** [Assign Roles and Privileges \[page 21\]](#)

**Next:** [Download and Deploy the Data Provisioning Delivery Unit \[page 34\]](#)

### Related Information

#### 2.2.1 Enable the Server in a Multi-Database Container Scenario

To enable the Data Provisioning Server on tenants in a multi-database container environment, use the `ALTER DATABASE SQL` command.

##### Sample Code

```
ALTER DATABASE <database_name> ADD 'dpserver' [AT LOCATION  
'<hostname>[:<port_number>'] ]
```

**Parent topic:** [Configure the Data Provisioning Server \[page 28\]](#)

## Related Information

[Enable the Server in a Scale-Out SAP HANA Database Scenario \[page 29\]](#)

[Enable the Server for the SAP HANA Service for SAP BTP \[page 30\]](#)

[Data Provisioning Server Configuration Parameters \[page 30\]](#)

[ALTER DATABASE Statement \(Tenant Database Management\) \(SAP HANA SQL and System Views Reference\)](#)

## 2.2.2 Enable the Server in a Scale-Out SAP HANA Database Scenario

In a scale-out SAP HANA database scenario, you **must** enable the Data Provisioning Server only on the host that runs the master index server. Subordinate nodes shouldn't have enabled Data Provisioning Server instances.

### Sample Code

```
ALTER SYSTEM ALTER CONFIGURATION ('daemon.ini', 'HOST',  
'<master_indexserver_hostname>') SET ('dpserver','instances') = '1' WITH  
RECONFIGURE;
```

**Parent topic:** [Configure the Data Provisioning Server \[page 28\]](#)

## Related Information

[Enable the Server in a Multi-Database Container Scenario \[page 28\]](#)

[Enable the Server for the SAP HANA Service for SAP BTP \[page 30\]](#)

[Data Provisioning Server Configuration Parameters \[page 30\]](#)

## 2.2.3 Enable the Server for the SAP HANA Service for SAP BTP

To use SAP HANA smart data integration with the SAP HANA service for SAP BTP, you must use an instance with the SAP HANA Data Provisioning Server capability enabled.

### Context

Create an instance with the capability, or enable it on an existing instance.

### Procedure

- To create an instance with the SAP HANA Data Provisioning Server capability, use the SAP BTP cockpit.
- To enable the SAP HANA Data Provisioning Server capability on an existing instance, use the SAP HANA Service Dashboard.

### Next Steps

For more information about managing an SAP HANA Service instance, see the [SAP HANA Service for SAP BTP Getting Started Guide](#)

**Task overview:** [Configure the Data Provisioning Server \[page 28\]](#)

### Related Information

[Enable the Server in a Multi-Database Container Scenario \[page 28\]](#)

[Enable the Server in a Scale-Out SAP HANA Database Scenario \[page 29\]](#)

[Data Provisioning Server Configuration Parameters \[page 30\]](#)

[Create an SAP HANA Service Instance Using the Cloud Cockpit](#)

[Enable and Disable Capabilities](#)

## 2.2.4 Data Provisioning Server Configuration Parameters

The Data Provisioning Server configuration parameters provide advanced configuration options for the operation of the data provisioning server. You can configure the parameters by modifying the `indexserver.ini` and `dpserver.ini` files on your SAP HANA instance.

### ⚠ Caution

Don't modify these parameters unless you're instructed to do so; in most cases, default settings suffice. Use these parameters only for debugging or performance tuning. Also, changes to some of these parameters may require corresponding changes to the agent configuration parameters on your data provisioning agents.

## Configuration Parameters (indexserver.ini)

| Section        | Parameter Name              | Description  | Default Value | Data Type | Value Range               | Restart Required |
|----------------|-----------------------------|--|---------------|-----------|---------------------------|------------------|
| agent_group    | load_balance_mode           | Load-balancing mode for agent groups.                | NONE          | STRING    | none, random, round_robin | No               |
| dataprotection | appliermaxrows-stagingtable | Maximum number of rows in the applier staging table. | 0             | INTEGER   |                           | No               |

## Configuration Parameters (dpserver.ini)

| Section        | Parameter Name                        | Description  | Default Value | Data Type | Value Range   | Restart Required |
|----------------|---------------------------------------|--|---------------|-----------|---|------------------|
| dataprotection | auto_reset_non_acd_check_interval_sec | Interval at which to check and reset certain subscriptions not in the APPLY_CHANGE_DATA state.<br><br>A value of 0 disables this check and prevents the automatic reset. | 43200         | SECONDS   |   | No               |
| dataprotection | auto_reset_max_non_acd_sec            | Maximum time in seconds that a subscription can remain in state other than APPLY_CHANGE_DATA.  | 259200        | SECONDS   |   | No               |
| framework      | compressData                          | Specifies when to use message compression.   | 2             | INTEGER   | 0 - Never<br>1 - Always<br>2 - Cloud-only<br>3 - TCP-only | No               |

| Section                   | Parameter Name          | Description  | Default Value | Data Type | Value Range | Restart Required |
|---------------------------|-------------------------|--|---------------|-----------|-------------|------------------|
| frame-work                | fetchSize               | Request size when asking for the next set of rows.   | 1000          | INTEGER   |             | No               |
| frame-work                | initialChannelsPerAgent | Number of initial socket connections made to TCP agents.   | 10            | INTEGER   |             | No               |
| frame-work                | maintenancePeriod       | Period between heartbeat pings sent to data provisioning agents.                                       | 60            | SECONDS   |             | No               |
| frame-work                | maxAgentPingFailures    | Number of consecutive failed pings that trigger the agent down mechanism and clean up data structures. | 5             | INTEGER   |             | No               |
| frame-work                | maxChannelsPerAgent     | Maximum number of socket connections to a particular TCP agent.  | 100           | INTEGER   |             | No               |
| frame-work                | messageTimeout          | Amount of time that any non-ping request waits for a reply before returning a timeout error.           | 600           | SECONDS   |             | No               |
| frame-work                | pingMessageTimeout      | Amount of time that a ping message wait for a reply before returning a timeout error.                  | 30            | SECONDS   |             | No               |
| frame-work                | prefetchIdleTimeout     | Amount of time for the prefetch thread idle timeout.   | 600           | SECONDS   |             | No               |
| frame-work                | prefetchLimit           | Number of prefetches to go ahead for normal prefetch.  | 4             | INTEGER   |             | No               |
| frame-work                | prefetchTimeout         | Amount of time to wait for a response from the prefetch thread before returning a timeout error.       | 600           | SECONDS   |             | No               |
| frame-work                | usePrefetch             | Specifies whether to use prefetch.   | TRUE          | BOOLEAN   | true, false | No               |
| frame-work                | useStreaming            | Specifies whether to use streaming prefetch instead of normal prefetch.                                | TRUE          | BOOLEAN   | true, false | No               |
| re-mote_source_statistics | collect_interval        | Amount of time between each remote source statistics collection.                                       | 300           | SECONDS   |             |                  |



| Section                   | Parameter Name                    | Description  | Default Value   | Data Type | Value Range | Restart Required |
|---------------------------|-----------------------------------|--|---|-----------|-------------|------------------|
| re-mote_source_statistics | dp_ui_stats_procedure_name        | Name of the procedure used to collect statistics.  | sap.hana.im.dp.monitor.ds::LOG_REMOTE_SOURCE_STATISTICS | STRING    |             |                  |
| re-mote_source_statistics | dp_ui_stats_procedure_schema_name | Name of the schema for the procedure used to collect statistics.                           | SAP_HANA_IM_DP  | STRING    |             |                  |
| re-mote_source_statistics | latency_history_retain_period     | Period to retain latency history.  | 2   | DAYS      |             |                  |
| re-mote_source_statistics | update_interval                   | Amount of time between each update of remote source statistics.                            | 300   | SECONDS   |             |                  |
| smart_data_integration    | force_reset_remote_subscription   | Specifies whether to force a subscription reset after attempting to stop the subscription. | TRUE  | BOOLEAN   | true, false | No               |

**Note**

When set to **true**, after stopping a remote subscription, the subscription is reset even when the stop action fails.

Parent topic: [Configure the Data Provisioning Server \[page 28\]](#)

## Related Information

[Enable the Server in a Multi-Database Container Scenario \[page 28\]](#)

[Enable the Server in a Scale-Out SAP HANA Database Scenario \[page 29\]](#)

[Enable the Server for the SAP HANA Service for SAP BTP \[page 30\]](#)

[Agent Configuration Parameters \[page 112\]](#)

## 2.3 Download and Deploy the Data Provisioning Delivery Unit

Download the Data Provisioning delivery unit and deploy it to obtain monitoring, proxy, and administration applications.

| Functionality | Description   |
|---------------|---|
| Monitoring    | The Monitoring application provides a browser-based interface to monitor agents, tasks, and remote subscriptions created in the SAP HANA system. The monitor application can be accessed from the SAP HANA cockpit.   |
| Proxy         | The Proxy application provides a way for the Data Provisioning Agent to communicate with the Data Provisioning Server and is required when SAP HANA is running in the cloud or when the remote sources are behind a firewall. In this case, the Data Provisioning Agent stays behind the firewall (that is, close to the remote source) and communicates with SAP HANA (specifically, the dpserver) via the Proxy application running in the XS engine. |
| Admin         | The Admin application provides a way for the Data Provisioning Agent Configuration tool to issue SQL commands necessary to register the agent and the adapters in the SAP HANA system. This application is used when SAP HANA is in the cloud and the Data Provisioning Agent is behind a firewall.   |

**Parent topic:** [Configure Smart Data Integration \[page 20\]](#)

**Previous:** [Configure the Data Provisioning Server \[page 28\]](#)

**Next:** [Installing the Data Provisioning Agent \[page 37\]](#)

### Related Information

[Download the Data Provisioning Delivery Unit \[page 34\]](#)

[Deploy the Delivery Unit from SAP HANA Studio \[page 35\]](#)

[Deploy the Delivery Unit from SAP HANA Application Lifecycle Management \[page 36\]](#)

### 2.3.1 Download the Data Provisioning Delivery Unit

Download the Data Provisioning delivery unit from the SAP Software Download Center.

#### Context

The data provisioning delivery unit is available in the same download area as the data provisioning agent.

## Procedure

1. Go to the SAP Software Download Center, and navigate to the following location: ► [SAP Software Download Center](#) ► [Software Downloads](#) ► [Installations & Upgrades](#) ► [By Alphabetical Index \(A-Z\)](#) ► [H](#) ► [SAP HANA SDI](#) ► [SAP HANA SDI 2.0](#) ►.
2. Click [COMPRISED SOFTWARE COMPONENT VERSIONS](#).
3. Click [HANA DP 2.0](#).
4. Click the ZIP file that you need, and save it to your preferred location.
5. In the `HANAIMDP<version number>.ZIP` file, find and extract the `HANA_IM_DP.tgz` file.  
This is the delivery unit file that needs to be imported into SAP HANA.

## Related Information

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

## 2.3.2 Deploy the Delivery Unit from SAP HANA Studio

You can deploy the Data Provisioning delivery unit from SAP HANA studio.

### Note

When SAP HANA is deployed in a multi-tenant database container configuration, you must import the delivery unit into the tenant database.

## Prerequisites

Ensure that you have been granted the SYSTEM privilege `REPO.IMPORT` to be able to import the delivery unit.

## Procedure

1. Log in to SAP HANA studio as user SYSTEM.
2. In the upper left corner, click ► [File](#) ► [Import](#) ►.
3. On the [Import](#) dialog, type **delivery** into the search box for [Select an import source](#).
4. Click [Delivery Unit](#) on the resulting navigation tree and click [Next](#).
5. Select your SAP HANA server name, and click [Next](#).

6. On the *Import Through Delivery Unit* dialog, select either *Client* or *Server*, depending on whether the delivery unit is on the client or server machine.
  - a. If you select *Client*, click *Browse* and navigate to the location where you downloaded the delivery unit, then select `HANAIMDP.tgz` and click *Open*.
  - b. If you select *Server*, select the delivery unit you want to import from the dropdown list.
7. Click *Finish*.

## 2.3.3 Deploy the Delivery Unit from SAP HANA Application Lifecycle Management

You can deploy the Data Provisioning delivery unit through SAP HANA Application Lifecycle Management (ALM).

### Note

When SAP HANA is deployed in a multi-tenant database container configuration, you must import the delivery unit into the tenant database.

## Procedure

1. If not already granted, grant the role `sap.hana.xs.lm.roles::Administrator` to the user name you use to log in to ALM.
  - a. In the SAP HANA studio *Systems* view, expand the name of your SAP HANA server and choose `► Security ► Users ► System ▾`.
  - b. On the *Granted Roles* tab, click the green "+" icon in the upper left corner.
  - c. On the *Select Roles* dialog, type `lm` in the search string box.
  - d. Select the role `sap.hana.xs.lm.roles::Administrator` and click *OK*.
2. Access ALM by typing the following URL in a web browser:
 

```
<host name>:80<2-digit instance number>/sap/hana/xs/lm
```
3. Log in to ALM as the user name you authorized in step 1.
 

The first time you log in, a pop-up window asks you to enter a name for this server.
4. On the ALM *Home* tab, click the *Delivery Units* tile.
5. Click the *Import* tab.
6. Click *Browse* and navigate to the location where you downloaded the delivery unit, then select `HANAIMDP.tgz` and click *Open*.
7. Click *Import*.
 

After successful import, the name `HANA_IM_DP (sap.com)` appears in the list of delivery units on the left.

## 2.4 Installing the Data Provisioning Agent

The Data Provisioning Agent provides secure connectivity between the SAP HANA database and your on-premises and other sources.

The agent is a container that runs outside the SAP HANA environment and is managed by the Data Provisioning Server. It hosts Data Provisioning adapters that enable data federation, replication, and transformation scenarios for on-premises or in-cloud deployments. The agent also hosts custom adapters created using the adapter SDK.

You must install one or more Data Provisioning Agents separately from SAP HANA server or client. After you've installed the agent, refer to the information in this section to complete the configuration process.

For complete information about installing the Data Provisioning Agent on a supported host system, see the [Data Provisioning Agent Installation and Update Guide](#).

**Parent topic:** [Configure Smart Data Integration \[page 20\]](#)

**Previous:** [Download and Deploy the Data Provisioning Delivery Unit \[page 34\]](#)

**Next:** [Configure the Data Provisioning Agent \[page 37\]](#)

## 2.5 Configure the Data Provisioning Agent

The Data Provisioning Agent is a lightweight component that provides secure connectivity between the SAP HANA database and your on-premises and other sources. You must configure the Data Provisioning Agent before you can use adapters to connect to data sources, create remote sources, and so on.

### Installing the Data Provisioning Agent

The agent is a container that runs outside the SAP HANA environment and is managed by the Data Provisioning Server. It hosts Data Provisioning adapters that enable data federation, replication, and transformation scenarios for on-premises or in-cloud deployments. The agent also hosts custom adapters created using the adapter SDK.

You must install one or more Data Provisioning Agents separately from SAP HANA server or client. After you've installed the agent, refer to the information in this section to complete the configuration process.

For complete information about installing the Data Provisioning Agent on a supported host system, see the [Data Provisioning Agent Installation and Update Guide](#).

[Configuring the Agent in Interactive Mode \[page 39\]](#)

Use the agent configuration tool to connect to the SAP HANA server and configure the Data Provisioning Agent and adapters.

### [Configuring the Agent in Command-Line Batch Mode \[page 76\]](#)

Use the agent configuration tool to connect to the SAP HANA server and configure the Data Provisioning Agent and adapters.

### [Reconfigure the Java Runtime Environment \[page 93\]](#)

The SAP JVM is bundled with the Data Provisioning Agent and used as the default Java Runtime Environment. You can choose to update the version of the SAP JVM used by an installed agent or replace it with a custom Java Runtime Environment.

### [Managing Agent Groups \[page 94\]](#)

Agent grouping provides failover and load-balancing capabilities by combining individual Data Provisioning Agents installed on separate host systems.

### [Manage Agents from the Data Provisioning Agent Monitor \[page 105\]](#)

Use the agent monitor to perform basic administration tasks such as registering, altering, or dropping Data Provisioning Agents.

### [Configure the Agent Management Webservice \[page 106\]](#)

The agent management webservice provides basic agent management functions and exposes these functions on the local network via a web-accessible interface.

### [Configure Tracing for the SAP HANA JDBC Driver \[page 110\]](#)

Use driver tracing to troubleshoot the SAP HANA JDBC driver used by the Data Provisioning Agent.

### [Agent Configuration Parameters \[page 112\]](#)

The agent configuration parameters in the `dpagentconfig.ini` file provide advanced options for the Data Provisioning Agent.

### [Agent Runtime Options \[page 140\]](#)

Use the agent configuration tool to manage advanced runtime options stored in the `dpagent.ini` configuration file safely.

### [Replicating an Agent Configuration to Another Host \[page 141\]](#)

There are items that you need to consider when moving to a different host from one where your agent is configured.

**Parent topic:** [Configure Smart Data Integration \[page 20\]](#)

**Previous:** [Installing the Data Provisioning Agent \[page 37\]](#)

**Next task:** [Register Data Provisioning Adapters \[page 142\]](#)

## Related Information

## 2.5.1 Configuring the Agent in Interactive Mode

Use the agent configuration tool to connect to the SAP HANA server and configure the Data Provisioning Agent and adapters. For example, you can view the agent and adapter statuses and versions, manage custom and SAP-delivered adapters, and modify keystore paths.

At each menu in interactive mode, specify the number of the desired action or option and press `Enter`. At any screen, you can press `B` to return to the previous menu or `Q` to quit the configuration tool.

If the selected option requires input, the configuration tool displays any existing or default value in parentheses. You can accept the existing or default value by pressing `Enter` to move to the next prompt.

### Note

Passwords are hidden from display in interactive mode. If an option has an existing password, the password displays as "\*\*\*\*\*". You need to re-enter the password only if the password has changed.

### Caution

When you're asked for input entry for an option, you can't cancel or return to the previous menu. To abort the operation without saving, you must press `Ctrl` + `C` to terminate the configuration tool.

#### [Start the Agent Configuration Tool \[page 40\]](#)

Start the configuration tool in interactive mode to modify the agent configuration.

#### [Connect to SAP Datasphere \[page 41\]](#)

Connect to SAP HANA using JDBC when you're using an SAP Datasphere instance.

#### [Connect to the SAP HANA service for SAP BTP, Cloud Foundry Environment via JDBC \[page 43\]](#)

Connect to SAP HANA using JDBC when you're using the SAP HANA service for SAP BTP in the Cloud Foundry environment.

#### [Connect to the SAP HANA service for SAP BTP, Neo Environment via HTTP \[page 50\]](#)

Specify connection information, user credentials, and SSL configuration information for the SAP HANA service for SAP BTP, Neo environment.

#### [Connect to SAP HANA On-Premises via JDBC \[page 55\]](#)

Connect to SAP HANA using JDBC when SAP HANA is located on-premises.

#### [Connect to SAP HANA On-Premises via TCP \[page 62\]](#)

Connect to SAP HANA using TCP when SAP HANA is located on-premises.

#### [Manage the Agent Service \[page 63\]](#)

Use the agent configuration tool to stop or start the Data Provisioning Agent service.

#### [Register the Agent with SAP HANA \[page 64\]](#)

Before you can use adapters deployed on the Data Provisioning Agent, you must register the agent with SAP HANA.

#### [Manage Credentials for the HANA User for Agent Messaging \[page 66\]](#)

If the authentication credentials for the HANA User for Agent Messaging have changed or expired, you must update the credentials in the agent secure storage.

#### [Manage Credentials for the Agent Configuration Tool \[page 67\]](#)

If you prefer to define an authorized administration user for agent configuration changes, create or modify the credentials that the configuration tool uses to connect to the agent.

### [Store Remote Data Source Credentials Securely \[page 68\]](#)

If you don't want to store credentials for your adapter-based data sources in SAP HANA, you can store them in the Data Provisioning Agent secure storage.

### [Configure the Agent for IPv6 Mode \[page 69\]](#)

By default, the Data Provisioning Agent is configured in IPv4 mode. If you want to use IPv6, you must perform additional configuration steps.

### [Configure HTTPS Proxy Authentication for Adapters \[page 70\]](#)

Configure HTTPS proxy connection information and store authentication credentials in the Data Provisioning Agent secure storage.

### [Test the JDBC Connection \[page 71\]](#)

Test the connection between the agent host system and SAP HANA to troubleshoot issues or verify that the connection is sufficient for your requirements.

## Related Information

### 2.5.1.1 Start the Agent Configuration Tool

Start the configuration tool in interactive mode to modify the agent configuration.

## Prerequisites

Set the `DPA_INSTANCE` environment variable to the installation root location (`<DPAgent_root>`):

| Platform | Command   |
|----------|---|
| Windows  | <code>set DPA_INSTANCE=C:\usr\sap\dataprovagent</code>  |
| Linux    | <code>export DPA_INSTANCE=/usr/sap/dataprovagent</code> |

#### ⚠ Caution

Multiple instances of the Data Provisioning Agent can be installed on a single Linux host. Be sure that you set `DPA_INSTANCE` to the instance that you want to modify before you start the configuration tool. If you don't set the environment variable correctly, you can unintentionally modify the configuration of a different agent instance.

## Procedure

1. Navigate to `<DPAgent_root>\bin` and start the configuration tool with the `--configAgent` parameter.



| Platform | Command                                 |
|----------|---|
| Windows  | <code>agentcli.bat --configAgent</code> |
| Linux    | <code>agentcli.sh --configAgent</code>  |

2. **Optional:** If you've configured an authorized agent administrator user, log in with the configured credentials.
  - a. Choose *Login* to establish the secure connection to the agent.
  - b. Specify the administrator username and password as prompted.

#### Note

For more information about configuring an agent administrator user, see [Manage Credentials for the Agent Configuration Tool \[page 67\]](#).

## Results

The configuration tool's main menu appears.

### 2.5.1.2 Connect to SAP Datasphere

Connect to SAP HANA using JDBC when you're using an SAP Datasphere instance.

#### Prerequisites

- You've created an SAP Datasphere instance in the SAP BTP cockpit.
- You've installed the Data Provisioning Agent to an on-premise or cloud-based host system.

#### Note

SAP Datasphere requires Data Provisioning Agent version 2.4.2.6 or newer.

- You've created a Data Provisioning Agent instance in SAP Datasphere.

#### Note

When you create an agent instance in SAP Datasphere, save the connection settings required to configure the agent:

- Agent Name
- HANA Server (Hostname)
- HANA Port
- HANA User Name for Agent Messaging
- HANA User Password for Agent Messaging

- X.509 certificates for the HANA User for Agent Messaging, if applicable
- You've added the IP address of the agent host system to the IP allowlist in SAP Datasphere.

## Procedure

1. Start the agent configuration tool.
2. Choose *SAP HANA Connection*.
3. Choose *Connect to SAP Datasphere via JDBC*.
4. Specify the name of the agent instance.
5. Specify **true** to use an encrypted connection over JDBC.

### → Tip

An encrypted connection is always required when connecting to SAP HANA in a cloud-based environment.

6. Specify the hostname and port for the SAP Datasphere instance.
  - Hostname: **<instance\_name>.hanacloud.ondemand.com**
  - Port Number: **443**
7. If HTTPS traffic from your agent host is routed through a proxy, specify any required proxy information as prompted.

The agent uses the HTTPS protocol to communicate with SAP Datasphere.
8. Specify whether to use X.509 certificate-based authentication for the HANA User for Agent Messaging.
9. Provide the authentication credentials for the HANA User for Agent Messaging as prompted.

The HANA User for Agent Messaging is used only for messaging between the agent and SAP Datasphere.

  - For X.509 authentication, specify the X.509 client certificate file path, private key file path, and private key password.
  - For password-based authentication, specify the username and password.
10. Specify whether to save the agent connection settings.

Any existing agent connection settings are overwritten.
11. Restart the Data Provisioning Agent.

## Results

The Data Provisioning Agent connects to the SAP Datasphere instance, and displays *CONNECTED* in the *Registered Data Provisioning Agents* list.

## Next Steps

To update the HANA User for Agent Messaging credentials after agent configuration, repeat the [Connect to SAP Datasphere via JDBC](#) steps, and provide new authentication credentials, or start the agent configuration tool with the `--setSecureProperty` and set the new credentials.

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Manage Credentials for the HANA User for Agent Messaging \[page 66\]](#)

### 2.5.1.3 Connect to the SAP HANA service for SAP BTP, Cloud Foundry Environment via JDBC

Connect to SAP HANA using JDBC when you're using the SAP HANA service for SAP BTP in the Cloud Foundry environment.

## Prerequisites

- You're using the SAP HANA service for SAP BTP with the SAP HANA Data Provisioning Server capability.
- You've installed the Data Provisioning Agent to an on-premise or cloud-based host system.
- The Agent Admin HANA User must have the following roles or privileges to perform the noted actions:

Table 4: Roles and Privileges

| Action  | Role or Privilege   |
|---|---|
| Connect to SAP HANA                                 | <ul style="list-style-type: none"><li>System privilege: AGENT ADMIN</li><li>System privilege: ADAPTER ADMIN</li></ul> |
| Create the HANA User for Agent Messaging (Optional) | <ul style="list-style-type: none"><li>System privilege: USER ADMIN</li></ul>  |

**Note**

These privileges are required only when you want to create the HANA User for Agent Messaging as part of the configuration process within the agent configuration tool.

- You have an SAP HANA User for Agent Messaging for messaging between the agent and SAP HANA. To create such a user manually:
  - Create the agent user (for example, `AGTUSR`) with a nonexpiring password.
  - `GRANT AGENT MESSAGING ON AGENT "<your_agent_name>" TO <your_agent_user>;`

### → Tip

If the Agent Admin HANA User has been granted the privileges indicated in the “Roles and Privileges” table, it can create the HANA User for Agent Messaging during the configuration process. The configuration tool creates the HANA User for Agent Messaging as a technical user with the no expiration period for the password.

### ⓘ Note

In general, the password for a new SAP HANA user expires according to the SAP HANA password policy settings, the default for which is 182 days. To avoid agent disruptions in a production scenario, treat a new HANA User for Agent Messaging as a technical user and ensure that its password doesn't expire.

For more information about configuring the password policy for a technical user in SAP HANA, see the *SAP HANA Security Guide*.

## Context

The Data Provisioning Agent connects to the SAP HANA service through JDBC.

## Procedure

1. Start the agent configuration tool.
2. Choose *SAP HANA Connection*.
3. Choose *Connect to SAP HANA Service for BTP, Cloud Foundry environment via JDBC*.
4. Specify **true** to use an encrypted connection over JDBC.

### → Tip

An encrypted connection is always required when connecting to SAP HANA in a cloud-based environment.

5. For the SAP HANA service, specify **true** to use WebSockets instead of a Direct SQL connection.
6. Specify the WebSocket URL, host, and port as prompted.
  - WebSocket URL: **/service/<service\_instance\_id>**
  - WebSocket Host: **<instance\_name>.dbaas.ondemand.com**
  - WebSocket Port: **80**
7. Provide the authentication credentials for the Agent Admin HANA User as prompted.
8. Provide the authentication credentials for the HANA User for Agent Messaging as prompted.

The HANA User for Agent Messaging is used only for messaging between the agent and SAP HANA, and must be different from the Agent Admin HANA User used for agent administration tasks.
9. If HTTPS traffic from your agent host is routed through a proxy, specify any required proxy information as prompted.

The agent uses the HTTPS protocol to communicate with the SAP HANA service.

10. Specify whether to create a new HANA User for Agent Messaging.

- Enter **true** to create a new user with the authentication credentials you provided.
- Enter **false** if the credentials are for an existing user.

→ Tip

Generally, you create this user only during the initial configuration of an agent instance. If you're modifying the configuration of an existing agent instance, you usually don't need to create a user.

## Results

The configuration tool creates the SAP HANA User for Agent Messaging, if applicable, and connects to the SAP HANA server.

## Related Information

[JDBC Connection Properties \[page 45\]](#)

[Password Policy Configuration Options \(SAP HANA Administration Guide\)](#)

[Start the Agent Configuration Tool \[page 40\]](#)

[Configuring SSL \[page 590\]](#)

[JDBC Connection Properties \[page 45\]](#)

### 2.5.1.3.1 JDBC Connection Properties

When connecting to an SAP HANA database or to a remote source using JDBC, there are several connection properties that you can configure.

## Default Properties

The following table lists the default JDBC connection properties, which are case insensitive, available in the `agentcli` tool and are written to the `<DPAgent_root>\dpagentconfig.ini` file.

| Property                               | Value                       | Default   | Description   |
|--|-----------------------------|-----------|---|
| <code>jdbc.communicationTimeout</code> | <code>&lt;number&gt;</code> | 330       | Aborts communication after the specified timeout. Setting this parameter to 0 disables the timeout.   |
| <code>jdbc.connections</code>          | <code>&lt;number&gt;</code> | 10        | Specifies the maximum number of JDBC connections.   |
| <code>jdbc.databaseName</code>         | <code>&lt;String&gt;</code> | Empty     | <p>Specifies the name of the SAP HANA database.</p> <p>For example: H00</p> <p>You can query the actual database name from a SQL console:</p> <pre>select * from m_database</pre> |
| <code>jdbc.enabled</code>              | Boolean                     | FALSE     | Specifies whether to use JDBC for message communication.  |
| <code>jdbc.encrypt</code>              | Boolean                     | TRUE      | Enables or disables TLS/SSL encryption.   |
| <code>jdbc.failover.hosts</code>       | <code>&lt;String&gt;</code> | Empty     | <p>Specifies optional failover hosts and port numbers as a semicolon-delimited list.</p> <p>For example:</p> <pre>failover1:30015;failover2:30015</pre>                           |
| <code>jdbc.host</code>                 | <code>&lt;name&gt;</code>   | localhost | Specifies the JDBC host name.   |

| Property                                | Value                       | Default | Description   |
|---|-----------------------------|---------|---|
| <code>jdbc.hostNameInCertificate</code> | <code>&lt;name&gt;</code>   | *       | <p>Specifies the host name used to verify server's identity.</p> <p>The host name is used to verify the identity of the server instead of the host name with which the connection was established.</p> <p>For example, in a single-host system, if a connection is established from a client on the same host as the server, a mismatch would arise between the host named in the certificate (actual host name) and the host used to establish the connection (localhost).</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>If you specify * as the host name, this property has no effect. Other wild-cards aren't permitted.</p> </div> |
| <code>jdbc.port</code>                  | <code>&lt;number&gt;</code> | 30015   | Specifies the JDBC port number.   |
| <code>jdbc.proxyHost</code>             | <code>&lt;name&gt;</code>   | proxy   | Specifies the JDBC proxy host name.   |

| Property  | Value  | Default | Description   |
|---|--|---------|---|
| <code>jdbc.proxyHttp</code>   | Boolean  | FALSE   | When using a proxy, this parameter specifies whether it's an HTTP proxy (true) or a SOCKS proxy (false).  |
| <div style="border: 1px solid #ccc; padding: 10px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>There's no support for WebSocket (HTTP/HTTPS) connections with a SOCKS proxy. WebSocket connections must either use no proxy or an HTTP proxy. Non-WebSocket (TCP/TLS, via Direct SQL, for example) connections can use no proxy, a SOCKS proxy, or an HTTP proxy.</p> </div> |  |         |   |
| <code>jdbc.proxyPassword</code>   | <String>   | Empty   | Specifies the JDBC proxy password.  |
| <code>jdbc.proxyPort</code>   | <number>   | 8080    | Specifies the JDBC proxy port number.   |
| <code>jdbc.proxyUsername</code>   | <String>   | Empty   | Specifies the JDBC proxy user name.   |
| <code>jdbc.reconnectRetries</code>  | <number>   | 10      | Specifies the maximum number of connect retries.  |
| <code>jdbc.reconnectTime</code>   | <number>   | 30      | Specifies the amount of time to wait before JDBC attempts a new registration.                             |
| <code>jdbc.retryMax</code>  | <number>   | 10      | Specifies the maximum number of send retries.   |
| <code>jdbc.retryTime</code>   | <number>   | 5       | Specifies the amount of time to wait before resending the message.  |
| <code>jdbc.sniHostname</code>   | <name>   | Empty   | Specifies the name of the host that is attempting to connect at the start of the TLS handshaking process. |
| <code>jdbc.timeout</code>   | <number>   | 60      | Specifies the amount of time to wait for an available JDBC connection.                                    |
| <code>jdbc.timeUnit</code>  | DAYS, HOURS, MICROSECONDS, MILLISECONDS, MINUTES, NANoseconds, SECONDS | SECONDS | Specifies the JDBC time unit.   |



| Property                               | Value           | Default | Description  |
|--|-----------------|---------|--|
| <code>jdbc.useProxy</code>             | Boolean         | FALSE   | Specifies whether to use proxy properties for the JDBC connection.   |
| <code>jdbc.useProxyAuth</code>         | Boolean         | FALSE   | Specifies whether to use proxy authentication. If true, you must provide a proxy username and password.  |
| <code>jdbc.useWebSocketURL</code>      | Boolean         | FALSE   | Specifies whether to use WebSocket properties for the JDBC connection.   |
| <code>jdbc.validateCertificate</code>  | Boolean         | TRUE    | Specifies whether to validate the server's certificate.  |
| <code>jdbc.websocketURL</code>         | <websocket URL> | Empty   | Specifies the JDBC WebSocket URL.  |
| <code>jdbc.additionalParameters</code> | <String>        | Empty   | <p>Additional parameters to pass to the JDBC driver.</p> <p>Any property that isn't supported in the <code>dpagentconfig.ini</code> file (that is, not listed here), but is supported by the SAP HANA JDBC driver, can be specified using <code>jdbc.additionalParameters</code> property.</p> <p>Entries in the <code>jdbc.additionalParameters</code> must be specified with a comma delimiter when there are multiple parameters. For example, <code>jdbc.additionalParameters=reconnect=TRUE,ignoreTopology=FALSE</code></p> |

#### Note

These additional properties aren't prepended with "jdbc".

There are other SAP HANA-specific properties available in addition to the properties listed here. See the *SAP HANA Client Interface Programming Reference for SAP HANA Platform* for more information.

## Related Information

[\[SAP HANA\] JDBC Connection Properties](#)

### 2.5.1.4 Connect to the SAP HANA service for SAP BTP, Neo Environment via HTTP

Specify connection information, user credentials, and SSL configuration information for the SAP HANA service for SAP BTP, Neo environment.

#### ⚠ Caution

This topic applies only to the SAP HANA service for SAP BTP in the Neo environment. For information about connecting to the SAP HANA service for SAP BTP in the Cloud Foundry environment, see [Connect to the SAP HANA service for SAP BTP, Cloud Foundry Environment via JDBC \[page 43\]](#).

When SAP HANA is in the cloud, the agent initiates all communication. The agent polls the server to see if there are any messages for the agent to act upon.

## Prerequisites

- The Data Provisioning delivery unit must be imported to the SAP HANA system.
- The Agent Admin HANA User must have the following roles or privileges:

Table 5: Roles and Privileges

| Action  | Role or Privilege   |
|---|---|
| Connect to SAP HANA                             | <ul style="list-style-type: none"><li>• Application privilege: <code>sap.hana.im.dp.admin::Administrator</code></li><li>• System privilege: <code>AGENT ADMIN</code></li><li>• System privilege: <code>ADAPTER ADMIN</code></li></ul> |
| Create HANA User for Agent Messaging (Optional) | <ul style="list-style-type: none"><li>• System privilege: <code>USER ADMIN</code></li><li>• Object privilege: <code>EXECUTE</code> on <code>GRANT_APPLICATION_PRIVILEGE</code></li></ul>  |

#### 📌 Note

These privileges are required only when you want to create the HANA User for Agent Messaging as part of the configuration process within the agent configuration tool.

- The HANA User for Agent Messaging must have the following roles or privileges:

Table 6: Roles and Privileges

| Action                                   | Role or Privilege   |
|--|---|
| Messaging between the agent and SAP HANA | Application privilege:<br><code>sap.hana.im.dp.proxy::AgentMessaging</code> |

### → Tip

If the Agent Admin HANA User has been granted the privileges indicated in the “Roles and Privileges” table, it can create the HANA User for Agent Messaging during the configuration process. The configuration tool creates the HANA User for Agent Messaging as a technical user with the no expiration period for the password.

### ⓘ Note

In general, the password for a new SAP HANA user expires according to the SAP HANA password policy settings, the default for which is 182 days. To avoid agent disruptions in a production scenario, treat a new HANA User for Agent Messaging as a technical user and ensure that its password doesn't expire.

For more information about configuring the password policy for a technical user in SAP HANA, see the *SAP HANA Security Guide*.

## Procedure

1. Start the agent configuration tool.
2. Choose *SAP HANA Connection*.
3. Choose *Connect to SAP HANA Service for SAP BTP, Neo environment via HTTP*.
4. Specify whether to use HTTPS when connecting to SAP HANA.

### ⓘ Note

If the agent framework keystore doesn't already have the certificates for the SAP HANA server, the configuration tool automatically downloads and imports them during configuration.

5. Specify the hostname, port, and Agent Admin HANA User credentials for SAP HANA as prompted.  
The hostname should include the instance name. For example, `<your_instance_name>.hana.ondemand.com`.
6. If there's a firewall between SAP HANA and the agent host, specify any required proxy information as prompted.
7. Specify the credentials for the HANA User for Agent Messaging.  
The HANA User for Agent Messaging is used only for messaging between the agent and SAP HANA, and must be different from the Agent Admin HANA User used to connect to SAP HANA.
8. Specify whether the HANA User for Agent Messaging is an existing user.
  - Enter **true** if the user already exists.
  - Enter **false** if you want the configuration tool to create a user with the specified credentials.

→ Tip

Generally, you create this user only during the initial configuration of an agent instance. If you're modifying the configuration of an existing agent instance, you usually don't need to create a user.

## Results

The configuration tool creates the HANA User for Agent Messaging, if applicable, and connects to the SAP HANA server.

## Related Information

[Configure an x509 Certificate HTTPS Connection \[page 52\]](#)

[Password Policy Configuration Options \(SAP HANA Administration Guide\)](#)

[Download and Deploy the Data Provisioning Delivery Unit \[page 34\]](#)

[Start the Agent Configuration Tool \[page 40\]](#)

### 2.5.1.4.1 Configure an x509 Certificate HTTPS Connection

Follow these steps to create and use an x509 certificate for your SSL connection.

## Context

Before creating your x509 certificate, be sure you've specified connection information, user credentials, and SSL configuration information. You can find more information in [Connect to the SAP HANA service for SAP BTP, Neo Environment via HTTP \[page 50\]](#).

When connecting to Neo cloud, include "cert" in the URL. For example: `http://a320ee06ea094b0fca.cert.hana.ondemand.com/...`

Data Provisioning Agent support for an x509 certificate is available in version 2.5.0 and after.

## Procedure

1. For Neo cloud, the agent certificate must be signed by a CA trust chain that ends with one of the root CAs listed in [Trusted Certificate Authorities for Client Certificate Authentication](#)

### Note

Self-signed certificates are not supported in Neo.

### Note

The key alias "xsdpuser" below is an example value and can be substituted with another value as appropriate.

```
# Generate public/private key pair. Enter the certificate DN properties when
prompted.
keytool -genkey -alias xsdpuser -keyalg RSA -keypass changeit -storepass
changeit -keystore /lwork/inst/<DPAgent_root>/ssl/cacerts
# Generate certificate sign request and have it signed by a trusted
Certificate Authority approved for Neo cloud
keytool -keystore /lwork/inst/<DPAgent_root>/ssl/cacerts -certreq -alias
xsdpuser -keyalg rsa -file xsdpuser.csr
# Import the CA certificate as trusted
keytool -import -keystore /lwork/inst/<DPAgent_root>/ssl/cacerts -file CA-
cert.pem -alias ca-root
# Import the intermediate certificate
keytool -import -keystore "/lwork/inst/<DPAgent_root>/ssl/cacerts " -file
intermediate-cert.pem -alias intermediate
# After logging into NEO cloud, export the server certificate from the
browser (Base-64 encoded X.509).
# Import the server certificate:
keytool -import -keystore /lwork/inst/<DPAgent_root>/ssl/cacerts -file
server.cer -alias server
# import the signed certificate request reply
keytool -import -keystore /lwork/inst/<DPAgent_root>/ssl/cacerts -file
xsdpuser.pem -alias xsdpuser
```

2. Run `/usr/sap/dataprovagent/bin/agentcli.sh --setSecureProperty`
3. Choose [3. Set HANA XS Key Alias \(for X509 User Certificate\)](#), and enter the alias.

This alias for example would be the key alias "xsdpuser" specified in step 1, used to generate the public/private key pair.

4. Choose [1. Set HANA XS Username](#), and enter the XS username.

### Note

Steps 5 and 6 are for on-premise SAP HANA installations only.

5. On the SAP HANA server, import, as trusted, the root CA certificate of the CA that signed the client certificate for the Data Provisioning Agent:

```
sapgenpse maintain_pk -p /usr/sap/<SAPHANAInstance>/HDB/<InstNo>/
<Hostname>/sec/sapsrv.pse -a CA-cert.pem
sapgenpse maintain_pk -p /usr/sap/<SAPHANAInstance>/HDB/<InstNo>/
<Hostname>/sec/SAPSSL.pse -a CA-cert.pem
```

6. Restart the SAP HANA server.
7. On the SAP HANA server, create x509 PSE with the root CA and intermediate certificates by running the following:
  - a. Create certificate entries.

## Note

The following X509\_SSO\_PUB and SSL\_DPAGENT names are examples and can be substituted with other values as appropriate.

```
CREATE CERTIFICATE FROM '  
-----BEGIN CERTIFICATE-----  
Insert the corresponding content here from the root CA certificate (the  
CA-cert.pem file in the example above)  
-----END CERTIFICATE-----  
' COMMENT 'X509_SSO_PUB';
```

For example,

```
CREATE CERTIFICATE FROM '  
-----BEGIN CERTIFICATE-----  
MIIDfzCCAmegAwIBAgIJAMOu/72G9vMfMA0GCSqGSIb3DQEBCwUAMFYxCzAJBgNV  
BAYTANVzMQswCQYDVQQIDAJjYTELMAkGALUEBwwCCEExDDAKBgNVBAoMA3NhcDEM  
MAoGALUECwwDZWltMREwDwYDVQQDDAhhIGwgLSBjYTAeFw0yMDA1MDgyMjMwMzZa  
Fw0yMzAyMDIyMjMwMzZaMfYxCzAJBgNVBAYTANVzMQswCQYDVQQIDAJjYTELMAkG  
ALUEBwwCCEExDDAKBgNVBAoMA3NhcDEMMAoGALUECwwDZWltMREwDwYDVQQDDAhh  
IGwgLSBjYTCASiWdQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBBAOLPn3Z1ytna  
bvh6EvqiJR/K6SLAo5n+CvGn4O2cUspqGC/G1Od6sxWDBWgT/Qq0/ugsnG0dHUFH  
Nn3WLzX9Hz2GfuJdGuZDG62OVJ0EMjf0D0LiKriXy3iB6trD17U6G5Q2A5HxBBad  
mzq/jjbv/xJ3U8dI2U1w+HOG8vtTq87+zjLuruf2UvlqQ0Aw+NhcPEfB5miTP+xC  
xNnzvIhNri145An+TNJy/FCM9UPsYKE+XxaqXITrsQ2Ra92i0FMbveIQPu9Wb19I  
D9cuS14dt7DMY+VyfaVgBv0tcaRjsfUmbU+W7G1DmVu9E51ruBCrtpMtNXgHZ1kA  
qtTYm70YK3sCAwEAAnQME4wHQYDVR0OBBYEFFJX6u2xsxywh1oFPnidYdjgzohp  
MB8GA1UdIwQYMBaAFFJX6u2xsxywh1oFPnidYdjgzohpMAwGA1UdEwQFMAMBAf8w  
DQYJKoZIhvcNAQELBQADggEBAG44K5Nk3RyQk/wQBxsvceV1zv00kbYWMkHCcxBl  
bW1/iIb15M4JXcZP53ypAI/ysx2WDgb4RulqOtU3gXcDdfkD6EpQTf6TZP3wIPZ/  
wB47LmNZ0n8jRFTXktR5Mr3wBqvUfSxCURSIiGLreKpHaUDBmvnYSWDr8mFwpjSd  
JN6Vz2d79y639cpyNkFVQ3aRtmXbVssOucYvez07kTUvhvojq5qEE8pB35twSnjR  
RR0vkVXvDuO/ioqvEtwTuwTEIDR7Y4xSPrBAxgCZcoCShCaaURBnZK1ToQI5KgfD  
zS9gQCnz8isU5kSVQH6qAyXBzK/N+NmvJy4wzJtxRde2WD4=  
-----END CERTIFICATE-----  
' COMMENT 'X509_SSO_PUB';
```

Repeat the create certificate command to add the intermediate certificate contents with its own comment.

- b. Create the PSE. This is done only once.

```
CREATE PSE SSL_DPAGENT;  
SET PSE SSL_DPAGENT PURPOSE X509
```

- c. Add certificates to PSE.

```
SELECT CERTIFICATE_ID FROM SYS.CERTIFICATES WHERE COMMENT='X509_SSO_PUB';  
-- for example the CERTIFICATE_ID above was 163102  
ALTER PSE SSL_DPAGENT ADD CERTIFICATE 163102;
```

Repeat the ALTER PSE command to add the intermediate certificate ID.

8. On SAP HANA server, add the client certificate identity to the HANA User for Agent Messaging already configured in [Connect to the SAP HANA service for SAP BTP, Neo Environment via HTTP \[page 50\]](#). In the example below, it's XSDPUSER, and the values for IDENTITY and ISSUER are correspondingly the CN of

the client certificate for the Data Provisioning Agent and the CN of the CA that signed the client certificate mentioned above.

```
alter user XSDPUSER add IDENTITY 'CN=fl, OU=eim, O=sap, L=pa, ST=ca, C=us'  
ISSUER 'CN=myCA, OU=eim, O=sap, L=pa, ST=ca, C=us' FOR X509;
```

Alternatively, you can add the client certificate identity information in the browser logged into Neo cloud by importing the signed agent certificate:

1. In the Security section, for the HANA User for Agent Messaging, select the [X509](#) checkbox, and click the [Configure](#) link.
  2. Import the signed agent certificate.
9. On SAP HANA server, configure the smart data integration DPProxy application for X509 authentication by loading the following in a web browser and enabling X509. You may also disable other authentication types if required.

```
https://<HANA host>:43<HANA instance number>/sap/hana/xs/admin/#/package/  
sap.hana.im.dp.proxy
```

## Related Information

[Connect to the SAP HANA service for SAP BTP, Neo Environment via HTTP \[page 50\]](#)  
[Trusted Certificate Authorities for Client Certificate Authentication](#)

### 2.5.1.5 Connect to SAP HANA On-Premises via JDBC

Connect to SAP HANA using JDBC when SAP HANA is located on-premises.

#### Prerequisites

- You've installed the Data Provisioning Agent to an on-premise host system.
- The Agent Admin HANA User must have the following roles or privileges to perform the noted actions:

Table 7: Roles and Privileges

| Action              | Role or Privilege   |
|---------------------|---|
| Connect to SAP HANA | <ul style="list-style-type: none"><li>• System privilege: AGENT ADMIN</li><li>• System privilege: ADAPTER ADMIN</li></ul> |

| Action  | Role or Privilege   |
|---|---|
| Create the HANA User for Agent Messaging (Optional) | <ul style="list-style-type: none"> <li>System privilege: <code>USER ADMIN</code></li> </ul> |

#### Note

These privileges are required only when you want to create the HANA User for Agent Messaging as part of the configuration process within the agent configuration tool.

- You have an SAP HANA User for Agent Messaging for messaging between the agent and SAP HANA. To create such a user manually:
  - Create the agent user (for example, `AGTUSR`) with a nonexpiring password.
  - `GRANT AGENT MESSAGING ON AGENT "<your_agent_name>" TO <your_agent_user>;`

#### → Tip

If the Agent Admin HANA User has been granted the privileges indicated in the "Roles and Privileges" table, it can create the HANA User for Agent Messaging during the configuration process. The configuration tool creates the HANA User for Agent Messaging as a technical user with the no expiration period for the password.

#### Note

In general, the password for a new SAP HANA user expires according to the SAP HANA password policy settings, the default for which is 182 days. To avoid agent disruptions in a production scenario, treat a new HANA User for Agent Messaging as a technical user and ensure that its password doesn't expire.

For more information about configuring the password policy for a technical user in SAP HANA, see the *SAP HANA Security Guide*.

- If you plan to use X.509 certificate-based authentication, you've obtained X.509 certificates for the HANA User for Agent Messaging and Agent Admin HANA Users from your SAP HANA administrator. If you plan to create the HANA User for Agent Messaging during the configuration process, obtain the X.509 identity and issuer from your SAP HANA administrator.

## Context

The Data Provisioning Agent connects to SAP HANA through JDBC.

## Procedure

- Start the agent configuration tool.
- Choose *SAP HANA Connection*.
- Choose *Connect to local SAP HANA (on-premises) via JDBC*.



4. Specify **true** to use an encrypted connection over JDBC.
5. For a local SAP HANA installation, specify **false** to use a Direct SQL connection.
6. **Optional:** To connect to SAP HANA via SYSTEMDB port, specify the database name.
7. **Optional:** Specify any failover hostnames and ports.

Enter any failover hostnames and ports as a single line separated by semicolons. For example:

```
abc : 30115 ; xyz : 30215.
```

To clear a previously entered, cached value, enter whitespace characters.

8. Specify whether to use X.509 certificate-based authentication for the Agent Admin HANA User.
9. Provide the authentication credentials for the Agent Admin HANA User as prompted.
  - For X.509 authentication, specify the X.509 client certificate file path, private key file path, and private key password.
  - For password-based authentication, specify the username and password.
10. Specify whether to use X.509 certificate-based authentication for the HANA User for Agent Messaging.
11. Provide the authentication credentials for the HANA User for Agent Messaging as prompted.

The HANA User for Agent Messaging is used only for messaging between the agent and SAP HANA Cloud, and must be different from the Agent Admin HANA User used for agent administration tasks.

  - For X.509 authentication, specify the X.509 client certificate file path, private key file path, and private key password.
  - For password-based authentication, specify the username and password.
12. If HTTPS traffic from your agent host is routed through a proxy, specify any required proxy information as prompted.

The agent uses the HTTPS protocol to communicate with the SAP HANA server.
13. Specify whether to create a new HANA User for Agent Messaging.
  - Enter **true** to create a new user with the authentication credentials you provided.

If you're creating a new user with X.509 authentication, provide the X.509 certificate identity and certificate issuer as prompted.
  - Enter **false** if the credentials are for an existing user.

#### → Tip

Generally, you create this user only during the initial configuration of an agent instance. If you're modifying the configuration of an existing agent instance, you usually don't need to create a user.

## Results

The configuration tool creates the SAP HANA User for Agent Messaging, if applicable, and connects to the SAP HANA server.

## Related Information

[JDBC Connection Properties \[page 58\]](#)

[Password Policy Configuration Options \(SAP HANA Administration Guide\)](#)

[Start the Agent Configuration Tool \[page 40\]](#)

[Configuring SSL \[page 590\]](#)

[JDBC Connection Properties \[page 45\]](#)

### 2.5.1.5.1 JDBC Connection Properties

When connecting to an SAP HANA database or to a remote source using JDBC, there are several connection properties that you can configure.

#### Default Properties

The following table lists the default JDBC connection properties, which are case insensitive, available in the `agentcli` tool and are written to the `<DPAgent_root>\dpagentconfig.ini` file.

| Property                               | Value                       | Default | Description  |
|--|-----------------------------|---------|--|
| <code>jdbc.communicationTimeout</code> | <code>&lt;number&gt;</code> | 330     | Aborts communication after the specified timeout. Setting this parameter to 0 disables the timeout.  |
| <code>jdbc.connections</code>          | <code>&lt;number&gt;</code> | 10      | Specifies the maximum number of JDBC connections.  |
| <code>jdbc.databaseName</code>         | <code>&lt;String&gt;</code> | Empty   | Specifies the name of the SAP HANA database.<br><br>For example: <code>H00</code><br><br>You can query the actual database name from a SQL console:<br><pre>select * from m_database</pre> |
| <code>jdbc.enabled</code>              | Boolean                     | FALSE   | Specifies whether to use JDBC for message communication.   |
| <code>jdbc.encrypt</code>              | Boolean                     | TRUE    | Enables or disables TLS/SSL encryption.  |

| Property                                | Value                       | Default   | Description  |
|---|-----------------------------|-----------|--|
| <code>jdbc.failover.hosts</code>        | <code>&lt;String&gt;</code> | Empty     | <p>Specifies optional failover hosts and port numbers as a semicolon-delimited list.</p> <p>For example:</p> <pre>failover1:30015;failover2:30015</pre>  |
| <code>jdbc.host</code>                  | <code>&lt;name&gt;</code>   | localhost | Specifies the JDBC host name.  |
| <code>jdbc.hostNameInCertificate</code> | <code>&lt;name&gt;</code>   | *         | <p>Specifies the host name used to verify server's identity.</p> <p>The host name is used to verify the identity of the server instead of the host name with which the connection was established.</p> <p>For example, in a single-host system, if a connection is established from a client on the same host as the server, a mismatch would arise between the host named in the certificate (actual host name) and the host used to establish the connection (localhost).</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>If you specify * as the host name, this property has no effect. Other wildcards aren't permitted.</p> </div> |
| <code>jdbc.port</code>                  | <code>&lt;number&gt;</code> | 30015     | Specifies the JDBC port number.  |
| <code>jdbc.proxyHost</code>             | <code>&lt;name&gt;</code>   | proxy     | Specifies the JDBC proxy host name.  |

| Property  | Value  | Default | Description   |
|---|--|---------|---|
| <code>jdbc.proxyHttp</code>   | Boolean  | FALSE   | When using a proxy, this parameter specifies whether it's an HTTP proxy (true) or a SOCKS proxy (false).  |
| <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>There's no support for WebSocket (HTTP/HTTPS) connections with a SOCKS proxy. WebSocket connections must either use no proxy or an HTTP proxy. Non-WebSocket (TCP/TLS, via Direct SQL, for example) connections can use no proxy, a SOCKS proxy, or an HTTP proxy.</p> </div> |  |         |   |
| <code>jdbc.proxyPassword</code>   | <String>   | Empty   | Specifies the JDBC proxy password.  |
| <code>jdbc.proxyPort</code>   | <number>   | 8080    | Specifies the JDBC proxy port number.   |
| <code>jdbc.proxyUsername</code>   | <String>   | Empty   | Specifies the JDBC proxy user name.   |
| <code>jdbc.reconnectRetries</code>  | <number>   | 10      | Specifies the maximum number of connect retries.  |
| <code>jdbc.reconnectTime</code>   | <number>   | 30      | Specifies the amount of time to wait before JDBC attempts a new registration.                             |
| <code>jdbc.retryMax</code>  | <number>   | 10      | Specifies the maximum number of send retries.   |
| <code>jdbc.retryTime</code>   | <number>   | 5       | Specifies the amount of time to wait before resending the message.  |
| <code>jdbc.sniHostname</code>   | <name>   | Empty   | Specifies the name of the host that is attempting to connect at the start of the TLS handshaking process. |
| <code>jdbc.timeout</code>   | <number>   | 60      | Specifies the amount of time to wait for an available JDBC connection.                                    |
| <code>jdbc.timeUnit</code>  | DAYS, HOURS, MICROSECONDS, MILLISECONDS, MINUTES, NANOSECONDS, SECONDS | SECONDS | Specifies the JDBC time unit.   |

| Property                               | Value           | Default | Description  |
|--|-----------------|---------|--|
| <code>jdbc.useProxy</code>             | Boolean         | FALSE   | Specifies whether to use proxy properties for the JDBC connection.   |
| <code>jdbc.useProxyAuth</code>         | Boolean         | FALSE   | Specifies whether to use proxy authentication. If true, you must provide a proxy username and password.  |
| <code>jdbc.useWebSocketURL</code>      | Boolean         | FALSE   | Specifies whether to use WebSocket properties for the JDBC connection.   |
| <code>jdbc.validateCertificate</code>  | Boolean         | TRUE    | Specifies whether to validate the server's certificate.  |
| <code>jdbc.websocketURL</code>         | <websocket URL> | Empty   | Specifies the JDBC WebSocket URL.  |
| <code>jdbc.additionalParameters</code> | <String>        | Empty   | <p>Additional parameters to pass to the JDBC driver.</p> <p>Any property that isn't supported in the <code>dpagentconfig.ini</code> file (that is, not listed here), but is supported by the SAP HANA JDBC driver, can be specified using <code>jdbc.additionalParameters</code> property.</p> <p>Entries in the <code>jdbc.additionalParameters</code> must be specified with a comma delimiter when there are multiple parameters. For example, <code>jdbc.additionalParameters=reconnect=TRUE,ignoreTopology=FALSE</code></p> |

#### Note

These additional properties aren't prepended with "jdbc".

There are other SAP HANA-specific properties available in addition to the properties listed here. See the *SAP HANA Client Interface Programming Reference for SAP HANA Platform* for more information.

## Related Information

[\[SAP HANA\] JDBC Connection Properties](#)

### 2.5.1.6 Connect to SAP HANA On-Premises via TCP

Connect to SAP HANA using TCP when SAP HANA is located on-premises.

#### Prerequisites

- The Agent Admin HANA User must have the following roles or privileges:

Table 8: Roles and Privileges

| Action              | Role or Privilege               |
|---------------------|---------------------------------|
| Connect to SAP HANA | System privilege: AGENT ADMIN   |
|                     | System privilege: ADAPTER ADMIN |

- If the SAP HANA server is configured for SSL, the agent host must already be prepared for SSL before connecting the agent configuration tool to the server. If you want to use TCP with SSL, but the agent isn't yet prepared, see [Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#).

#### Procedure

- Start the agent configuration tool.
- Choose [SAP HANA Connection](#).
- Choose [Connect to local SAP HANA \(on-premises\) via TCP](#).
- Specify whether to use SSL over TCP.
  - If you want to use SSL and the agent has already been prepared, choose *true*.
  - If you don't want to use SSL or the agent hasn't already been prepared, choose *false*.

For more information about preparing the agent for SSL, see [Configuring SSL \[page 590\]](#).

- Specify the hostname, port, and Agent Admin HANA User credentials for the SAP HANA server as prompted.

#### → Tip

To determine the correct port number when SAP HANA is deployed in a multi-database configuration, execute the following SQL statement:

```
SELECT DATABASE_NAME, SERVICE_NAME, PORT, SQL_PORT, (PORT + 2) HTTP_PORT  
FROM SYS_DATABASES.M_SERVICES WHERE DATABASE_NAME='<DBNAME>' and
```

```
((SERVICE_NAME='indexserver' and COORDINATOR_TYPE= 'MASTER') or
(SERVICE_NAME='xsengine'))
```

## Results

The configuration tool connects to the SAP HANA server.

## Related Information

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

[Start the Agent Configuration Tool \[page 40\]](#)

[Assign Roles and Privileges \[page 21\]](#)

## 2.5.1.7 Manage the Agent Service

Use the agent configuration tool to stop or start the Data Provisioning Agent service.

## Procedure

1. Start the agent configuration tool.
2. Choose *Start or Stop Agent*.
3. Choose *Start Agent Using Service* or *Stop Agent Using Service*.

## Results

The configuration tool indicates whether the agent service is running and the listening port in use by the agent.

## Next Steps

On Windows, you can also manage the agent service from the standard Windows Services tool. The name of the service is *SAP\_HANA\_SDI\_Agent\_Service\_Daemon\_<instance\_name>*.

On Linux, you can also manage the agent with a shell script. The shell script is located at *<DPAgent\_root>/bin/dpagent\_servicedaemon.sh* and supports the following commands:

- `./dpagent_servicedaemon.sh start`
- `./dpagent_servicedaemon.sh stop`

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Configure the Agent Management Webservice \[page 106\]](#)

## 2.5.1.8 Register the Agent with SAP HANA

Before you can use adapters deployed on the Data Provisioning Agent, you must register the agent with SAP HANA.

### Prerequisites

The Agent Admin HANA User must have the following roles or privileges:

Table 9: Roles and Privileges

| Action           | Role or Privilege             |
|------------------|-------------------------------|
| Register adapter | System privilege: AGENT ADMIN |

For the SAP HANA service for SAP BTP in the Neo environment, the HANA User for Agent Messaging must have the following roles or privileges:

Table 10: Roles and Privileges

| Action                                   | Role or Privilege   |
|--|---|
| Register adapter                         | System privilege: AGENT ADMIN                               |
| Messaging between the agent and SAP HANA | Application privilege: sap.hana.im.dp.proxy::AgentMessaging |

### Procedure

1. Start the agent configuration tool and connect to SAP HANA.
2. Choose [Agent Registration](#).
3. Choose [Register Agent](#) to register the agent with SAP HANA.
4. Specify the agent name and hostname as prompted.

Ensure that the SAP HANA server can communicate with the agent host. Depending on your network configuration, you need to qualify the agent hostname fully. Additionally, ensure that your firewall settings



allow the connection from the SAP HANA server to the agent host on the listener port. By default, the listener is port 5050.

#### ⚠ Caution

When you're asked for input entry for an option, you can't cancel or return to the previous menu. To abort the operation without saving, you must press `Ctrl` + `C` to terminate the configuration tool.

#### ℹ Note

For the SAP HANA service for SAP BTP in the Neo environment, specify only the agent name.

The agent service restarts to complete the registration process.

5. Press `Enter` to continue.

## Results

The agent is registered with SAP HANA.

For the SAP HANA service for SAP BTP in the Neo environment, the agent service restarts automatically.

## Next Steps

To unregister the agent, choose to unregister the agent from the [Agent Registration](#) menu.

#### ⚠ Caution

Unregistering the agent from the SAP HANA server performs a cascade drop of the agent. As a result, any remote subscriptions that use the agent are also deleted, even if they are active.

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

## 2.5.1.9 Manage Credentials for the HANA User for Agent Messaging

If the authentication credentials for the HANA User for Agent Messaging have changed or expired, you must update the credentials in the agent secure storage.

### Context

To set the new credentials in the agent secure storage, use the agent configuration tool.

### Procedure

1. Navigate to `<DPAgent_root>\bin` and start the configuration tool with the `--setSecureProperty` parameter.

| Platform | Command  |
|----------|--|
| Windows  | <code>agentcli.bat --setSecureProperty</code>  |
| Linux    | <code>./agentcli.sh --setSecureProperty</code> |

2. For X.509 certificate-based authentication, set the X.509 client certificate, private key, and private key password.
  - a. Choose [Set HANA XS User X509 Client Certificate](#) and enter the path to the client certificate.
  - b. **Optional:** Choose [Set HANA XS User X509 Private Key](#) and enter the path to the private key file.
  - c. **Optional:** Choose [Set HANA XS User X509 Private Key Password](#) and enter the private key password.

#### → Tip

To clear a stored X.509 credential, press  without specifying a new value.

3. For password-based authentication, set the HANA XS username and password.
  - a. If you want to use a different HANA User for Agent Messaging, choose [Set HANA XS Username](#) and enter the new username as prompted.
  - b. Choose [Set HANA XS Password](#) and enter the new password as prompted.
4. Restart the Data Provisioning Agent.

#### ⚠ Caution

When the agent restarts, any real-time subscriptions configured on the agent are terminated and must be reconfigured.

## Related Information

[Manage the Agent Service \[page 63\]](#)

### 2.5.1.10 Manage Credentials for the Agent Configuration Tool

By default, the configuration tool uses an internal user to connect to the agent to make configuration changes. If you prefer to define an authorized administration user for agent configuration changes, create or modify the credentials that the configuration tool uses to connect to the agent.

#### Note

If you prefer to use the default internal user for agent configuration changes, you don't need to configure credentials for an authorized administration user.

## Prerequisites

To use an agent administration user, you must set the `framework.admininternallogin` agent configuration parameter to `False` to disable the default internal user.

For more information, see [Agent Configuration Parameters \[page 112\]](#).

## Context

When you use an authorized agent administration user, the configuration tool establishes a secure connection to the agent to make configuration changes. Unauthorized applications without the correct credentials are unable to connect to the agent and run administration commands.

Each time you open the configuration tool, you must log in with the authorized username and password.

## Procedure

1. Navigate to `<DPAgent_root>\bin` and start the configuration tool with the `--configAgent` parameter.

| Platform | Command                                 |
|----------|---|
| Windows  | <code>agentcli.bat --configAgent</code> |
| Linux    | <code>agentcli.sh --configAgent</code>  |

2. Choose the option for the task that you want to perform.

| Task   | Actions   |
|--|---|
| <b>Securely connect to the agent</b>         | <p>Choose <a href="#">Login</a> and specify the username and password.</p> <p>The configuration tool's main menu appears.</p>   |
| <b>Create a new authorized user</b>          | <p>Choose <a href="#">Create New Admin User</a> and specify the username and password.</p> <p>The credentials are saved in the secure storage, and you can log in with the new username and password.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>⚠ Caution</b></p> <p>When you create a new user, the new credentials overwrite the existing credentials in the secure storage.</p> </div> |
| <b>Change or reset the existing password</b> | <p>Choose <a href="#">Reset Admin Password</a> and specify a new password. You're prompted to log in unless you're already logged in.</p> <p>The new password is saved in the secure storage, and you can log in with the existing user-name and new password.</p>  |

## 2.5.1.11 Store Remote Data Source Credentials Securely

If you don't want to store credentials for your adapter-based data sources in SAP HANA, you can store them in the Data Provisioning Agent secure storage. This method of storing credentials also provides management flexibility by allowing you to edit and delete credentials whenever you want.

### Context

You need three components to store credentials in the Data Provisioning Agent: remote source name, user name, and password.

### Procedure

1. Start the agent configuration tool.
2. Choose [Remote Source Credentials](#).
3. Choose [Add a new credential](#) to add credentials for your remote source database.
4. Enter the remote source name, user name, and password (and confirmation), and press Enter.

## Results

You can now access these credentials to connect to a remote source through the *Use Agent Stored Credential* remote source configuration parameter for your adapter. You can also use this editor to view, delete, and edit credentials.

## Related Information

[SAP HANA Remote Source Configuration \[page 529\]](#)

[IBM DB2 Mainframe Remote Source Configuration \[page 355\]](#)

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

### 2.5.1.12 Configure the Agent for IPv6 Mode

By default, the Data Provisioning Agent is configured in IPv4 mode. If you want to use IPv6, you must perform additional configuration steps.

## Procedure

1. In a text editor, open `<DPAgent_root>/dpagent.ini`.
2. Under `-vmargs`, add the following parameter:

```
-Djava.net.preferIPv6Addresses=true
```

3. Set the `SAP_IPv6_ACTIVE` environment variable to `1`.  
For example:

```
export SAP_IPv6_ACTIVE=1
```

4. Restart the Data Provisioning Agent and any running instances of the configuration tool.

## Results

The Data Provisioning Agent, adapters, and configuration tool now start in IPv6 mode.

## Next Steps

If you want to revert to IPv4, remove `-Djava.net.preferIPv6Addresses=true` from `dpagent.ini`, unset the `SAP_IPv6_ACTIVE` environment variable, and restart the agent and configuration tool.

### 2.5.1.13 Configure HTTPS Proxy Authentication for Adapters

Configure HTTPS proxy connection information and store authentication credentials in the Data Provisioning Agent secure storage.

#### Context

If your adapter requires HTTPS proxy authentication, but your agent is configured to connect to SAP HANA over a non-HTTP protocol such as JDBC, you can configure the proxy connection and authentication with the Data Provisioning Agent configuration tool.

When you configure the proxy, you must specify the proxy hostname and port, as well as the username and password for authentication.

#### Procedure

1. Start the agent configuration tool.
2. Choose *Configure DPAgent HTTP(S) Proxy Authentication*.
3. If the proxy requires an HTTPS connection, enter **true** for *Use HTTPS*.
4. Specify the proxy hostname and port.
5. Specify any non-proxy hosts.

Connections to these hosts aren't passed through the proxy.

Separate multiple hostnames by pipe characters:

```
hostname1|hostname2|hostname3
```

6. If the proxy requires authentication, enter **true** for *Use HTTP(S) Proxy Authentication*.
  - a. Specify the proxy username and password.
  - b. Confirm the proxy password.
7. In `<DPAgent_root>/dpagentconfig.ini`, add the following parameter:

```
jdk.http.auth.tunneling.disabledSchemes=
```

8. Restart the Data Provisioning Agent.

## Results

The proxy connection information is saved and the authentication credentials are stored in the Data Provisioning Agent secure storage. Adapters can use the stored credentials to connect to the proxy.

## Related Information

[Connect to Microsoft Azure Data Explorer \[page 416\]](#)

### 2.5.1.14 Test the JDBC Connection

Test the connection between the agent host system and SAP HANA to troubleshoot issues or verify that the connection is sufficient for your requirements.

## Context

Start the utility with the `--makeConnection` command to test the JDBC connection.

## Procedure

1. Navigate to `<DPAgent_root>/bin`.
2. Start the connection test utility with the `--makeConnection` command and any additional options.

| Option  | Description  |
|---------|--|
| Windows | <code>connectiontestutil.bat --makeConnection</code> |
| Linux   | <code>connectiontestutil.sh --makeConnection</code>  |

```
./connectiontestutil.sh --makeConnection --host=<hostname> --port=<port> --  
user=<username> --password=<password> --encrypt=false
```

The connection test utility reads JDBC configuration parameters from `<DPAgent_root>/dpagentconfig.ini`, if found. Within `dpagentconfig.ini`, the utility recognizes only those parameters that start with `jdbc.` Values that you specify at the command line override any values found in the configuration file.

#### ⚠ Caution

Specify connection credentials such as usernames or passwords only at the command line and not in `dpagentconfig.ini`.

## 2.5.1.14.1 Supported Connection Test Options

The connection test utility supports most JDBC connection properties as optional parameters.

The utility supports the following options:

Table 11: Supported Connection Test Options

| Option  | Value                   | Default | Description   |
|---|-------------------------|---------|---|
| user  | <String>                |         | Specifies the user name to use when connecting to SAP HANA.   |
| password  | <String>                |         | Specifies the password to use when connecting to SAP HANA.  |
| host  | <String>                |         | Specifies the hostname or IP address of the SAP HANA target.  |
| port  | <number>                | 30015   | Specifies the JDBC port used by the SAP HANA target.  |
| failover.hosts  | <String>                |         | Specifies optional failover hosts and port numbers as a semicolon-delimited list.   |
| <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin: 10px 0;"> <p><b>Sample Code</b></p> <pre>failover1:30015;failover2:30015</pre> </div> |                         |         |   |
| sniHostName   | <name>                  |         | Specifies the name of the host that is attempting to connect at the start of the TLS handshaking process.   |
| databaseName  | <String>                |         | Specifies the name of the SAP HANA database, such as H00.<br>You can query the actual database name from a SQL console:   |
| <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin: 10px 0;"> <pre>select * from m_database</pre> </div>                                  |                         |         |   |
| communicationTimeout  | <number> (milliseconds) | 330     | Aborts communication after the specified timeout. Setting this parameter to 0 disables the timeout.   |
| useProxy  | Boolean                 | FALSE   | Specifies whether to use proxy properties for the JDBC connection.  |
| proxyHttp   | Boolean                 | FALSE   | Specifies whether the proxy is an HTTP proxy or a SOCKS proxy. <ul style="list-style-type: none"> <li>• <i>True</i>: HTTP</li> <li>• <i>False</i>: SOCKS</li> </ul> |
| proxyHostName   | <name>                  | proxy   | Specifies the JDBC proxy host name.   |
| proxyPort   | <number>                | 1080    | Specifies the JDBC proxy port number.   |
| useProxyAuth  | Boolean                 | FALSE   | Specifies whether to use proxy authentication. If true, you must provide a proxy username and password.   |
| proxyUserName   | <String>                |         | Specifies the JDBC proxy user name.   |
| proxyPassword   | <String>                |         | Specifies the JDBC proxy password.  |
| useX509   | Boolean                 | FALSE   | Specifies whether to use X.509 certificate-based authentication.  |



| Option                | Value      | Default | Description   |
|-----------------------|------------|---------|---|
| x509.cert             | <filepath> |         | Specifies the path to the X.509 client certificate file.  |
| x509.privateKey       | <filepath> |         | Specifies the path to the X.509 client private key file.  |
| x509.pkPassword       | <String>   |         | Specifies the password to use to decrypt the X.509 private key.   |
| encrypt               | Boolean    | TRUE    | Specifies whether to use TLS/SSL encryption for the JDBC connection.  |
| trustStore            | <filepath> |         | Specifies the path to the trust store file.<br><br>This parameter is required when <code>encrypt</code> is set to <code>true</code> .   |
| trustStorePassword    | <String>   |         | Specifies the password for the trust store file.  |
| trustStoreType        | <String>   | JKS     | Specifies the type of the trust store: <ul style="list-style-type: none"> <li>• JKS</li> <li>• PKCS12</li> </ul>  |
| hostNameInCertificate | <name>     | *       | Specifies the host name used to verify the server's identity.<br><br>The host name is used to verify the identity of the server instead of the host name with which the connection was established.<br><br>For example, in a single-host system, consider a connection established from a client on the same host as the server. In this scenario, a mismatch occurs between the host named in the certificate (actual host name) and the host used to establish the connection (localhost). <div style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>If you specify <code>*</code> as the host name, this property has no effect. Other wildcards aren't permitted.</p> </div> |
| validateCertificate   | Boolean    | FALSE   | Specifies whether the server's certificate is validated.  |
| additionalParameters  | <String>   |         | Specifies additional parameters to pass to the JDBC driver.<br><br>Any property that isn't supported in the <code>dpagent.config.ini</code> file, but is supported by the SAP HANA JDBC driver, can be specified using this property.<br><br>You must specify entries with a comma delimiter when there are multiple parameters. For example, to specify values for the <code>reconnect</code> and <code>ignoreTopology</code> parameters, you could use the following string: <div style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;"> <pre>-- additionalParameters=reconnect=TRUE,ignoreTopology=FALSE</pre> </div>   |

| Option       | Value                  | Default  | Description   |
|--------------|------------------------|----------|---|
| traceOptions | <String>               |          | <p>Specifies a list of trace options to append to the JDBC connection string.</p> <p>For example, to enable tracing for connections, timestamps, and API call information into a file located at C:\usr\sap\tracefile.html, include the CONNECTION, TIMESTAMP, and API options in the string:</p> <pre>-- traceOptions="autocommit=false&amp;traceFile=C:\usr\sap\tracefile.html&amp;traceOptions=CONNECTIONS,TIMESTAMPS,API"</pre> <p>For more information about the available JDBC trace options, see "JDBC Tracing and Trace Options" in the <i>SAP HANA Client Interface Programming Reference</i>.</p> |
| connections  | <number>               | 10       | Specifies the maximum number of JDBC connections.   |
| times        | <number> or <String>   | 1000     | <p>Specifies the number of times to test each connection.</p> <p>If set to <b>infinite</b>, the test runs endlessly until you manually stop it.</p>   |
| mode         | SEQUENCE, PARALLEL     | SEQUENCE | Specifies whether to open test connections one by one or in parallel.   |
| sql          | <filepath> or <String> |          | <p>Specifies SQL commands to run after the tool opens each connection to SAP HANA as either a file path or a semicolon-separated list of SQL statements.</p> <ul style="list-style-type: none"> <li>• <b>File path:</b> The utility reads SQL statements from the file.</li> <li>• <b>List of statements:</b> The utility reads the statements directly. The maximum length is 50 characters.</li> </ul> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The utility supports only SELECT statements.</p> </div>  |

## Related Information

[SAP HANA Client Interface Programming Reference: JDBC Tracing and Trace Options](#)

## 2.5.1.14.2 Connection Test Examples

When you run a connection test, use options that match your real world scenario.

### Example: Connect to SAP HANA Cloud

The connection test utility opens a connection to the SAP HANA Cloud instance at `myinstance.hanacloud.ondemand.com`.

#### Sample Code

```
connectiontestutil.sh --makeConnection --  
host=myinstance.hanacloud.ondemand.com --port=443 --user=myuser --  
password=mypassword --encrypt=false
```

### Example: Connect to SAP HANA On-Premises

The connection test utility opens a connection to an on-premises SAP HANA server at `198.51.100.1`.

#### Sample Code

```
connectiontestutil.sh --makeConnection --host=198.51.100.1 --port=30015 --  
user=myuser --password=mypassword  
--encrypt=false
```

### Example: Connect to SAP HANA Cloud with Two Connections in Sequence

The connection test utility opens two connections one after the other and repeats the test 10 times.

#### Sample Code

```
connectiontestutil.sh --makeConnection --  
host=myinstance.hanacloud.ondemand.com --port=443 --user=myuser --  
password=mypassword --connections=2 --times=10 --mode=sequence --encrypt=false
```

### Example: Connect to SAP HANA Cloud with Two Connections in Parallel

The connection test utility opens two connections in parallel and repeats the test 10 times.

### ↔ Sample Code

```
connectiontestutil.sh --makeConnection --  
host=myinstance.hanacloud.ondemand.com --port=443 --user=myuser --  
password=mypassword --connections=2 --times=10 --mode=parallel --encrypt=false
```

## Example: Connect to SAP HANA Cloud and Run SQL Commands

In this example, `sql.txt` contains SQL commands such as the following:

### ↔ Sample Code

```
SELECT * FROM DUMMY;  
SELECT SUM(100+100) FROM DUMMY;  
SELECT CURRENT_DATE FROM DUMMY;  
SELECT DAYNAME ('2011-05-30') "DAYNAME" FROM DUMMY;
```

The connection test utility opens two connections in parallel and repeats the test 10 times. Each time, it runs the SQL commands defined in `sql.txt`.

### ↔ Sample Code

```
connectiontestutil.sh --makeConnection --  
host=myinstance.hanacloud.ondemand.com --port=443 --user=myuser --  
password=mypassword --connections=2 --times=10 --mode=parallel --sql=/usr/sap/  
sapdataprovagent/sql.txt --encrypt=false
```

## 2.5.2 Configuring the Agent in Command-Line Batch Mode

Use the agent configuration tool to connect to the SAP HANA server and configure the Data Provisioning Agent and adapters. For example, you can use the configuration tool to view the agent and adapter statuses and versions, manage custom and SAP-delivered adapters, and modify keystore paths.

### → Tip

For tasks such as silent configuration with no user interaction or automated configuration, combine sequences of individual batch commands into scripts.

#### [Execute Single Configuration Commands \[page 77\]](#)

Execute single commands to perform individual configuration tasks, or automate agent configuration by grouping multiple commands into a script.

#### [Supported Configuration Functions \[Batch\] \[page 78\]](#)

Perform configuration tasks by specifying a supported batch mode function.

#### [Connecting to SAP HANA \[Batch\] \[page 80\]](#)

Connect the Data Provisioning Agent to SAP HANA in batch mode by specifying parameters that depend on your scenario.

[Manage the Agent XS HANA User Credentials \[Batch\] \[page 90\]](#)

If the Agent XS HANA User password has changed or expired, you may need to update the credentials in the agent's secure storage.

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 91\]](#)

Store source database access credentials in the Data Provisioning Agent secure storage using batch mode.

## Related Information

### 2.5.2.1 Execute Single Configuration Commands

Execute single commands to perform individual configuration tasks, or automate agent configuration by grouping multiple commands into a script.

#### Prerequisites

Set the `DPA_INSTANCE` environment variable to the installation root location (`<DPAgent_root>`).

| Platform | Command  |
|----------|--|
| Windows  | <pre>set<br/>DPA_INSTANCE=C:\usr\sap\dataprovagent</pre>   |
| Linux    | <pre>export DPA_INSTANCE=/usr/sap/<br/>dataprovagent</pre> |

#### ⚠ Caution

Multiple instances of the Data Provisioning Agent can be installed on a single Linux host. Be sure that you set `DPA_INSTANCE` to the instance that you want to modify before starting the configuration tool. If you don't set the environment variable correctly, you can unintentionally modify the configuration of a different agent instance.

#### Procedure

1. Navigate to `<DPAgent_root>\bin`.
2. Execute the command using the `--configAgent` parameter.  
Specify the function to perform with the `--function <function>` parameter.

| Platform | Command  |
|----------|--|
| Windows  | <code>agentcli.bat --configAgent --function &lt;function&gt; [&lt;additional_parameters&gt;]</code>  |
| Linux    | <code>./agentcli.sh --configAgent --function &lt;function&gt; [&lt;additional_parameters&gt;]</code> |

## Results

The command executes without extra input.

### 2.5.2.2 Supported Configuration Functions [Batch]

Perform configuration tasks by specifying a supported batch mode function.

Table 12: Supported Functions

| Function                                | Description  | Parameters and Notes   |
|---|--|--|
| <code>adapterStatus</code>              | Displays the status of adapters on the agent instance              | <div style="border-left: 2px solid orange; padding-left: 10px;"> <p><b>⚠ Restriction</b></p> <p>Connect the configuration tool to SAP HANA before using this function.</p> </div>  |
| <code>adapterVersions</code>            | Displays the version of adapters on the agent instance             | <p>(Optional) <code>--adapter.name &lt;adapter_name&gt;</code></p> <div style="border-left: 2px solid blue; padding-left: 10px;"> <p><b>📄 Note</b></p> <p><code>&lt;adapter_name&gt;</code> must match the name displayed by <code>adapterStatus</code>. If you do not specify the <code>--adapter.name</code> parameter, all adapter versions display.</p> </div> |
| <code>agentComponentVersions</code>     | Displays the version for all components of the agent instance      |  |
| <code>agentPreferences</code>           | Sets adapter framework preferences                                 | <p><code>--D&lt;name&gt;=&lt;value&gt;</code></p> <p>For preference details, see <a href="#">Agent Configuration Parameters [page 112]</a></p>   |
| <code>agentStatus</code>                | Displays the status of the agent instance                          |  |
| <code>agentVersion</code>               | Displays the version of the agent instance                         |  |
| <code>configureAdapters Keystore</code> | Configures the SSL keystore used by adapters on the agent instance |  |

| Function                    | Description  | Parameters and Notes   |
|-----------------------------|--|--|
| configureAdaptersTruststore | Configures the SSL truststore used by adapters on the agent instance |  |
| configureFrameworkKeystore  | Configures the SSL keystore used by the agent framework              | <p><b>Note</b></p> <p>If you do not specify the <code>-Dframework.keystore.key.password</code> parameter, the keystore password is used for both the keystore and individual keys. This value is checked only if a key password was specified during key generation in the <code>keytool</code> utility.</p> |
| connectHanaViaHTTP          | Connects to the SAP HANA server using HTTP or HTTPS                  | For parameter details, see <a href="#">Connecting to SAP HANA [Batch] [page 80]</a>  |
| connectHanaViaTCP           | Connects to an on-premise SAP HANA server using TCP                  | For parameter details, see <a href="#">Connecting to SAP HANA [Batch] [page 80]</a>  |
| deployAdapter               | Deploys a custom adapter on the agent instance                       | <code>--adapter.filepath &lt;path_to_jar_file&gt;</code>   |
| pingAgent                   | Pings the agent instance to verify connectivity                      |  |
| registerAdapter             | Registers an adapter with the SAP HANA server                        | <p><code>--adapter.name &lt;adapter_name&gt;</code></p> <p><b>Note</b></p> <p><code>&lt;adapter_name&gt;</code> must match the name displayed by <code>adapterStatus</code>.</p> <p><b>Restriction</b></p> <p>Connect the configuration tool to SAP HANA before using this function.</p>                     |
| registerAgent               | Registers the agent instance with the SAP HANA server                | <p><code>-Dagent.name=&lt;agent_name&gt;</code></p> <p>For TCP only: <code>-Dagent.hostname=&lt;hostname&gt;</code></p> <p><b>Restriction</b></p> <p>Connect the configuration tool to SAP HANA before using this function.</p>  |
| showAgentPreferences        | Displays agent framework preferences                                 |  |
| showKeystores               | Displays all keystores for the agent instance                        |  |
| startAgentUsingService      | Starts the agent through the agent service                           |  |

| Function              | Description   | Parameters and Notes  |
|-----------------------|---|---|
| stopAgentUsingService | Stops the agent through the agent service               |   |
| undeployAdapter       | Undeploys a custom adapter from the agent instance      | --adapter.name <adapter_name><br><div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>&lt;adapter_name&gt; must match the name displayed by adapterStatus.</p> </div>  |
| unregisterAdapter     | Unregisters an adapter from the SAP HANA server         | --adapter.name <adapter_name><br><div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>&lt;adapter_name&gt; must match the name displayed by adapterStatus.</p> </div> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Restriction</b></p> <p>Connect the configuration tool to SAP HANA before using this function.</p> </div> |
| unregisterAgent       | Unregisters the agent instance from the SAP HANA server | <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Restriction</b></p> <p>Connect the configuration tool to SAP HANA before using this function.</p> </div>  |

## Accessing Help for Batch Functions

The configuration tool provides help for each supported command and function, including required and optional parameters and usage information. To view the help for a command or function, append `--help` to the command.

For example, to view the help for the `connectHanaViaHttp` configuration function:

```
agentcli.bat --configAgent --function connectHanaViaHttp --help
```

### 2.5.2.3 Connecting to SAP HANA [Batch]

Connect the Data Provisioning Agent to SAP HANA in batch mode by specifying parameters that depend on your scenario.

To connect to the SAP HANA server in batch mode, use the `connectHanaViaTcp` or `connectHanaViaHTTP` function and specify any additional parameters relevant to your system landscape.



## Common Connection Parameters

Parameters related to the SAP HANA server and administrator user are required in all connection scenarios.

Table 13: Required Parameters

| Parameter                             | Description  |
|---------------------------------------|--|
| -Dhana.server=<hostname>              | Hostname of the SAP HANA server  |
| -Dhana.port=<port>                    | Port used to connect to the SAP HANA server                            |
| -Dhana.admin.username=<username>      | Name of the Agent Admin HANA User that connects to the SAP HANA server |
| -Dhana.admin.password=<password_path> | Path to the file that contains the Agent Admin HANA User password      |

### → Tip

To determine the correct port number when SAP HANA is deployed in a multi-database configuration, execute the following SQL statement:

```
SELECT DATABASE_NAME, SERVICE_NAME, PORT, SQL_PORT, (PORT + 2) HTTP_PORT
FROM SYS_DATABASES.M_SERVICES WHERE DATABASE_NAME='<DBNAME>' and
((SERVICE_NAME='indexserver' and COORDINATOR_TYPE= 'MASTER') or
(SERVICE_NAME='xsengine'))
```

## Related Information

[Connecting to SAP HANA On-Premise \[Batch\] \[page 81\]](#)

[Connect to SAP HANA via JDBC WebSockets or Direct SQL \[Batch\] \[page 83\]](#)

[Connect to the SAP HANA Service for SAP BTP in the Neo Environment \[Batch\] \[page 86\]](#)

[Connect to SAP Datasphere \[Batch\] \[page 88\]](#)

### 2.5.2.3.1 Connecting to SAP HANA On-Premise [Batch]

Connect to SAP HANA on-premise with the `connectHanaViaTcp` function of the command-line configuration tool. In addition to the common parameters, additional connection parameters are required.

## Prerequisites

- The Agent Admin HANA User must have the following roles or privileges:

Table 14: Roles and Privileges

| Action              | Role or Privilege               |
|---------------------|---------------------------------|
| Connect to SAP HANA | System privilege: AGENT ADMIN   |
|                     | System privilege: ADAPTER ADMIN |

- If the SAP HANA server is configured for SSL, the agent host must already be prepared for SSL.

## More Connection Parameters

Table 15: More Parameters

| Parameter  | Description   |
|--|---|
| <code>-Dframework.enableSSL=&lt;value&gt;</code> | Specifies whether the connection uses SSL encryption<br><br>Allowed values: <b>true</b> or <b>false</b> |

### Example: Connect to SAP HANA On-Premise with TCP

```
agentcli.bat --configAgent --function connectHanaViaTcp
-Dframework.enableSSL=false -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<username> -Dhana.admin.password=<password_path>
```

### Example: Connect to SAP HANA On-Premise with TCP and SSL

```
agentcli.bat --configAgent --function connectHanaViaTcp
-Dframework.enableSSL=true -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<username> -Dhana.admin.password=<password_path>
```

#### Note

The agent host must already be configured for SSL.

## Related Information

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

## 2.5.2.3.2 Connect to SAP HANA via JDBC WebSockets or Direct SQL [Batch]

Connect to SAP HANA via JDBC WebSockets or Direct SQL with the `connectHanaViaJdbc` function of the agent configuration tool. In addition to the required parameters, additional optional connection parameters may be needed for your configuration.

### Prerequisites

- The Data Provisioning delivery unit must be imported to the SAP HANA system.
- The Agent Admin HANA User must have the following roles or privileges:

Table 16: Roles and Privileges

| Action  | Role or Privilege  |
|---|--|
| Connect to SAP HANA                                 | <ul style="list-style-type: none"> <li>• System privilege: AGENT ADMIN</li> <li>• System privilege: ADAPTER ADMIN</li> </ul> |
| Create the HANA User for Agent Messaging (Optional) | <ul style="list-style-type: none"> <li>• System privilege: USER ADMIN</li> </ul>   |

#### Note

These privileges are required only when you want to create the HANA User for Agent Messaging as part of the configuration process within the agent configuration tool.

- You have a HANA User for Agent Messaging for messaging between the agent and SAP HANA. To create such a user manually:
  1. Create the agent user (for example, AGTUSR) with a non-expiring password.
  2. GRANT AGENT MESSAGING ON AGENT "<your\_agent\_name>" TO AGTUSR;

#### → Tip

If the Agent Admin HANA User has been granted the privileges indicated in the "Roles and Privileges" table, it can create the HANA User for Agent Messaging during the configuration process. The configuration tool creates the HANA User for Agent Messaging as a technical user with the no expiration period for the password.

#### Note

In general, the password for a new SAP HANA user expires according to the SAP HANA password policy settings, the default for which is 182 days. To avoid agent disruptions in a production scenario, treat a new HANA User for Agent Messaging as a technical user and ensure that its password doesn't expire.

For more information about configuring the password policy for a technical user in SAP HANA, see the *SAP HANA Security Guide*.

## Required Connection Parameters

Table 17: Required Parameters

| Parameter  | Description   |
|--|---|
| <code>-Dhana.admin.username=&lt;username&gt;</code>      | Specifies the name of the Agent Admin HANA User that connects to the SAP HANA server            |
| <code>-Dhana.admin.password=&lt;password_path&gt;</code> | Specifies the path to the file that contains the password for the Agent Admin HANA User         |
| <code>-Dhana.xs.username=&lt;username&gt;</code>         | Specifies the name of the HANA User for Agent Messaging   |
| <code>-Dhana.xs.password=&lt;path_to_password&gt;</code> | Specifies the path to the file that contains the password for the HANA User for Agent Messaging |

## Additional Connection Parameters

Table 18: Optional Parameters

| Parameter   | Description   |
|---|---|
| <code>-Djdbc.encrypt=&lt;value&gt;</code>         | Specifies whether to use an encrypted JDBC connection<br><br>Allowed values: <b>true</b> or <b>false</b><br><br>Default: <b>true</b>  |
| <code>-Djdbc.useWebsocketURL=&lt;value&gt;</code> | Specifies whether to use JDBC WebSockets or Direct SQL<br><br>Allowed values: <b>true</b> or <b>false</b><br><br>Default: <b>true</b><br><br>To use Direct SQL to connect to SAP HANA, specify <b>false</b> . |
| <code>-Djdbc.websocketURL=&lt;value&gt;</code>    | Specifies the URL to use for the JDBC WebSockets connection<br><br>For example, <code>/service/&lt;service_instance_id&gt;</code>   |
| <code>-Djdbc.host=&lt;value&gt;</code>            | Specifies the JDBC WebSocket host<br><br>For Direct SQL, specifies the hostname of the SAP HANA server.   |
| <code>-Djdbc.port=&lt;value&gt;</code>            | Specifies the JDBC WebSocket port<br><br>For Direct SQL, specifies the port used to connect to the SAP HANA server.   |
| <code>-Djdbc.useProxy=&lt;value&gt;</code>        | Specifies whether to use a proxy for the JDBC WebSockets or Direct SQL connection<br><br>Allowed values: <b>true</b> or <b>false</b><br><br>Default: <b>false</b>   |

| Parameter                                       | Description  |
|---|--|
| <code>-Djdbc.proxyHttp=&lt;value&gt;</code>     | <p>Specifies whether the proxy uses HTTP or SOCKS</p> <p>Allowed values: <b>true</b> or <b>false</b></p> <p>Default: <b>false</b></p> <p>To use an HTTP proxy, specify <b>true</b>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px; margin-top: 10px;"> <p><b>⚠ Restriction</b></p> <p>SOCKS proxies aren't supported when using JDBC WebSockets to connect to SAP HANA.</p> </div> |
| <code>-Djdbc.proxyHost=&lt;value&gt;</code>     | Specifies the host name of the HTTP or SOCKS proxy   |
| <code>-Djdbc.proxyPort=&lt;value&gt;</code>     | Specifies the port used by the HTTP or SOCKS proxy   |
| <code>-Djdbc.useProxyAuth=&lt;value&gt;</code>  | <p>Specifies whether the proxy requires authentication</p> <p>Allowed values: <b>true</b> or <b>false</b></p> <p>Default: <b>false</b></p>   |
| <code>-Djdbc.proxyUserName=&lt;value&gt;</code> | Specifies the user name to use for proxy authentication  |
| <code>-Djdbc.proxyPassword=&lt;value&gt;</code> | Specifies the path to the file that contains the password used for proxy authentication  |
| <code>--hana.xs.createUser &lt;value&gt;</code> | <p>Specifies whether or not the configuration program creates an Agent XS HANA User</p> <p>To use an existing Agent XS HANA User, specify <b>false</b>.</p>  |

## Example: Connect to SAP HANA via JDBC WebSockets and HTTP Proxy Without Authentication

```
agentcli.bat --configAgent --function connectHanaViaJdbc
-Dhana.admin.username=<username>
-Dhana.admin.password=<password_path> -Dhana.xs.username=<username>
-Dhana.xs.password=<password_path> -Djdbc.encrypt=false
-Djdbc.useWebSocketURL=true
-Djdbc.host=<hana_hostname> -Djdbc.port=<hana_sql_port>
-Djdbc.useProxy=true -Djdbc.proxyHttp=true
-Djdbc.proxyHost=<http_proxy_hostname>
-Djdbc.proxyPort=<http_proxy_port> -Djdbc.useProxyAuth=false
```

## Example: Connect to SAP HANA via Direct SQL and SOCKS Proxy with Authentication

```
agentcli.bat --configAgent --function connectHanaViaJdbc
-Dhana.admin.username=<username>
```

```
-Dhana.admin.password=<password_path> -Dhana.xs.username=<username>
-Dhana.xs.password=<password_path> -Djdbc.encrypt=false
-Djdbc.useWebsocketURL=false
-Djdbc.host=<hana_hostname> -Djdbc.port=<hana_sql_port>
-Djdbc.useProxy=true -Djdbc.proxyHttp=false
-Djdbc.proxyHost=<socks_proxy_hostname>
-Djdbc.proxyPort=<socks_proxy_port> -Djdbc.useProxyAuth=true
-Djdbc.proxyUserName=<username> -Djdbc.proxyPassword=<password_path>
```

### 2.5.2.3.3 Connect to the SAP HANA Service for SAP BTP in the Neo Environment [Batch]

Connect to SAP HANA service for SAP BTP in the Neo environment with the `connectHanaViaHttp` function of the agent configuration tool. In addition to the common parameters, extra connection parameters are required.

#### Prerequisites

- The Data Provisioning delivery unit must be imported to the SAP HANA system.
- The Agent Admin HANA User must have the following roles or privileges:

Table 19: Roles and Privileges

| Action                    | Role or Privilege   |
|---------------------------|---|
| Connect to SAP HANA       | <ul style="list-style-type: none"> <li>• Application privilege:<br/><code>sap.hana.im.dp.admin::Administrator</code></li> <li>• System privilege: AGENT ADMIN</li> <li>• System privilege: ADAPTER ADMIN</li> </ul> |
| Create Agent XS HANA User | <ul style="list-style-type: none"> <li>• System privilege: USER ADMIN</li> <li>• Object privilege: EXECUTE on<br/><code>GRANT_APPLICATION_PRIVILEGE</code></li> </ul>   |

- The Agent XS HANA User must have the following roles or privileges:

Table 20: Roles and Privileges

| Action   | Role or Privilege  |
|--|--|
| Messaging between the agent and the SAP HANA service | <ul style="list-style-type: none"> <li>• Application privilege:<br/><code>sap.hana.im.dp.proxy::AgentMessaging</code></li> </ul> |

#### → Tip

The configuration tool can create the Agent XS HANA User during the agent configuration process as long as the Agent Admin HANA User has been granted the correct privileges.

## Extra Connection Parameters

Table 21: Extra Parameters

| Parameter  | Description   |
|--|---|
| <code>-Dhana.useSSL=&lt;value&gt;</code>                 | Specifies whether the connection uses SSL encryption<br>Allowed values: <b>true</b> or <b>false</b>   |
| <code>-Dcloud.useProxy=&lt;value&gt;</code>              | Specifies whether a proxy is required for the connection<br>Allowed values: <b>true</b> or <b>false</b>   |
| <code>-Dcloud.useProxyAuth=&lt;value&gt;</code>          | Specifies whether proxy authorization is required<br>Allowed values: <b>true</b> or <b>false</b>  |
| <code>-Dhana.xs.username=&lt;username&gt;</code>         | Name of the Agent XS HANA User for messaging between the Data Provisioning Agent and the SAP HANA server  |
| <code>-Dhana.xs.password=&lt;path_to_password&gt;</code> | Path to the file that contains the Agent XS HANA User password  |
| <code>--hana.xs.createUser &lt;value&gt;</code>          | Specifies whether or not the configuration program creates an Agent XS HANA User<br>To use an existing Agent XS HANA User, specify <b>false</b> . |

### Example: Connect to the SAP HANA Service for SAP BTP with HTTP

```
agentcli.bat --configAgent --function connectHanaViaHttp
-Dhana.useSSL=false -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<admin_username>
-Dhana.admin.password=<admin_password_path>
-Dhana.xs.username=<xs_username> -Dhana.xs.password=<xs_password_path> --
hana.xs.createUser false
```

### Example: Connect to the SAP HANA Service for SAP BTP with HTTP and Create Agent XS HANA User

```
agentcli.bat --configAgent --function connectHanaViaHttp
-Dhana.useSSL=false -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<admin_username>
-Dhana.admin.password=<admin_password_path>
-Dhana.xs.username=<xs_username> -Dhana.xs.password=<xs_password_path> --
hana.xs.createUser true
```

## Example: Connect to SAP HANA on Cloud with HTTPS

```
agentcli.bat --configAgent --function connectHanaViaHttp
-Dhana.useSSL=true -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<admin_username>
-Dhana.admin.password=<admin_password_path>
-Dhana.xs.username=<xs_username> -Dhana.xs.password=<xs_password_path> --
hana.xs.createUser false
```

## Example: Connect to SAP HANA on Cloud with HTTPS and Proxy

```
agentcli.bat --configAgent --function connectHanaViaHttp
-Dhana.useSSL=true -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<admin_username>
-Dhana.admin.password=<admin_password_path>
-Dhana.xs.username=<xs_username> -Dhana.xs.password=<xs_password_path> --
hana.xs.createUser false
-Dcloud.useProxyAuth=false -Dcloud.useProxy=true -DproxyHost=<proxy_hostname> -
DproxyPort=<proxy_port>
```

### 2.5.2.3.4 Connect to SAP Datasphere [Batch]

Connect to SAP HANA via JDBC with the `saveConnectHanaViaJdbc` function of the agent configuration tool when you're using an SAP Datasphere instance.

#### Prerequisites

- You've created an SAP Datasphere instance in the SAP BTP cockpit.
- You've installed the Data Provisioning Agent to an on-premise or cloud-based host system.

#### Note

SAP Datasphere requires Data Provisioning Agent version 2.4.2.6 or newer.

- You've created a Data Provisioning Agent instance in SAP Datasphere.

#### Note

When you create an agent instance in SAP Datasphere, record the connection settings required to configure the agent:

- Agent Name
- HANA Server (Hostname)
- HANA Port
- HANA User Name for Agent Messaging



- HANA User Password for Agent Messaging
- You've added the IP address of the agent host system to the IP allowlist in SAP Datasphere.

## Required Connection Parameters

Table 22: Required Parameters

| Parameter  | Description   |
|--|---|
| <code>-Dagent.name=&lt;instance_name&gt;</code>          | Specifies the name of Data Provisioning Agent instance registered on SAP Datasphere             |
| <code>-Djdbc.host=&lt;value&gt;</code>                   | Specifies the HANA Server hostname in SAP Datasphere  |
| <code>-Djdbc.port=&lt;value&gt;</code>                   | Specifies the HANA Port in SAP Datasphere   |
| <code>-Dhana.xs.username=&lt;username&gt;</code>         | Specifies the name of the HANA User for Agent Messaging   |
| <code>-Dhana.xs.password=&lt;path_to_password&gt;</code> | Specifies the path to the file that contains the password for the HANA User for Agent Messaging |

## Additional Connection Parameters

Table 23: Optional Parameters

| Parameter                                   | Description   |
|---|---|
| <code>-Djdbc.encrypt=&lt;value&gt;</code>   | Specifies whether to use an encrypted JDBC connection<br>Allowed values: <b>true</b> or <b>false</b><br>Default: <b>true</b>  |
| <code>-Djdbc.useProxy=&lt;value&gt;</code>  | Specifies whether to use a proxy for the JDBC connection<br>Allowed values: <b>true</b> or <b>false</b><br>Default: <b>false</b>                                      |
| <code>-Djdbc.proxyHttp=&lt;value&gt;</code> | Specifies whether the proxy uses HTTP or SOCKS<br>Allowed values: <b>true</b> or <b>false</b><br>Default: <b>false</b><br>To use an HTTP proxy, specify <b>true</b> . |
| <code>-Djdbc.proxyHost=&lt;value&gt;</code> | Specifies the host name of the HTTP or SOCKS proxy  |
| <code>-Djdbc.proxyPort=&lt;value&gt;</code> | Specifies the port used by the HTTP or SOCKS proxy  |

| Parameter                                       | Description   |
|---|---|
| <code>-Djdbc.useProxyAuth=&lt;value&gt;</code>  | Specifies whether the proxy requires authentication<br><br>Allowed values: <b>true</b> or <b>false</b><br><br>Default: <b>false</b> |
| <code>-Djdbc.proxyUserName=&lt;value&gt;</code> | Specifies the user name to use for proxy authentication   |
| <code>-Djdbc.proxyPassword=&lt;value&gt;</code> | Specifies the path to the file that contains the password used for proxy authentication   |

### Example: Connect to SAP Datasphere via JDBC Without HTTP Proxy

```
agentcli.bat --configAgent --function saveConnectHanaViaJdbc
-Dagent.name=<agent_name>
-Dhana.xs.username=<username> -Dhana.xs.password=<password_path>
-Djdbc.encrypt=true
-Djdbc.useWebsocketURL=false -Djdbc.host=<hana_hostname> -Djdbc.port=<hana_port>
-Djdbc.useProxy=false
```

### Related Information

[Manage the Agent XS HANA User Credentials \[Batch\] \[page 90\]](#)

## 2.5.2.4 Manage the Agent XS HANA User Credentials [Batch]

If the Agent XS HANA User password has changed or expired, you may need to update the credentials in the agent's secure storage.

### Context

Use the agent configuration tool in command-line batch mode to set the new credentials in the agent's secure storage.

## Procedure

1. Navigate to `<DPAgent_root>/bin`.
2. Execute the commands using the `--setSecureProperty` parameter.
  - a. If you want to use a different Agent XS HANA User, specify the `setHanaXsUsername` function.

| Platform | Command   |
|----------|---|
| Windows  | <pre>agentcli.bat --setSecureProperty --function setHanaXsUsername --file &lt;username_file_path&gt;</pre>  |
| Linux    | <pre>./agentcli.sh --setSecureProperty --function setHanaXsUsername --file &lt;username_file_path&gt;</pre> |

- b. Specify the `setHanaXsPassword` to set the new password.

| Platform | Command   |
|----------|---|
| Windows  | <pre>agentcli.bat --setSecureProperty --function setHanaXsPassword --file &lt;password_file_path&gt;</pre>  |
| Linux    | <pre>./agentcli.sh --setSecureProperty --function setHanaXsPassword --file &lt;password_file_path&gt;</pre> |

3. Restart the Data Provisioning Agent.

### ⚠ Caution

When the agent restarts, any real-time subscriptions configured on the agent are terminated and you may need to configure the real-time subscriptions again.

## 2.5.2.5 Store Source Database Credentials in Data Provisioning Agent [Batch]

Store source database access credentials in the Data Provisioning Agent secure storage using batch mode.

### Context

If you don't want to store credentials in SAP HANA, you can store them in the Data Provisioning Agent secure storage.

Entering credentials in the Data Provisioning Agent requires three components: remote source name, user name and password. This method of storing credentials also gives you more management flexibility by allowing you to edit and delete whenever you want.

## Procedure

1. List all remote credentials stored in Data Provisioning Agent.

```
bin/agentcli.sh --configAgent --function listCredentials
```

2. Add a new remote credential.

```
bin/agentcli.sh --configAgent --function addCredentials  
-Dadd.remoteCredential.remoteSourceName=<Remote Source Name>  
-Dadd.remoteCredential.username=<User Name>  
-Dadd.remoteCredential.password=<Password File>
```

3. Edit a new remote credential.

```
bin/agentcli.sh --configAgent --function editCredentials  
-Dedit.originalRemoteCredential.remoteSourceName=<Original Remote Source  
Name>  
-Dedit.originalRemoteCredential.username=<Original User Name>  
-Dedit.remoteCredential.remoteSourceName=<New Remote Source Name>  
-Dedit.remoteCredential.username=<New User Name>  
-Dedit.remoteCredential.password=<Password file including New Password>
```

4. Delete a credential.

```
bin/agentcli.sh --configAgent --function delCredentials  
-Ddel.remoteCredential.remoteSourceName=<Remote Source Name>  
-Ddel.remoteCredential.username=<User Name>
```

## Results

You can now access these credentials to connect to a remote source through the *Use Agent Stored Credential* remote source configuration parameter for your adapter.

## Related Information

[SAP HANA Remote Source Configuration \[page 529\]](#)

[IBM DB2 Mainframe Remote Source Configuration \[page 355\]](#)

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

## 2.5.3 Reconfigure the Java Runtime Environment

The SAP JVM is bundled with the Data Provisioning Agent and used as the default Java Runtime Environment. You can choose to update the version of the SAP JVM used by an installed agent or replace it with a custom Java Runtime Environment.

### Prerequisites

If you want to update your version of the SAP JVM, download the version of the SAP JVM that matches the operating system and processor architecture used by the Data Provisioning Agent host.

### Procedure

- Update the SAP JVM with a newer version.
  - a. Extract the downloaded .SAR file containing the latest SAP JVM to a temporary location.
  - b. Stop the Data Provisioning Agent service.
  - c. Delete or back up the entire contents of the `<DPAgent_root>/sapjvm` directory.
  - d. Copy the extracted .SAR contents from `<temp_location>/sapjvm_<version>/jre` into `<DPAgent_root>/sapjvm`.
  - e. Restart the Data Provisioning Agent service.
- Replace the SAP JVM with a custom JRE. That is, any Java runtime other than the SAP JVM.
  - a. Stop the Data Provisioning Agent service.
  - b. In a text editor, open `dpagent.ini` and replace the value of the `-vm` setting with the path to the custom JRE.

#### Note

The `-vm` setting must be specified before the `-vmargs` setting in the `dpagent.ini` file, and `-vm` and its setting must be entered on different lines. Additionally, do not use quotes around the path even if the path contains spaces.

Table 24: Example Replacement

| Platform | Original Value   | New Value  |
|----------|--|--|
| Windows  | <code>-vm<br/>C:\usr\sap\dataprovagant\sapjvm<br/>\bin</code>            | <code>-vm<br/>C:\Program Files\Java\jre7\bin</code>                  |
| Linux    | <code>-vm<br/>/usr/sap/dataprovagant/<br/>sapjvm/lib/amd64/server</code> | <code>-vm<br/>/usr/java/jdk1.7.0_71/jre/lib/<br/>amd64/server</code> |

- c. Restart the Data Provisioning Agent service.

## Related Information

[Manage the Agent Service \[page 63\]](#)

## 2.5.4 Managing Agent Groups

Agent grouping provides failover and load-balancing capabilities by combining individual Data Provisioning Agents installed on separate host systems.

### ⚠ Restriction

Failover is supported only for real-time requests. For initial or batch load failures that occur because an agent is unavailable, restart the initial or batch load.

### ⚠ Restriction

Load balancing is supported only for initial loads. It is not supported for changed-data capture (CDC) operations.

## Planning Considerations

Before configuring agents in a group, review the following considerations and limitations:

- For real-time replication failover, each agent in a group must be installed on a different host system.
- All agents in a group must have identical adapter configurations.
- All agents in a group must use the same communication protocol. You can't mix on-premise agents (TCP) and cloud-based agents (HTTP) in a single group.

### [Failover Behavior in an Agent Group \[page 95\]](#)

When an agent node in an agent group is inaccessible for longer than the configured heartbeat interval, the Data Provisioning Server chooses a new active agent within the group. It then resumes replication for any remote subscriptions active on the original agent.

### [Load Balancing in an Agent Group \[page 96\]](#)

With multiple agents in an agent group, you can choose to have the agent for the initial loads selected randomly, selected from the list of agents in a round-robin fashion, or not load balanced.

### [Create or Remove an Agent Group \[page 96\]](#)

You can create an agent group or remove an existing group using tools available in your SAP HANA landscape.

### [Manage Agent Nodes in an Agent Group \[page 98\]](#)

You can manage the agent nodes that belong to an agent group using tools available in your SAP HANA landscape.

### [Add Adapters to an Agent Group \[page 101\]](#)

Before you can create remote sources in an agent group, you must add adapters to the group using tools available in your SAP HANA landscape.

### [Configure Remote Sources in an Agent Group \[page 102\]](#)

To receive the benefits of failover from an agent group, you must configure your remote sources in the agent group.

## Related Information

### 2.5.4.1 Failover Behavior in an Agent Group

When an agent node in an agent group is inaccessible for longer than the configured heartbeat interval, the Data Provisioning Server chooses a new active agent within the group. It then resumes replication for any remote subscriptions active on the original agent.

Initial and batch load requests to a remote source configured on the agent group are routed to the first available agent in the group.

#### ⚠ Restriction

Failover is supported only for real-time requests. For initial or batch load failures that occur because an agent is unavailable, restart the initial or batch load.

Although no user action is required for automatic failover within an agent group, you can monitor the current agent node information.

- Use the following query to return the current master agent name for a remote source:

```
SELECT AGENT_NAME FROM "SYS"."M_REMOTE_SOURCES_" WHERE "REMOTE_SOURCE_OID" =  
(SELECT REMOTE_SOURCE_OID FROM "SYS"."REMOTE_SOURCES_" WHERE  
REMOTE_SOURCE_NAME = '<remote_source_name>');
```

- Use the following query to generate a list of all agent and agent group names:

```
SELECT AGENT_NAME, AGENT_GROUP_NAME FROM SYS."AGENTS";
```

#### ⚠ Caution

If all nodes in an agent group are down, replication can't continue and must be recovered after one or more agent nodes are available.

## Restarting Agent Nodes in an Agent Group

Restarting nodes in an agent group doesn't impact active replication tasks.

For the master agent node, stopping or restarting the agent triggers the failover behavior and a new active master node is selected from the agent group.

## 2.5.4.2 Load Balancing in an Agent Group

With multiple agents in an agent group, you can choose to have the agent for the initial loads selected randomly, selected from the list of agents in a round-robin fashion, or not load balanced.

### Note

Agent grouping provides load balancing for initial loads only. Load balancing isn't supported for changed-data capture (CDC) operations.

Load balancing is governed by the `'agent_group'. 'load_balance_mode'` index server parameter and supports the following modes:

- *none*: No load balancing is performed.
- *random*: The agent is chosen randomly.
- *round\_robin*: The chosen agent is the next in the list of available agents after the previously chosen agent.

For example, use the following query to randomly select the agent for initial loads:

```
ALTER SYSTEM ALTER CONFIGURATION ('indexserver.ini', 'SYSTEM') SET ('agent_group', 'load_balance_mode') = 'random' WITH RECONFIGURE;
```

The default load balancing behavior is *round\_robin*.

## 2.5.4.3 Create or Remove an Agent Group

You can create an agent group or remove an existing group using tools available in your SAP HANA landscape.

### Prerequisites

To create or remove an agent group, you must have the AGENT ADMIN system privilege.



# Create or Remove an Agent Group in the Data Provisioning Agent Monitor

## Prerequisites

In addition to the AGENT ADMIN system privilege, you must have the following roles or privileges to create or remove an agent group in the Data Provisioning Agent Monitor:

Table 25: Roles and Privileges

| Action             | Role or Privilege  |
|--------------------|--|
| Create agent group | <ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.monitor.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::CreateAgentGroup</li><li>• System privilege: AGENT ADMIN</li></ul> |
| Remove agent group | <ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.monitor.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::DropAgentGroup</li><li>• System privilege: AGENT ADMIN</li></ul>   |

## Context

Use the buttons in the [Agent Group](#) table to create or remove an agent group.

## Procedure

- Click [Create](#) to create an agent group.  
Specify the name for the new agent group, and click [Create Agent Group](#).  
The new agent group appears in the [Agent Group](#) table.
- Select the agent group and click [Drop](#) to remove an existing agent group.

### Note

When you remove an agent group, any agent nodes for the group are removed from the group first. Agents can't be removed from the group if there are active remote subscriptions.

Any agent nodes are removed from the group, and the group is removed from the [Agent Group](#) table.

# Create or Remove an Agent Group with SQL Syntax

## Context

In a SQL console, use the CREATE or DROP statements to create or remove an agent group.

## Procedure

- Use the CREATE statement to create a new agent group:

```
CREATE AGENT GROUP <group_name>
```

- Use the DROP statement to remove an existing agent group:

```
DROP AGENT GROUP <group_name>
```

### Note

When you remove an agent group, any agent nodes for the group are removed from the group first. Agents can't be removed from the group if there are active remote subscriptions.

## Related Information

[CREATE AGENT GROUP Statement \[Smart Data Integration\] \[page 635\]](#)

[DROP AGENT GROUP Statement \[Smart Data Integration\] \[page 649\]](#)

## 2.5.4.4 Manage Agent Nodes in an Agent Group

You can manage the agent nodes that belong to an agent group using tools available in your SAP HANA landscape.

## Prerequisites

To manage the agent nodes in an agent group, you must have the AGENT ADMIN system privilege.

# Manage Agent Nodes in the Data Provisioning Agent Monitor

## Prerequisites

In addition to the AGENT ADMIN system privilege, you must have the following roles or privileges to manage agent nodes in the Data Provisioning Agent Monitor:

Table 26: Roles and Privileges

| Action                        | Role or Privilege   |
|-------------------------------|---|
| Create agent                  | <ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::CreateAgent</li><li>• System privilege: AGENT ADMIN</li></ul> |
| Add agent to agent group      | <ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::AlterAgent</li><li>• System privilege: AGENT ADMIN</li></ul>  |
| Remove agent from agent group | <ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::AlterAgent</li><li>• System privilege: AGENT ADMIN</li></ul>  |

## Context

Use the buttons in the [Agent Monitor](#) and [Agent Group](#) tables to perform the action.

### → Tip

Select an agent group in the [Agent Group](#) table to display its nodes in the [Agent Monitor](#) table.

## Procedure

- To register a new agent with the SAP HANA system and add it to an existing agent group, click [Create Agent](#).

When specifying the parameters for the agent, select the agent group from the [Agent Group](#) list.

The new agent appears in the [Agent Monitor](#) table.

- To modify the group assignment for an existing agent, click [Alter Agent](#).
  - Select the new agent group from the [Agent Group](#) list.  
If you're assigning the agent to a different group, select the empty entry for [Enable SSL](#) to avoid connection issues when the group is changed.
  - To remove the agent from an agent group, select the empty entry from the [Agent Group](#) list.

The group for the agent is displayed in the [Agent Monitor](#) table.

- To add multiple existing agents to an agent group, select the group in the *Agent Group* table and click *Add Agents*.
  - a. Select the agents that you want to add to the group.
  - b. Click *Add Agents*.

The selected agents are assigned to the agent group and all associated entries in the *Agent Monitor* and *Agent Group* tables are updated.

## Manage Agent Nodes Using SQL Syntax

### Context

In a SQL console, use the CREATE AGENT or ALTER AGENT statements to manage the agent nodes in an agent group.

### Procedure

- **Optional:** If you don't know the group name, you can query the system for a list of agent groups:

```
SELECT AGENT_NAME, AGENT_GROUP_NAME FROM SYS."AGENTS" ;
```

- Use the CREATE AGENT statement to create a new agent in the group:

```
CREATE AGENT <agent_name> PROTOCOL { { 'HTTP' } |
                                     { 'TCP' HOST <agent_hostname> PORT <agent_port_number> }
                                     [{ENABLE | DISABLE} SSL]} [AGENT GROUP <agent_group_name>]
```

- Use the ALTER AGENT to add an existing agent to the group:

```
ALTER AGENT <agent_name> SET AGENT GROUP <group_name>
```

### Related Information

[CREATE AGENT Statement \[Smart Data Integration\] \[page 633\]](#)

[ALTER AGENT Statement \[Smart Data Integration\] \[page 622\]](#)

## 2.5.4.5 Add Adapters to an Agent Group

Before you can create remote sources in an agent group, you must add adapters to the group using tools available in your SAP HANA landscape.

### Prerequisites

To add an adapter to the agent group, you must have the following roles or privileges:

Table 27: Roles and Privileges

| Action                     | Role or Privilege               |
|----------------------------|---------------------------------|
| Add adapter to agent group | System privilege: ADAPTER ADMIN |

### Context

Use the CREATE ADAPTER and ALTER ADAPTER statements to add the adapter to each node in the group.

### Procedure

1. **Optional:** If you don't know the agent names, you can query the system for a list of agents and agent groups:

```
SELECT AGENT_NAME,AGENT_GROUP_NAME FROM SYS."AGENTS";
```

2. Create the adapter on the first agent node:

```
CREATE ADAPTER "<adapter_name>" AT location agent "<agent1_name>" ;
```

3. Add the adapter to each additional agent node in the agent group:

```
ALTER ADAPTER "<adapter_name>" ADD location agent "<agent#_name>" ;
```

## 2.5.4.6 Configure Remote Sources in an Agent Group

To receive the benefits of failover from an agent group, you must configure your remote sources in the agent group.

### Configure Remote Sources in the SAP HANA Web-Based Development Workbench

#### Procedure

- To create a new remote source in an agent group:
  - a. In the Catalog editor, right-click the ► *Provisioning* ► *Remote Sources* ► folder, and choose *New Remote Source*.
  - b. Enter the required configuration information for the remote source, including the adapter name.
  - c. In the *Location* dropdown, choose *agent group*, and select the agent group name.
  - d. Click *Save*.
- To add an existing remote source to an agent group:
  - a. In the Catalog editor, select the remote source in the ► *Provisioning* ► *Remote Sources* ► folder.
  - b. In the *Location* dropdown, choose *agent group*, and select the agent group name.
  - c. Click *Save*.

#### Related Information

[Create a Remote Source in the Web-Based Development Workbench](#)

### Configure Remote Sources Using SQL Syntax

#### Context

Use the CREATE REMOTE SOURCE and ALTER REMOTE SOURCE statements to configure remote sources.

#### Procedure

- Use the CREATE REMOTE SOURCE statement to create a new remote source in the agent group:

```
CREATE REMOTE SOURCE <source_name> ADAPTER <adapter_name> AT LOCATION AGENT
GROUP <group_name> <configuration_clause> <credential_clause>
```

- Use the ALTER REMOTE SOURCE statement to add an existing remote source to the group:

```
ALTER REMOTE SOURCE <source_name> ADAPTER <adapter_name> AT LOCATION AGENT
GROUP <group_name> <configuration_clause> <credential_clause>
```

#### → Tip

If you're changing only the location for the remote source, you can omit the ADAPTER and CONFIGURATION clauses:

```
ALTER REMOTE SOURCE <source_name> AT LOCATION AGENT GROUP <group_name>
<credential_clause>
```

## Related Information

[CREATE REMOTE SOURCE Statement \[Smart Data Integration\] \[page 638\]](#)

[ALTER REMOTE SOURCE Statement \[Smart Data Integration\] \[page 624\]](#)

## Alter Remote Source Clauses

When you use ALTER REMOTE SOURCE to modify a remote source, you must specify the configuration and credential details as XML strings.

### Example Credential Clause

```
WITH CREDENTIAL TYPE 'PASSWORD' USING '<CredentialEntry name="credential">
  <user><username></user>
  <password><password></password>
</CredentialEntry>'
```

### Example Configuration Clause

```
CONFIGURATION '<?xml version="1.0" encoding="UTF-8"?>
  <ConnectionProperties name="configurations">
    <PropertyGroup name="generic">
      <PropertyEntry name="map_char_types_to_unicode">false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="database">
      <PropertyEntry name="cdb_enabled">false</PropertyEntry>
      <PropertyEntry name="pds_use_tnsnames">false</PropertyEntry>
      <PropertyEntry name="pds_host_name"><db_hostname></PropertyEntry>
      <PropertyEntry name="pds_port_number">1521</PropertyEntry>
      <PropertyEntry name="pds_database_name">ORCL</PropertyEntry>
    </PropertyGroup>
  </ConnectionProperties>
</CONFIGURATION>'
```

```

        <PropertyEntry name="cdb_service_name"></PropertyEntry>
        <PropertyEntry name="pds_service_name"></PropertyEntry>
        <PropertyEntry name="pds_tns_filename"></PropertyEntry>
        <PropertyEntry name="pds_tns_connection"></PropertyEntry>
        <PropertyEntry name="cdb_tns_connection"></PropertyEntry>
        <PropertyEntry name="_pds_tns_connection_with_cdb_enabled"></
PropertyEntry>
        <PropertyEntry name="pds_byte_order"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="schema_alias_replacements">
        <PropertyEntry name="schema_alias"></PropertyEntry>
        <PropertyEntry name="schema_alias_replacement"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="security">
        <PropertyEntry name="pds_use_ssl">false</PropertyEntry>
        <PropertyEntry name="pds_ssl_sc_dn"></PropertyEntry>
        <PropertyEntry name="_enable_ssl_client_auth">false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="jdbc_flags">
        <PropertyEntry name="remarksReporting">false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="cdc">
        <PropertyGroup name="databaseconf">
            <PropertyEntry name="pdb_archive_path"></PropertyEntry>
            <PropertyEntry name="pdb_supplemental_logging_level">table</
PropertyEntry>
        </PropertyGroup>
        <PropertyGroup name="parallelsca">
            <PropertyEntry name="lr_parallel_scan">false</PropertyEntry>
            <PropertyEntry name="lr_parallel_scanner_count"></PropertyEntry>
            <PropertyEntry name="lr_parallel_scan_queue_size"></
PropertyEntry>
            <PropertyEntry name="lr_parallel_scan_range"></PropertyEntry>
        </PropertyGroup>
        <PropertyGroup name="logreader">
            <PropertyEntry name="skip_lr_errors">false</PropertyEntry>
            <PropertyEntry name="lr_max_op_queue_size">1000</PropertyEntry>
            <PropertyEntry name="lr_max_scan_queue_size">1000</PropertyEntry>
            <PropertyEntry name="lr_max_session_cache_size">1000</
PropertyEntry>
            <PropertyEntry name="scan_fetch_size">10</PropertyEntry>
            <PropertyEntry name="pdb_dflt_column_repl">>true</PropertyEntry>
            <PropertyEntry name="pdb_ignore_unsupported_anydata">false</
PropertyEntry>
            <PropertyEntry name="pds_sql_connection_pool_size">15</
PropertyEntry>
            <PropertyEntry name="pds_retry_count">5</PropertyEntry>
            <PropertyEntry name="pds_retry_timeout">10</PropertyEntry>
        </PropertyGroup>
    </PropertyGroup>
</ConnectionProperties>'

```

### Note

You can't change user names while the remote source is suspended.



## 2.5.5 Manage Agents from the Data Provisioning Agent Monitor

Use the agent monitor to perform basic administration tasks such as registering, altering, or dropping Data Provisioning Agents.

### Prerequisites

The user must have the following roles or privileges to manage agents:

Table 28: Roles and Privileges

| Action                         | Role or Privilege   |
|--------------------------------|---|
| Add Data Provisioning Agent    | <ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.monitor.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::CreateAgent</li><li>• System privilege: AGENT ADMIN</li></ul> |
| Alter Data Provisioning Agent  | <ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.monitor.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::AlterAgent</li><li>• System privilege: AGENT ADMIN</li></ul>  |
| Remove Data Provisioning Agent | <ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.monitor.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::DropAgent</li><li>• System privilege: AGENT ADMIN</li></ul>   |

### Context

Use the following controls in the [Agent Monitor](#) table to perform an action.

### Procedure

- Select [Create Agent](#) to register a new agent with the SAP HANA system.
  - a. Specify the name of the agent and relevant connection information.
  - b. If the agent uses a secure SSL connection, select [Enable SSL](#).
  - c. If you want to assign the agent to an existing agent group, select the group under [Agent Group](#).
  - d. Click [Create Agent](#).

The new agent appears in the [Agent Monitor](#) table.

- Select [Alter Agent](#) to make connection configuration changes on an agent already registered in the SAP HANA system.

- a. Specify the new connection information for the agent. You can't change the name or connection protocol for an existing agent.
- b. If the agent uses a secure SSL connection, check *Enable SSL*.
- c. If you want to assign the agent to an existing agent group, select the group under *Agent Group*.
- d. Click *Alter Agent*.

The updated agent information appears in the *Agent Monitor* table.

- Select *Drop Agent* to remove an agent from the SAP HANA system.
  - a. To drop any dependent objects automatically, such as registered adapters, choose *CASCADE option*. You can't remove an agent while it has dependent objects such as registered adapters. Remove the adapters from the agent manually, or check *CASCADE option*.
  - b. Click *Drop Agent*.

The agent is removed from the *Agent Monitor* table. If the agent was assigned to an agent group, it's also removed from the agent group.

## Related Information

[Assign Roles and Privileges \[page 21\]](#)

## 2.5.6 Configure the Agent Management Webservice

The agent management webservice provides basic agent management functions and exposes these functions on the local network via a web-accessible interface.

### Prerequisites

You've installed the Data Provisioning Agent on a supported host system.

### Context

Before you can use the Data Provisioning Agent Management Interface, you must configure and start the webservice on the agent host system.

### Procedure

1. Use the agent configuration tool to configure the authentication type used to access the management interface:

- [Configure Basic Authentication for the Webservice \[page 108\]](#)
  - [Configure LDAP Authentication for the Webservice \[page 108\]](#)
2. **Optional:** Configure the port number for the management interface.
- The default management interface port number is 8050.
- Open the `dpagentwebservice.ini` configuration file in a text editor.
  - Add the `org.eclipse.equinox.http.jetty.https.port` JVM parameter with your desired port number.
- For example, the following parameter changes the port to 8750:

```
-Dorg.eclipse.equinox.http.jetty.https.port=8750
```

- Use the agent configuration tool to start or stop the webservice.
  - Start the agent configuration tool.
  - Choose [Start or Stop Agent](#).
  - Choose [Start Webservice](#) or [Stop Webservice](#) as required.

#### Note

When you choose [Stop Webservice](#), all running instances of the webservice started from the same location are stopped.

## Next Steps

The webservice starts and the management interface can be reached at `https://<agent_hostname>:<port>`.

#### Note

If you haven't imported a CA certificate key pair into the agent keystore, you may receive the following error:

```
This site can't provide a secure connection.
```

Import a CA certificate pair into the keystore, or generate self-signed keys and certificates with the JDK `keytool` command:

- At the command line, navigate to `<DPAgent_root>/ssl`.
- Generate the key pair with `keytool`.

For example:

```
<DPAgent_root>/sapjvm/bin/keytool -keystore cacerts -alias dpagent
-genkey -keyalg RSA -keysize 4096 -sigalg SHA256withRSA -dname
"CN=<agent_hostname>"
```

## Related Information

[Manage Agents Remotely](#)

### 2.5.6.1 Configure Basic Authentication for the Webservice

You can connect to the agent management webservice using credentials stored in the agent's secure storage.

#### Procedure

1. Start the agent configuration tool.
2. Choose *Webservice Authentication*.
3. Specify **basic** for the authentication provider.
4. Specify the user name and password as prompted.

#### Results

The agent configuration tool stores the user name and password, and you can connect to the Data Provisioning Agent management webservice using the stored credentials.

### 2.5.6.2 Configure LDAP Authentication for the Webservice

You can connect to the agent management webservice using Lightweight Directory Access Protocol (LDAP) authentication.

#### Prerequisites

- You've already configured an LDAP-compliant server such as Microsoft Active Directory (AD).
- You can reach the LDAP server from the Data Provisioning Agent host.
- You have an LDAP bind manager that can connect to the LDAP server with privileges to search the login user and group.

## Procedure

1. Start the agent configuration tool.
2. Choose *Webservice Authentication*.
3. Specify **ldap** for the authentication provider.
4. Specify the URI of your LDAP server.
5. Specify the LDAP bind manager and user information as prompted:

| Option                     | Description   |
|----------------------------|---|
| <b>Bind DN</b>             | The user DN of an LDAP manager who can access the LDAP server and search users and groups.  |
| <b>Bind Password</b>       | The password of the LDAP manager for LDAP server binding.                                   |
| <b>User Search Base</b>    | The LDAP search base of the user, such as <code>ou=users,dc=wimpi,dc=net</code> .           |
| <b>User Name Attribute</b> | The name of the attribute for user identity, such as <code>uid</code> for Active Directory. |
| <b>User Class</b>          | The user's LDAP class, such as <code>user</code> for Active Directory.                      |

6. **Optional:** If you want to use group-based authentication, specify the allowed LDAP groups and information as prompted:

| Option                            | Description   |
|-----------------------------------|---|
| <b>Allowed Groups</b>             | A comma-separated list of groups that are allowed to log in to the webservice, such as <code>group1,group2</code> . |
| <b>User Group Name Attribute</b>  | The name of the user attribute for naming the group, such as <code>memberOf</code> for Active Directory.            |
| <b>Group Search Base</b>          | The LDAP search base of the group, such as <code>ou=roles,dc=wimpi,dc=net</code> .                                  |
| <b>Group Name Attribute</b>       | The group attribute for group identity, such as <code>cn</code> for Active Directory.                               |
| <b>Group Class</b>                | The LDAP class of the group, such as <code>group</code> for Active Directory.                                       |
| <b>Group Membership Attribute</b> | The group attribute for user membership, such as <code>member</code> for Active Directory.                          |

### → Tip

If you don't want to use group-based authentication, leave *Allowed Groups* and all group-related properties empty and press  to continue.

## Results

The agent configuration tool stores the LDAP configuration and you can connect to the Data Provisioning Agent management webservice using an authorized LDAP user.

## Next Steps

If you're using LDAP over SSL, you must also import the LDAP server's SSL certificate into the Data Provisioning Agent trust store. Obtain the server certificate from the LDAP administrator or a command-line tool such as `openssl`.

Import the certificate into the Data Provisioning Agent trust store using the Java `keytool` command:

```
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore cacerts -storepass  
<password> -file ldaps.pem -alias IdapsServer -noprompt
```

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

## 2.5.7 Configure Tracing for the SAP HANA JDBC Driver

Use driver tracing to troubleshoot the SAP HANA JDBC driver used by the Data Provisioning Agent.

By default, the SAP HANA JDBC driver used by the agent is located at `<DPAgent_root>/plugins/com.sap.db.jdbc_<version>.jar`.

## Enable Driver Tracing with the Agent Configuration Tool

Configure tracing for the SAP HANA JDBC driver in the *Agent Preferences* menu.

### Procedure

1. Start the agent configuration tool.
2. Choose *Agent Preferences*.
3. Choose *Enable/Disable tracing for HANA JDBC Driver*.

| Option             | Description                                  |
|--------------------|--|
| <code>true</code>  | Enable tracing for the SAP HANA JDBC driver  |
| <code>false</code> | Disable tracing for the SAP HANA JDBC driver |

## Results

Driver and trace configuration details are displayed. By default, the trace file is located at `<DPAgent_root>/jdbctrace.prt`.

### → Tip

For more information about configuring other JDBC driver settings, run the help command displayed in the driver details:

```
java -jar <DPAgent_root>/plugins/com.sap.db.jdbc_<version>.jar -h
```

## Next Steps

### → Remember

After you've finished troubleshooting, be sure to turn JDBC driver tracing off. If you leave tracing on, agent performance can be impacted.

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

## Enable Driver Tracing with a Batch Command

Use the `setHanaJdbcTracing` function of the agent configuration tool to enable or disable JDBC driver tracing.

For example, use the following command to enable tracing for the SAP HANA JDBC driver on Linux:

```
./agentcli.sh --configAgent --function setHanaJdbcTracing true
```

### → Remember

After you've finished troubleshooting, be sure to turn JDBC driver tracing off. If you leave tracing on, agent performance can be impacted.

## 2.5.8 Agent Configuration Parameters

The agent configuration parameters in the `dpagentconfig.ini` file provide advanced options for the Data Provisioning Agent. You can access and modify agent configuration parameters with the agent configuration tool either interactively or with discrete commands.

### Modify Agent Configuration Parameters in Interactive Mode

Use the *Set Agent Preferences* action in the *Agent Preferences* menu in interactive mode.

For example, to set the agent logging level to `ALL`:

1. Start the agent configuration tool.
2. Choose *Agent Preferences*.
3. Choose *Set Agent Preferences*.
4. Select the menu index for logging level, and enter `ALL` when prompted for the new value.

### Modify Agent Configuration Parameters with Discrete Commands

Use the `agentPreferences` function of the agent configuration tool.

For example, the following command sets the agent logging level to `ALL`:

```
--function agentPreferences -Dframework.log.level=ALL
```

Table 29: Agent Configuration Parameters

By default, the agent is configured to start in TCP mode and monitor port 5050 for requests from SAP HANA.

#### ⚠ Caution

Modify these parameters **only** if you're instructed to do so; in most cases, default settings suffice. Use these parameters only for debugging or performance tuning. Changes to some of these parameters also require changes to the `dpserver.ini` parameters file on SAP HANA.

#### 📌 Note

Some configuration parameters must be added and configured manually in the `dpagentconfig.ini` file; refer to the *Manual Entry Necessary?* column.



| Parameter Name                            | Description  | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range | Restart Required? | Manual Entry Necessary? |
|---|--|--------------------|------------|---------------|-----------|-------------|-------------------|-------------------------|
| adapter.ase.outetonewadapter              | <p>Set to <i>true</i> to convert an ASEAdapter to an ASELTAdapter.</p> <p>For more information, see <a href="#">Migrating from an ASE Adapter to an ASE LTL Adapter [page 509]</a>.</p>  | Optional           | All        | FALSE         | BOOLEAN   | True, False | Yes, if true      | Yes                     |
| adapter.committed_change_timeout_interval | <p>Specifies the time interval seconds of checking committed change message. If the time interval passes, and server still hasn't sent a committed change message, then all subscriptions for remote source are removed (unmarked) and truncation point is advanced to end of log.</p> <p>This parameter is specific to the Microsoft SQL Server log reader adapter.</p>   | Optional           | All        | 14400         | INTEGER   |             | Yes               | Yes                     |
| adapter.db2.compatibility.version         | <p>Specifies the compatibility version for an IBM DB2 source.</p> <ul style="list-style-type: none"> <li>• <b>MYS</b>: The adapter pushes LIMIT clauses down to the source database unchanged and OFFSET clauses are supported.</li> <li>• <b>NULL</b> (default): The adapter rewrites LIMIT clauses to FETCH FIRST &lt;n&gt; ROWS clauses, and OFFSET clauses aren't supported.</li> </ul> <p>This parameter is specific to the IBM DB2 Log Reader adapter.</p> | Optional           | All        |               | STRING    | MYS         | Yes               | Yes                     |

| Parameter Name                           | Description   | Mandatory/Optional | Deployment        | Default Value | Data Type | Value Range | Restart Required?  | Manual Entry Necessary? |
|--|---|--------------------|-------------------|---------------|-----------|-------------|--|-------------------------|
| adapter.db2ecc.enforceAllowlist          | If <i>true</i> , the remote source configuration must contain an allowlist table as specified in the respective adapter option <i>Allowlist Table in Remote Database</i> .                | Optional           | On-premise agents | FALSE         | BOOLEAN   | True, False | Suspend/resume of remote source needed. Agent restart not required | No                      |
| adapter.db2logreader.enforceAllowlist    |   |                    |                   |               |           |             |  |                         |
| adapter.hana.enforceAllowlist            |   |                    |                   |               |           |             |  |                         |
| adapter.mssqllecc.enforceAllowlist       |   |                    |                   |               |           |             |  |                         |
| adapter.mssqllogreader.enforceAllowlist  |   |                    |                   |               |           |             |  |                         |
| adapter.oracleecc.enforceAllowlist       |   |                    |                   |               |           |             |  |                         |
| adapter.oraclelogreader.enforceAllowlist |   |                    |                   |               |           |             |  |                         |
| adapter.oracle.jdbc.keepConnectionAlive  | Specifies whether to keep database connections open for reuse and performance considerations.<br><br>Set to <b>FALSE</b> to close connections immediately after a remote query completes. | Optional           | All               | TRUE          | BOOLEAN   | True, False | Yes  | Yes                     |
| adapter.mssql.jdbc.connectRetryCount     | Specifies the number of reconnection attempts if there's a connection failure.  | Optional           | All               |               | INTEGER   |             |  | Yes                     |
| adapter.mssql.jdbc.connectRetryInterval  | Specifies the number of seconds between each reconnection attempt.  | Optional           | All               |               | INTEGER   |             |  | Yes                     |

| Parameter Name                | Description   | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range | Restart Required? | Manual Entry Necessary? |
|-------------------------------|---|--------------------|------------|---------------|-----------|-------------|-------------------|-------------------------|
| adapter.time_committed_change | <p>Flag to turn on or off checking committed change message. If a time interval passes, and server still hasn't sent a committed change message, then all subscriptions for remote source are removed (unmarked) and truncation point is advanced to end of log.</p> <p>This parameter is specific to the Microsoft SQL Server log reader adapter.</p>  | Optional           | All        | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| agent.hostname                | Specifies the hostname of the machine where the Agent is running.   | Mandatory          | All        |               | STRING    |             | Yes               | No                      |
| agent.name                    | Specifies the name for this agent when registered with SAP HANA.  | Mandatory          | All        |               | STRING    |             | Yes               | No                      |
| cdi.enableAdminService        | <p>Enables the admin service API for all Cloud Data Integration (CDI) remote sources on this agent.</p> <p>When you enable the admin service, you can view CDI adapter information directly from views in SAP HANA to monitor replication or diagnose and troubleshoot issues. A new CDI_ADMIN_SERVICE namespace appears in the remote source tree.</p> | Optional           | All        | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| cdi.enableDataLog             | Enables data logging for Cloud Data Integration (CDI) remote sources on this agent.   | Optional           | All        | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| cdi.dataLog-SizeMB            | Specifies the maximum file size for an individual data log for the CDI adapter, in MB.  | Optional           | All        | 100           | INTEGER   |             | Yes               | Yes                     |

| Parameter Name                  | Description   | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range                                    | Restart Required? | Manual Entry Necessary? |
|---------------------------------|---|--------------------|------------|---------------|-----------|--|-------------------|-------------------------|
| cdi.dataLog-BackupTotal-SizeMB  | Specifies the total file size limit for backup log zip files for this subscription, in MB. Negative values mean no limit.   | Optional           | All        | 500           | INTEGER   |  | Yes               | Yes                     |
| cdi.dataLog-BackupRetentionDays | Specifies the number of days to retain backup log zip files for this subscription. Negative values mean no limit.   | Optional           | All        | -1            | INTEGER   |  | Yes               | Yes                     |
| cdi.dataLog-ConfigFile          | Specifies the name of the CDI data log configuration file. The configuration file must be located in <code>&lt;DPAgent_root&gt;/lgo</code> .<br><br>Add CDI remote objects such as remote tables or remote subscription IDs to the configuration file to enable logging. Specify one remote object per line.<br><br>For more information, see <a href="#">Configuring Cloud Data Integration Data Logs [page 221]</a> . | Optional           | All        | cdi-data.txt  | STRING    |  | Yes               | Yes                     |
| cdi.enableDataLog.row           | Specifies whether to log row data in the CDI data log.  | Optional           | All        | TRUE          | BOOLEAN   | True, False                                    | Yes               | Yes                     |
| cdi.enableDataLog.header        | Specifies whether to log the row column names in the CDI data log.  | Optional           | All        | TRUE          | BOOLEAN   | True, False                                    | Yes               | Yes                     |
| cdi.enableDataLog.command       | Specifies whether to log OData request information in the CDI data log.   | Optional           | All        | TRUE          | BOOLEAN   | True, False                                    | Yes               | Yes                     |
| cloud.default-MaxPerRoute       | Specifies the maximum number of connections that the internal HTTP client can create per route.   | Optional           | Neo        | 20            | INTEGER   | 0–214747483647                                 | Yes               | No                      |
| cloud.max-PostBodySize          | Specifies the maximum body size to be used for HTTP Post messages.  | Optional           | Neo        | 0             | File size | A valid size such as 1024B, 4KB, 10MB, or 99GB | Yes               | No                      |

| Parameter Name                 | Description  | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range        | Restart Required? | Manual Entry Necessary? |
|--------------------------------|--|--------------------|------------|---------------|-----------|--------------------|-------------------|-------------------------|
| cloud.maxTotal                 | Specifies the maximum total number of connections that the internal HTTP client can create.  | Optional           | Neo        | 20            | INTEGER   | 0–2147474836<br>47 | Yes               | No                      |
| cloud.retry.forceMessageResend | In cases where the SAP HANA server doesn't support receiving duplicate messages, the Data Provisioning agent doesn't try to resend messages by default. This parameter enables a forced resend of the messages, even if the version of SAP HANA doesn't support it. You can resend messages only when CDC data doesn't contain LOBs.   | Optional           | Neo        | FALSE         | BOOLEAN   | True, False        | Yes               | No                      |
| cloud.retry.maxTries           | Specifies the maximum number of tries to send a message to SAP HANA.   | Optional           | Neo        | 5             | INTEGER   | 0–2147474836<br>47 | Yes               | No                      |
| cloud.retry.maxWaitTime        | When agent communication with the server is broken, the agent tries to re-establish a connection at incremental wait times, starting from cloud.retry.waitTime and incrementing this wait time by 30 seconds for each subsequent attempt. Once cloud.retry.maxWaitTime is reached, the wait time starts again from cloud.retry.maxWaitTime, with 30-second increments and so on. | Optional           | Neo        | 60            | INTEGER   | 0–2147474836<br>47 | Yes               | No                      |
| cloud.retry.waitTime           | Specifies the time to wait between trying to resend a message to SAP HANA. After each failed attempt, the agent waits this amount of time before retrying to send the same message. Specify the time in SECONDS.   | Optional           | Neo        | 30            | INTEGER   | 0–2147474836<br>47 | Yes               | No                      |

| Parameter Name             | Description  | Mandatory/Optional | Deployment | Default Value | Data Type  | Value Range  | Restart Required? | Manual Entry Necessary? |
|----------------------------|--|--------------------|------------|---------------|------------|--|-------------------|-------------------------|
| cloud.ssl.cipherList       | Specifies a comma-separated list of cipher suites to use for customization. If blank, the default SSLConnectionSocketFactory is used.  | Optional           | Neo        |               | STRING     |  | Yes               | Yes                     |
| cloud.ssl.enableTrace      | Specifies whether to enable tracing when using a custom SSL socket factory.  | Optional           | Neo        | FALSE         | BOOLEAN    | True, False  | Yes               | Yes                     |
| cloud.ssl.protocolList     | Specifies a comma-separated list of protocols to use for customization, such as <b>TLS</b> , <b>TLSv1</b> , <b>TLSv1.1</b> , <b>TLSv1.2</b> . If blank, TLSv1.2 is used by default.  | Optional           | Neo        |               | STRING     |  | Yes               | Yes                     |
| cloud.useProxy             | Specifies whether you use a proxy server when connecting to SAP HANA.  | Optional           | Neo        | FALSE         | BOOLEAN    | True, False  | Yes               | No                      |
| cloud.useXSA               | <p>When connecting to SAP HANA using the Data Provisioning proxy application, use this parameter to specify whether you're using XSA or XSC.</p> <p>This parameter is applicable for the SAP HANA service for SAP BTP or when SAP HANA is deployed in the Cloud Foundry environment only and not when using JDBC WebSockets.</p> | Optional           | Neo        | FALSE         | BOOLEAN    | True, False  | Yes               | No                      |
| cloud.xsa.tokenRefreshTime | Specifies the interval at which the agent refreshes the XSA token.   | Optional           | Neo        | 4h            | Time value | A valid time value, such as 100ms, 10s, 30m, 4h, or 3d | Yes               | No                      |
| cloud.xsa.useJwtToken      | Specifies whether to use a JWT token when the agent connects to SAP HANA via XSA.  | Optional           | Neo        | FALSE         | BOOLEAN    | True, False  | Yes               | No                      |
| dslite.sqla.port           | SQLAnywhere port used by the agent's DSLite instance.  | Optional           | All        | 26381         | INTEGER    |  | Yes               | No                      |

| Parameter Name                              | Description   | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range | Restart Required? | Manual Entry Necessary? |
|---|---|--------------------|------------|---------------|-----------|-------------|-------------------|-------------------------|
| fileadapter.outputqueue.timeout             | Specifies the polling timeout, in seconds, for the File adapter's output queue (to send to the server).   | Optional           | All        | 1             | INTEGER   |             | Yes               | Yes                     |
| fileadapter.rowparsernum                    | Specifies the number of row parsers used by the File adapter.   | Optional           | All        | 2             | INTEGER   |             | Yes               | Yes                     |
| force.update.the.credential.in.secure.store | Specifies whether to automatically update the credentials stored in the agent secure storage when the credentials for a remote source are updated. <ul style="list-style-type: none"> <li><i>False</i>: Credentials aren't updated automatically.</li> <li><i>True</i>: Credentials are updated automatically in the secure storage.</li> </ul> | Optional           | All        | False         | BOOLEAN   | True, False | Yes               | Yes                     |

### Note

The Data Assurance adapter needs the credentials for each associated remote source to be stored in the agent secure storage.

By default, you must manually change or add credentials in the secure storage with the agent command-line tools and then restart the agent.

For more information about storing credentials, see [Store Remote Data Source Credentials Securely \[page 68\]](#).

| Parameter Name                     | Description   | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range                                     | Restart Required? | Manual Entry Necessary? |
|------------------------------------|---|--------------------|------------|---------------|-----------|---|-------------------|-------------------------|
| framework.admin-port               | Specifies the local port used for internal communication between the agent and the agent configuration tool. Don't open this admin port in your firewall; block the port from outside access to prevent unauthorized changes on the agent.                                    | Mandatory          | All        | 5051          | INTEGER   | 1–65535   | Yes               | No                      |
| framework.agent-Poll.multi-Message | Specifies whether the agent should receive multiple messages (instead of just the next message) from the server for each polling request (get message) the agent makes to the server.   | Optional           | All        | True          | BOOLEAN   | True, False                                     | Yes               | No                      |
| framework.async.fetchSize          | Specifies the stream fetch size; that is, how many rows to send to the server in each packet. If set to 0, it's the same as what is fetched from the source, which is indicated by framework.fetchSize. This parameter applies to streaming queries.                          | Optional           | All        | 0             | INTEGER   | 0–2147483647                                    | Yes               | No                      |
| framework.async.infoFrequency      | As data or rows stream, specifies when to print information to the log file to indicate it processed <x> number of rows; for example, print after every 100,000 rows.   | Optional           | All        | 10000<br>0    | INTEGER   | 0–2147483647                                    | Yes               | No                      |
| framework.async.limiterSize        | Specifies the limit on the throughput going to dpserver. When it hits the upper limit, the agent will wait until the server says it's ready for the next message. The default value of zero means that there's no upper limit; that is, all messages queued up on the server. | Optional           | All        | 5GB           | FILE SIZE | A valid size, such as 1024B, 4KB, 10MB, or 99GB | Yes               | No                      |



| Parameter Name                               | Description  | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range  | Restart Required? | Manual Entry Necessary? |
|--|--|--------------------|------------|---------------|-----------|--|-------------------|-------------------------|
| framework.async.pollingTimeout               | Specifies the internal timeout for polling (reading from serializer queue or response queue). The time unit is specified by framework.async.timeUnit.  | Optional           | All        | 600           | INTEGER   | 0–2147483647   | Yes               | No                      |
| framework.async.puttingTimeout               | Specifies the internal timeout for putting (writing to serializer queue or response queue). The time unit is specified by framework.async.timeUnit.  | Optional           | All        | 600           | INTEGER   | 0–2147483647   | Yes               | No                      |
| framework.async.timeunit                     | Specifies the async polling and putting timeout unit   | Optional           | All        | SECONDS       | TIME UNIT | DAYS, HOURS, MICROSECONDS, MILLISECONDS, MINUTES, NANOSECONDS, SECONDS | Yes               | No                      |
| framework.cdcAdapterInstanceCloseWaitMinutes | Specifies the time to wait in minutes for the adapter CDC instance to close before throwing an obsolete adapter instance error/warning. Use if specifying a wait time longer than the default wait time. This property doesn't close the instance just waits for a longer time before an error or warning is sent to the server. | Optional           | All        | 10            | INTEGER   |  | Yes               | Yes                     |
| framework.compressData                       | Specifies when to use compression for data. <ul style="list-style-type: none"> <li>0: Never</li> <li>1: Always</li> <li>2: Cloud</li> <li>3: TCP</li> </ul>  | Optional           | All        | 0             | INTEGER   | 0, 1, 2, 3   | Yes               | No                      |
| framework.compressThreshold                  | Specifies the minimum size (in bytes) of the body for which the agent framework decides to compress data.  | Optional           | All        | 32            | INTEGER   | 0–2147483647   | Yes               | No                      |

| Parameter Name                            | Description   | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range                                     | Restart Required? | Manual Entry Necessary? |
|---|---|--------------------|------------|---------------|-----------|---|-------------------|-------------------------|
| framework.data-Flow.maxFile-Count         | For debugging CDC communication, this parameter specifies the maximum number of files to use to trace the rowsets and data. This setting is per remote source (not total).                                | Optional           | All        | 10            | INTEGER   | 0–2147483647                                    | Yes               | No                      |
| framework.data-Flow.maxFile-Size          | For debugging CDC communication, this parameter specifies the maximum size for each data flow trace file. This setting is per remote source (not total).  | Optional           | All        | 100MB         | FILE SIZE | A valid size, such as 1024B, 4KB, 10MB, or 99GB | Yes               | No                      |
| framework.disable-CapCaseExpInAdapters    | Specifies the list of adapters for which to disable push-down of the CASE expression. Specify the adapters as a comma-separated list, such as <b>OracleLogReaderAdapter,MssqlLogReaderAdapter</b> .       | Optional           | All        |               | STRING    | Comma-separated list of adapters                | Yes               | Yes                     |
| framework.disable-CapToDecimalInAdapters  | Specifies the list of adapters for which to disable push-down of the TO_DECIMAL() function. Specify the adapters as a comma-separated list, such as <b>OracleLogReaderAdapter,MssqlLogReaderAdapter</b> . | Optional           | All        |               | STRING    | Comma-separated list of adapters                | Yes               | Yes                     |
| framework.disable-CapToNvarcharInAdapters | Specifies the list of adapters for which to disable push-down of the TO_VARCHAR() function. Specify the adapters as a comma-separated list, such as <b>OracleLogReaderAdapter,MssqlLogReaderAdapter</b> . | Optional           | All        |               | STRING    | Comma-separated list of adapters                | Yes               | Yes                     |
| framework.enableSSL                       | Specifies whether the agent is SSL enabled. In the TCP case, the agent requires the SAP HANA server to send secure messages via SSL.  | Optional           | All        | FALSE         | BOOLEAN   | True, False                                     | Yes               | No                      |

| Parameter Name               | Description  | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range                                      | Restart Required?       | Manual Entry Necessary? |
|------------------------------|--|--------------------|------------|---------------|-----------|--|-------------------------|-------------------------|
| framework.fetch-Size         | Specifies the maximum number of rows to fetch from an adapter. This parameter applies to all adapters as well as for browse nodes.   | Optional           | All        | 10000         | BIGINT    | 0–Long.MAX_VALUE                                 | Yes                     | No                      |
| framework.key-store.path     | Specifies the path to the agent keystore file. This must be a valid file path, such as <code>&lt;DPAgent_root&gt;/ssl/cacerts</code> .   | Mandatory          | All        | ssl/cacerts   | File path |  | Yes                     | Yes                     |
| framework.listener-Port      | Specifies the port where the agent listens for requests from the SAP HANA server. For security, enable the framework listener port for SSL.  | Mandatory          | All        | 5050          | INTEGER   | 1–65535  | Yes                     | No                      |
| framework.log.compress       | Specifies the log management strategy to use when the maximum number of agent framework log files is reached. <ul style="list-style-type: none"> <li><b>TRUE:</b> Older log files are compressed in zip files and retained for the period defined by the <code>framework.log.zip.duration</code> and <code>framework.log.zip.duration.unit</code> parameters.</li> <li><b>FALSE:</b> Older log files are deleted.</li> </ul> | Optional           | All        | TRUE          | BOOLEAN   | True, False                                      | Yes                     | No                      |
| framework.log.dir            | Specifies the location of the agent (and other related) log files.   | Mandatory          | All        |               | File path |  | Yes                     | Yes                     |
| framework.log.level          | Specifies the log level for the agent framework.   | Mandatory          | All        | INFO          | STRING    | ALL, TRACE, DEBUG, INFO, WARN, ERROR, FATAL, OFF | No (if using agent-cli) | No                      |
| framework.log.maxBackupIndex | Specifies the number of agent framework log files to retain.   | Mandatory          | All        | 10            | INTEGER   | 0–2147483647                                     | No (if using agent-cli) | No                      |

| Parameter Name                  | Description   | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range                                    | Restart Required?       | Manual Entry Necessary? |
|---------------------------------|---|--------------------|------------|---------------|-----------|--|-------------------------|-------------------------|
| framework.log.maxFileSize       | Specifies the maximum file size in MB or KB that the agent framework log file can use.  | Mandatory          | All        | 10MB          | FILE SIZE | A valid size such as 4KB or 10MB               | No (if using agent-cli) | No                      |
| framework.log.zip.duration      | Specifies the number of days, hours, minutes, or seconds to retain zipped agent framework log files.<br><br>Zipped log files that exceed this limit are deleted.  | Optional           | All        | 3             | INTEGER   | 1–2147483647                                   | Yes                     | No                      |
| framework.log.zip.duration.unit | Specifies the unit of the value defined in <code>framework.log.zip.duration</code> .  | Optional           | All        | DAYS          | TIME UNIT | DAYS, HOURS, MINUTES, SECONDS                  | Yes                     | No                      |
| framework.maxDataSize           | Specifies the maximum amount of data (actual number of rows) to fetch from an adapter.<br><br>To determine the actual number of rows to fetch, the following properties are considered: <ul style="list-style-type: none"> <li>fetchSize</li> <li>min.fetchSize</li> <li>maxDataSize</li> </ul> The actual number of rows requested is computed with the following formula, where MAX_ROW_SIZE is the maximum possible size of a row based on table schema: <pre>MAX( framework.min.fetchSize, MIN( framework.maxDataSize / &lt;MAX_ROW_SIZE&gt;, framework.fetchSize ) )</pre> | Optional           | All        | 10MB          | FILE SIZE | A valid size such as 1024B, 4KB, 10MB, or 99GB | Yes                     | No                      |
| framework.maxAsciiInlineLOBSize | Specifies the threshold for the maximum inline LOB size for ASCII or binary data.   | Optional           | All        | 64KB          | FILE SIZE | 64KB–250MB                                     | Yes                     | No                      |

| Parameter Name                      | Description   | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range      | Restart Required? | Manual Entry Necessary? |
|-------------------------------------|---|--------------------|------------|---------------|-----------|------------------|-------------------|-------------------------|
| frame-work.maxNonAsciiInlineLobSize | Specifies the threshold for the maximum inline LOB size for non-ASCII data, such as UTF-8 or UTF-16 data.   | Optional           | All        | 43KB          | FILE SIZE | 43KB–250MB       | Yes               | No                      |
| frame-work.min.fetchSize            | Specifies the minimum number of rows to fetch from an adapter.  | Optional           | All        | 10            | INTEGER   | 0–2147483647     | Yes               | No                      |
| frame-work.ping.directReply         | If set to True, this parameter specifies that the agent replies to ping messages immediately, rather than ping request being put into the request queue.  | Optional           | All        | TRUE          | BOOLEAN   | True, False      | Yes               | Yes                     |
| frame-work.polling.Timeout          | Specifies the length of time to perform a blocking wait on a queue; that is, the amount of time to wait for confirmation from the server (CDC response queue), for reading messages from the request queue, and so on.<br><br>If there's no response from the server within a set time (say, 600 seconds), then the agent sends an error to SAP HANA and the adapter shuts itself down. SAP HANA then retries the replication by restarting all the subscriptions for that remote source. | Optional           | All        | 600 (seconds) | BIGINT    | 0–Long.MAX_VALUE | Yes               | No                      |
| frame-work.putting.Timeout          | Specifies the amount of time to wait for putting messages into the queues (request queue). For example, if the queue is blocked for more than 10 minutes (600 seconds), it results in an error.   | Optional           | All        | 600 (seconds) | BIGINT    | 0–Long.MAX_VALUE | Yes               | No                      |

| Parameter Name                    | Description  | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range  | Restart Required? | Manual Entry Necessary? |
|-----------------------------------|--|--------------------|------------|---------------|-----------|--|-------------------|-------------------------|
| framework.readOnlyAdapters        | Specifies the list of adapters to operate in read-only mode. When this parameter is populated with an adapter name, the Data Provisioning Agent allows performing only SELECT on these adapters. Write-back queries return an error. Change data capture for a source is also supported. | Optional           | All        |               | STRING    | Adapter name   | Yes               | No                      |
| framework.response.pollingTimeout | Specifies how long to wait when polling on a blocking queue. The response handler only does polling for messages to be sent across to the server. Polling doesn't throw errors if there's no data to be processed.   | Optional           | All        | 600 (seconds) | BIGINT    | 0–Long.MAX_VALUE   | Yes               | No                      |
| framework.response.threadCount    | Specifies the number of threads for handling all response queues (across all adapters). For TCP, this value never needs to be larger than the number of TCP connections defined in dpserver.   | Optional           | All        | 10            | INTEGER   | 0–2147483647   | Yes               | No                      |
| framework.response.timeUnit       | Specifies the response handler timeout unit.   | Optional           | All        | SECONDS       | Time unit | DAYS, HOURS, MICROSECONDS, MILLISECONDS, MINUTES, NANOSECONDS, SECONDS | Yes               | No                      |
| framework.responsePoolSize        | Specifies the maximum memory used for the response queue. If the limit is reached, then adding messages to response queues is blocked until space is freed.  | Optional           | All        | 2GB           | File size | A valid size, such as 1024B, 4KB, 10M, 10MB, 99GB                      | Yes               | No                      |
| framework.retry.maxTries          | Specifies the maximum number of times the agent tries to connect after a registration or ping failure.   | Optional           | All        | 10            | INTEGER   | 0–2147483647   | Yes               | No                      |

| Parameter Name                       | Description  | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range  | Restart Required? | Manual Entry Necessary? |
|--------------------------------------|--|--------------------|------------|---------------|-----------|--|-------------------|-------------------------|
| frame-work.retry.waitTime            | Specifies the amount of time to wait before retrying (in SECONDS) to start the agent framework service.  | Optional           | All        | 30            | INTEGER   | 0–2147483647   | Yes               | No                      |
| frame-work.serializer.pollingTimeout | Specifies how long to wait when polling on a blocking queue. The serializer does both polling for messages and putting. Polling doesn't throw errors if there's no data to be processed. | Optional           | All        | 600 (seconds) | BIGINT    | 0–Long.MAX_VALUE   | Yes               | No                      |
| frame-work.serializer.puttingTimeout | Specifies how long to wait when trying to put messages into a blocking queue. The serializer does both polling for messages and putting. Putting throws errors if it isn't successful.   | Optional           | All        | 600 (seconds) | BIGINT    | 0–Long.MAX_VALUE   | Yes               | No                      |
| frame-work.serializer.threadCount    | Specifies the number of threads for handling all serializer queues (across all adapters).  | Optional           | All        | 10            | INTEGER   | 0–2147483647   | Yes               | No                      |
| frame-work.serializer.timeUnit       | Specifies the serializer timeout unit.   | Optional           | All        | SECONDS       | Time unit | DAYS, HOURS, MICROSECONDS, MILLISECONDS, MINUTES, NANOSECONDS, SECONDS | Yes               | No                      |
| frame-work.serializerPoolSize        | Specifies the maximum memory used for the serializer queue. If the limit is reached, then adding of messages to the serializer queues is blocked until space is obtained.                | Optional           | All        | 2GB           | FILE SIZE | A valid size, such as 1024B, 4KB, 10MB, or 99GB                        | Yes               | No                      |

| Parameter Name                   | Description  | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range                  | Restart Required? | Manual Entry Necessary? |
|----------------------------------|--|--------------------|------------|---------------|-----------|------------------------------|-------------------|-------------------------|
| frame-work.so.max-OpenConnection | Specifies the maximum open socket connections that the agent supports. This value should be greater than the dpserver INI setting (max-ChannelsPerAgent) for the maximum number of connections to an agent. If not, the server fails to open the connection when it tries.   | Mandatory          | All        | 100           | INTEGER   | 0–2147483647                 | Yes               | No                      |
| frame-work.so.timeout            | Specifies the timeout (in milliseconds) used by the internal HTTP client. It defines the socket timeout (SO_TIMEOUT) in milliseconds, which is the timeout for waiting for data or, put differently, a maximum period of inactivity between two consecutive data packets. A timeout value of zero is interpreted as an infinite timeout. | Mandatory          | All        | 12000<br>0    | BIGINT    | 0–Long.MAX_VALUE             | Yes               | Yes                     |
| frame-work.so.allowed-Servers    | Comma-separated values of fully qualified host names (or IP addresses) that can connect to the agent. All other connections are rejected. This parameter is necessary for customers with port scanners or malware scanners that can interfere with communications between the agent and SAP HANA.  | Optional           | All        |               | STRING    |                              | Yes               | Yes                     |
| frame-work.socket-PoolTimeout    | Specifies how long a response waits for the next available socket connection. This socket connection is used to send data across to the server.  | Mandatory          | All        | 60            | BIGINT    | 0–Long.MAX_VALUE             | Yes               | No                      |
| frame-work.ssl.protocol          | Specifies the protocol.  | Mandatory          | All        | TLSv1.<br>2   | STRING    | TLS, TLSv1, TLSv1.1, TLSv1.2 | Yes               | Yes                     |



| Parameter Name                    | Description   | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range  | Restart Required? | Manual Entry Necessary? |
|-----------------------------------|---|--------------------|------------|---------------|-----------|--|-------------------|-------------------------|
| framework.thread-PoolSize         | Specifies the number of worker threads across the agent framework to process incoming requests. The framework maintains one request queue from which many worker threads read.  | Mandatory          | All        | 10            | INTEGER   | 0–2147483647   | Yes               | No                      |
| framework.timeUnit                | Specifies the time unit used by the polling timeout (framework.pollingTimeout).   | Optional           | All        | SECONDS       | Time unit | DAYS, HOURS, MICROSECONDS, MILLISECONDS, MINUTES, NANoseconds, SECONDS | Yes               | No                      |
| framework.trace.data              | Specifies whether to enable tracing (printing to logs) the content of the data rows sent to the server.   | Optional           | All        | FALSE         | BOOLEAN   | True, False  | Yes               | No                      |
| framework.trace.length            | When tracing is enabled, this parameter specifies the number of characters in a trace message after which the message is truncated.   | Optional           | All        | 1024          | INTEGER   | 0–2147483647   | Yes               | No                      |
| framework.trace.pingMessage       | When tracing is enabled, this parameter specifies printing of the ping messages.  | Optional           | All        | FALSE         | BOOLEAN   | True, False  | Yes               | No                      |
| framework.trace-DPDataFlow        | Enables tracing for CDC rowsets. Related properties are framework.dataFlow.maxFileSize and framework.dataFlow.maxFileCount.   | Optional           | All        | FALSE         | BOOLEAN   | True, False  | Yes               | Yes                     |
| framework.useCDCMessageSequenceId | Specifies whether to add sequence IDs to the CDC messages. When message retry is enabled, sequence ID helps to detect duplicates. If this parameter is set to FALSE, then it disables retry as well. The force flag, cloud.retry.forceMessageResend can still overwrite this setting. | Optional           | All        | TRUE          | BOOLEAN   | True, False  | Yes               | Yes                     |

| Parameter Name   | Description  | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range                                     | Restart Required? | Manual Entry Necessary? |
|--|--|--------------------|------------|---------------|-----------|---|-------------------|-------------------------|
| framework.useRoundRobin  | Specifies the method used to determine whether a socket is picked for the response to be sent to the server.                 | Optional           | All        | TRUE          | BOOLEAN   | True, False                                     | Yes               | Yes                     |
| framework.useRoundRobin.force  | Forces the use of a round robin method to pick the socket connection to the server.  | Optional           | All        | FALSE         | BOOLEAN   | True, False                                     | Yes               | Yes                     |
| <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>In older versions of SAP HANA where there was no Volume ID to indicate which server the request came from, the round robin method isn't recommended if there are multiple SAP HANA servers running on the same system and are connected to the same agent. Volume ID was added in newer servers to distinguish where the request came from.</p> </div> |  |                    |            |               |           |   |                   |                         |
| framework.writeBackPoolSize  | Specifies the memory used for the write-back mechanism across the agent framework. This parameter is global to all adapters. | Optional           | All        | 2GB           | File size | A valid size, such as 1024B, 4KB, 10MB, or 99GB | Yes               | No                      |
| hana.onCloud   | Specifies whether SAP HANA is running on the cloud.  | Mandatory          | Neo        | FALSE         | BOOLEAN   | True, False                                     | Yes               | Yes                     |
| hana.port  | Specifies the port on the SAP HANA server to which the agent connects.   | Mandatory          | All        | 37115         | INTEGER   | 1–65535   | Yes               | Yes                     |
| hana.server  | Specifies the host name of the SAP HANA server.  | Mandatory          | All        |               | STRING    |   | Yes               | Yes                     |
| hana.useSSL  | Specifies whether SSL is used to connect to the SAP HANA server.   | Mandatory          | All        | TRUE          | BOOLEAN   | True, False                                     | Yes               | Yes                     |

| Parameter Name                           | Description   | Mandatory/Optional | Deployment | Default Value  | Data Type      | Value Range | Restart Required? | Manual Entry Necessary? |
|--|---|--------------------|------------|----------------|----------------|-------------|-------------------|-------------------------|
| hanaadapter.disablecdcdata.remotesources | Specifies a list of remote sources for which the HanaAdapter won't send real-time change data.  | Optional           | All        |                | STRING         |             | Yes               | Yes                     |
| hanaadapter.expose_system_tables         | Specifies whether to expose system tables created by the HanaAdapter in the source database.  | Optional           | All        | FALSE          | BOOLEAN        | True, False | Yes               | Yes                     |
| installDir                               | Specifies the directory where the Data Provisioning agent is installed. The agent enters this internal property during configuration. | Mandatory          | All        |                | Directory path |             | Yes               | Yes                     |
| java.security.krb5.conf                  | Specifies the path to the Kerberos configuration file.  | Mandatory          | All        | krb5/krb5.conf | File path      |             | Yes               | Yes                     |
| javax.net.ssl.keyStore                   | Specifies the path to the adapters keystore.<br><br>The default path is<br><DPAgent_root>/ssl/cacerts.                                | Mandatory          | All        |                | File path      |             | Yes               | Yes                     |
| javax.net.ssl.keyStoreType               | Specifies the adapters keystore type.   | Mandatory          | All        | jks            | ALPHA-NUMERIC  |             | Yes               | Yes                     |
| javax.net.ssl.trustStore                 | Specifies the path to the adapters truststore.<br><br>The default path is<br><DPAgent_root>/ssl/cacerts.                              | Mandatory          | All        |                | File path      |             | Yes               | Yes                     |
| javax.net.ssl.trustStoreType             | Specifies the adapters truststore type.   | Mandatory          | All        | jks            | ALPHA-NUMERIC  |             | Yes               | Yes                     |

| Parameter Name            | Description   | Mandatory/Optional | Deployment                        | Default Value | Data Type | Value Range  | Restart Required? | Manual Entry Necessary? |
|---------------------------|---|--------------------|-----------------------------------|---------------|-----------|--------------|-------------------|-------------------------|
| jdbc.additionalParameters | <p>Specifies additional parameters to pass to the JDBC driver.</p> <p>You can specify any parameters that aren't listed in this table but are supported by the SAP HANA JDBC driver.</p> <p>Specify multiple parameters in <code>jdbc.additionalParameters</code> as a comma-delimited list. For example, the following string defines values for the <b>reconnect</b> and <b>ignoreTopology</b> parameters:</p> <pre>jdbc.additionalParameters=reconnect=TRUE,ignoreTopology=FALSE</pre> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>Don't prepend these additional properties with "jdbc".</p> </div> | Optional           | HANA Cloud, HaaS, on-Premise HANA | Empty         | STRING    |              | Yes               | Yes                     |
| jdbc.communicationTimeout | Aborts communication after the specified timeout. Setting this parameter to 0 disables the timeout.   | Optional           | HANA Cloud, HaaS, on-Premise HANA | 330           | INTEGER   | 0–2147483647 | Yes               | Yes                     |
| jdbc.connections          | Specifies the maximum number of JDBC connections.   | Optional           | HANA Cloud, HaaS, on-Premise HANA | 10            | INTEGER   | 0–2147483647 | Yes               | No                      |
| jdbc.enabled              | Specifies whether to use JDBC for message communication.  | Optional           | HANA Cloud, HaaS, on-Premise HANA | FALSE         | BOOLEAN   | True, False  | Yes               | Yes                     |

| Parameter Name  | Description  | Mandatory/Optional | Deployment                        | Default Value | Data Type | Value Range | Restart Required? | Manual Entry Necessary? |
|---|--|--------------------|-----------------------------------|---------------|-----------|-------------|-------------------|-------------------------|
| jdbc.encrypt  | Enables or disables TLS/SSL encryption.  | Optional           | HANA Cloud, HaaS, on-Premise HANA | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| jdbc.host   | Specifies the JDBC host name.  | Mandatory          | HANA Cloud, HaaS, on-Premise HANA | localhost     | STRING    |             | Yes               | Yes                     |
| jdbc.hostNameInCertificate  | <p>Specifies the host name used to verify the server's identity.</p> <p>This host name is used to verify the identity of the server instead of the host name with which the connection was established.</p> <p>For example, in a single-host system, if a connection is established from a client on the same host as the server, a mismatch would arise between the host named in the certificate (actual host name) and the host used to establish the connection (localhost).</p> | Optional           | HANA Cloud, HaaS, on-Premise HANA | *             | STRING    |             | Yes               | Yes                     |
| <div style="border-left: 2px solid #0070C0; padding-left: 10px; margin-bottom: 10px;"> <p><b>Note</b></p> <p>If you specify * as the host name, this property has no effect. Other wildcards aren't permitted.</p> </div> |  |                    |                                   |               |           |             |                   |                         |
| jdbc.port   | Specifies the JDBC port number.  | Mandatory          | HANA Cloud, HaaS, on-Premise HANA | 30015         | INTEGER   | 1–65535     | Yes               | Yes                     |

| Parameter Name  | Description  | Mandatory/Optional | Deployment                        | Default Value | Data Type | Value Range | Restart Required? | Manual Entry Necessary? |
|---|--|--------------------|-----------------------------------|---------------|-----------|-------------|-------------------|-------------------------|
| jdbc.proxy-Host   | Specifies the JDBC proxy host name.  | Optional           | HANA Cloud, HaaS, on-Premise HANA | proxy         | STRING    |             | Yes               | Yes                     |
| jdbc.proxyHttp  | When using a proxy, this parameter specifies whether it's an HTTP proxy (true) or a SOCKS proxy (false). | Optional           | HANA Cloud, HaaS, on-Premise HANA | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>There's no support for WebSocket (HTTP/HTTPS) connections with a SOCKS proxy. WebSocket connections must either use no proxy or an HTTP proxy. Non-WebSocket (TCP/TLS, via Direct SQL, for example) connections can use no proxy, a SOCKS proxy, or an HTTP proxy.</p> </div> |  |                    |                                   |               |           |             |                   |                         |
| jdbc.proxy-Password   | Specifies the JDBC proxy password.   | Optional           | HANA Cloud, HaaS, on-Premise HANA | Empty         | STRING    |             | Yes               | Yes                     |
| jdbc.proxy-Port   | Specifies the JDBC proxy port number.  | Optional           | HANA Cloud, HaaS, on-Premise HANA | 8080          | INTEGER   |             | Yes               | Yes                     |
| jdbc.proxyUsername  | Specifies the JDBC proxy user name.  | Optional           | HANA Cloud, HaaS, on-Premise HANA | Empty         | STRING    |             | Yes               | Yes                     |

| Parameter Name        | Description   | Mandatory/Optional | Deployment                        | Default Value | Data Type | Value Range  | Restart Required? | Manual Entry Necessary? |
|-----------------------|---|--------------------|-----------------------------------|---------------|-----------|--|-------------------|-------------------------|
| jdbc.reconnectRetries | Specifies the maximum number of connect retries.  | Optional           | HANA Cloud, HaaS, on-Premise HANA | 10            | INTEGER   | 0–2147483647   | Yes               | No                      |
| jdbc.reconnectTime    | Specifies the amount of time to wait before JDBC attempts a new registration.                             | Optional           | HANA Cloud, HaaS, on-Premise HANA | 30            | INTEGER   | 0–2147483647   | Yes               | No                      |
| jdbc.retryMax         | Specifies the maximum number of send retries.   | Optional           | HANA Cloud, HaaS, on-Premise HANA | 10            | INTEGER   | 0–2147483647   | Yes               | No                      |
| jdbc.retryTime        | Specifies the amount of time to wait before resending the message.  | Optional           | HANA Cloud, HaaS, on-Premise HANA | 5             | INTEGER   | 0–2147483647   | Yes               | No                      |
| jdbc.sniHostName      | Specifies the name of the host that is attempting to connect at the start of the TLS handshaking process. | Optional           | HANA Cloud, HaaS, on-Premise HANA | Empty         | STRING    |  | Yes               | Yes                     |
| jdbc.timeout          | Specifies the amount of time to wait for an available JDBC connection.                                    | Optional           | HANA Cloud, HaaS, on-Premise HANA | 60            | INTEGER   | 0–2147483647   | Yes               | No                      |
| jdbc.timeUnit         | Specifies the JDBC time unit.   | Optional           | HANA Cloud, HaaS, on-Premise HANA | SECONDS       | STRING    | DAYS, HOURS, MINUTES, SECONDS, MILLISECONDS, MICROSECONDS, NANOSECONDS | Yes               | No                      |

| Parameter Name             | Description  | Mandatory/Optional | Deployment                        | Default Value | Data Type | Value Range | Restart Required? | Manual Entry Necessary? |
|----------------------------|--|--------------------|-----------------------------------|---------------|-----------|-------------|-------------------|-------------------------|
| jdbc.useProxy              | Specifies whether to use proxy properties for the JDBC connection.   | Optional           | HANA Cloud, HaaS, on-Premise HANA | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| jdbc.useProxyAuth          | Specifies whether to use proxy authentication. If true, you must provide a proxy username and password.  | Optional           | HANA Cloud, HaaS, on-Premise HANA | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| jdbc.useWebSocketURL       | Specifies whether to use WebSocket properties for the JDBC connection.   | Optional           | HANA Cloud, HaaS, on-Premise HANA | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| jdbc.validateCertificate   | If set to true, specifies that the server's certificate is validated.  | Optional           | HANA Cloud, HaaS, on-Premise HANA | TRUE          | BOOLEAN   | True, False | Yes               | Yes                     |
| jdbc.webSocketURL          | Specifies the JDBC WebSocket URL, such as <code>/service/&lt;service_instance_id&gt;</code> .  | Optional           | HANA Cloud, HaaS, on-Premise HANA |               | STRING    |             | Yes               | Yes                     |
| log-reader.db2.autoCleanup | Specifies whether to automatically clean up the remote source instance directory and RASD tables. If disabled, cleanup must be done manually.<br><br>This parameter is specific to the IBM DB2 log reader adapter. | Optional           | All                               | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |



| Parameter Name                    | Description  | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range | Restart Required? | Manual Entry Necessary? |
|-----------------------------------|--|--------------------|------------|---------------|-----------|-------------|-------------------|-------------------------|
| log-reader.mssql-autoCleanup      | <p>Specifies whether to automatically clean up the remote source instance directory and RASD tables. If disabled, cleanup must be done manually.</p> <p>This parameter is specific to the Microsoft SQL Server log reader adapter.</p>   | Optional           | All        | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| log-reader.mssql-rasd.fetch-Size  | <p>Specifies the fetch size for initializing/loading RepAgent RASD tables. (RepAgent). For busy source databases, sometimes it takes too long to queue the subscribed table or resume the log reader adapters.</p> <p>This parameter is specific to the Microsoft SQL Server log reader adapter.</p>   | Optional           | All        |               | INTEGER   |             | Yes               | Yes                     |
| log-reader.oracle.auto-Cleanup    | <p>Specifies whether to automatically clean up the remote source instance directory (that is configured to connect to an Oracle source) and RASD tables. If disabled, cleanup must be done manually.</p> <p>This parameter is specific to the Oracle log reader adapter.</p>   | Optional           | All        | FALSE         | BOOLEAN   | True, False | Yes               | Yes                     |
| log-reader.oracle.rasd.fetch-Size | <p>Specifies the fetch size for RASD (RepAgent). For busy source databases, sometimes it takes too long to queue the subscribed table or resume the log reader adapters. This parameter is used to configure fetch size for initializing/loading RepAgent RASD tables.</p> <p>This parameter is specific to the Oracle log reader adapter.</p> | Optional           | All        | 10            | INTEGER   |             | Yes               | Yes                     |

| Parameter Name               | Description   | Mandatory/Optional | Deployment | Default Value | Data Type     | Value Range                                      | Restart Required?     | Manual Entry Necessary? |
|------------------------------|---|--------------------|------------|---------------|---------------|--|-----------------------|-------------------------|
| nonProxyHosts                | Specifies that the hosts that should be accessed without going through the proxy. Typically, this defines internal hosts. The value of this property is a list of hosts, separated by the ' ' character. This is the same as the Java system property http.nonProxyHosts. | Optional           | Neo        |               | STRING        |  | Yes                   | No                      |
| oraclelog-reader.charset     | Specifies the character set for the adapter instance.<br><br>This parameter is specific to the Oracle log reader adapter.   | Optional           | All        |               | STRING        |  | Yes                   | Yes                     |
| proxyHost                    | Specifies the hostname of the proxy being used.   | Optional           | Neo        |               | STRING        |  | Yes                   | No                      |
| proxyPort                    | Specifies the port used by the proxy.   | Optional           | Neo        |               | INTEGER       | 1–65535  | Yes                   | No                      |
| proxyType                    | Specifies the type of proxy being used.   | Optional           | Neo        | http          | ALPHA-NUMERIC | http   | Yes                   | No                      |
| service.agent.disableRestart | Disables auto restart of the agent in cases where the agent doesn't respond.  | Mandatory          | All        | FALSE         | BOOLEAN       | True, False                                      | Yes (service restart) | Yes                     |
| service.log.level            | Specifies the log level for the dpagent servicedaemon.log service daemon log file.  | Mandatory          | All        | INFO          | STRING        | ALL, TRACE, DEBUG, INFO, WARN, ERROR, FATAL, OFF | Yes (service restart) | Yes                     |
| service.log.maxBackupIndex   | Specifies the number of service daemon log files to retain.   | Mandatory          | All        | 10            | INTEGER       | 0–2147483647                                     | Yes (service restart) | Yes                     |
| service.log.maxFileSize      | Specifies the maximum file size in MB or KB that the service daemon log file can use.   | Mandatory          | All        | 10MB          | File size     | A valid size such as 1024B, 4KB, 10M, 10MB, 99GB | Yes (service restart) | Yes                     |

| Parameter Name                           | Description   | Mandatory/Optional | Deployment | Default Value | Data Type | Value Range  | Restart Required?     | Manual Entry Necessary? |
|--|---|--------------------|------------|---------------|-----------|--------------|-----------------------|-------------------------|
| service.retry.maxRetries                 | Specifies the maximum number of ping retries before the service daemon attempts to restart the unresponsive agent. For example, if service.retry.maxRetries is 10 and service.retry.waitTime is 30, then the total wait time is 300 seconds.  | Mandatory          | All        | 10            | INTEGER   | 0–2147483647 | Yes (service restart) | Yes                     |
| service.retry.waitTime                   | Specifies the time to wait (in seconds) between each ping to the agent (polling interval for ping).   | Mandatory          | All        | 30            | INTEGER   | 0–2147483647 | Yes (service restart) | Yes                     |
| service.start.waitTime                   | Specifies the time to wait (in seconds) before starting to ping the agent after the agent was started.  | Mandatory          | All        | 90            | INTEGER   | 0–2147483647 | Yes (service restart) | Yes                     |
| service.stop.killWaitTime                | Specifies the time to wait (in seconds) for the agent to shut down gracefully after stopping the agent. After the wait time, if the agent is still running, it will be forcibly terminated.   | Mandatory          | All        | 610           | INTEGER   | 0–2147483647 | Yes (service restart) | Yes                     |
| trigger.mssql.extended.statistics.enable | Enables Microsoft SQL Server trigger-based adapter's extend statistics, such as query time for getting max scan number in queue, or time taken to query the latest scanned transaction timestamp in trigger queue. This parameter defaults to true, if it doesn't exist in the <code>dagentconfig.ini</code> file. Set the logging level for the framework to at least DEBUG or ALL to see these trace entries.<br><br>This parameter is specific to the Microsoft SQL Server log reader adapter. | Optional           | All        | TRUE          | BOOLEAN   | True, False  | Yes                   | Yes                     |

## 2.5.9 Agent Runtime Options

Use the agent configuration tool to manage advanced runtime options stored in the `dpagent.ini` configuration file safely. Agent runtime options are typically used when troubleshooting an agent issue or optimizing agent performance.

### Modify Agent Runtime Options in Interactive Mode

Start the agent configuration tool with the `--configAgentIniFile` parameter and select the option that you want to modify.

The configuration tool prompts you for any information required for the runtime option that you're modifying.

### Modify Agent Runtime Options with Discrete Commands

Use the `--configAgentIniFile` parameter and specify the function for the agent runtime option that you want to modify, as well as any additional parameters required by the function.

For example, the following command changes the maximum amount of memory available to the agent to 16 GB on Windows:

```
agentcli.bat --configAgentIniFile --function setDPAgentMemory  
-Ddpagent.vm.xmx=16g
```

## Supported Runtime Options

Table 30: Agent Runtime Options

| Option and Function               | Description and Parameters  |
|-----------------------------------|---|
| Clear DPAgent Cache on Next Start | When enabled, the next time the agent is restarted, any cached agent, OSGi, and Eclipse runtime data is removed and the caches are reinitialized. |

**⚠ Caution**  
Enable this option **only** if instructed to do so by SAP Support.

| Option and Function  | Description and Parameters   |
|--|--|
| Switch Java Virtual Machine<br><code>changeDefaultJVM</code>           | <p>Updates the version of the SAP JVM used by an installed agent, or replaces the SAP JVM with a custom Java Runtime Environment.</p> <p>The SAP JVM is bundled with the Data Provisioning Agent and used as the default Java Runtime Environment.</p> <pre>-Ddpagent.vm.directory=&lt;jvm_path&gt;</pre>  |
| Switch DPAgent Log Directory<br><code>changeLogDirectory</code>        | <p>Modifies the location of the root directory where all agent-related log files are generated.</p> <p>The default root log path is <code>&lt;DPAgent_root&gt;/log</code>.</p> <pre>-Ddpagent.log.directory=&lt;log_root_path&gt;</pre>  |
| Change DPAgent Max Available Memory<br><code>setDPAgentMemory</code>   | <p>Modify the maximum amount of memory that the agent can use.</p> <pre>-Ddpagent.vm.vmx=&lt;amount&gt;</pre> <p>For example, for 16 GB, specify <b>16g</b>.</p>   |
| Enable Remote Debugging<br><code>enableRemoteDebugging</code>          | <p>Assists SAP Support in troubleshooting agent-related issues.</p> <pre>-Ddpagent.remoteDebugging.port=&lt;port_number&gt;</pre> <pre>-Ddpagent.remoteDebugging.suspend=&lt;value&gt;</pre> <p>Available values: <b>true</b> or <b>false</b></p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>⚠ Caution</b><br/>Enable this option <b>only</b> if instructed to do so by SAP Support.</p> </div> |
| Inject System Property<br><code>injectSystemProperty</code>            | <p>Enables runtime JVM system properties.</p> <pre>-Ddpagent.system.key=&lt;value&gt;</pre> <pre>-Ddpagent.system.value=&lt;value&gt;</pre> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>⚠ Caution</b><br/>Enable this option <b>only</b> if instructed to do so by SAP Support.</p> </div>   |
| Revert dpagent.ini to original state<br><code>setCleanParameter</code> | <p>Removes any changes to the agent runtime options and reverts the <code>dpagent.ini</code> to its original state.</p>  |

## 2.5.10 Replicating an Agent Configuration to Another Host

There are items that you need to consider when moving to a different host from one where your agent is configured.

If you are migrating to a different host, keep the following rules in mind:

- The agent install path must be the same. You cannot migrate to a different path because the path is hardcoded in many places.
- The host operating system should be the same. For example, you cannot migrate a configuration from Linux to Windows.
- If you are migrating an agent that was configured to talk to SAP HANA on cloud, you cannot have both agents running afterwards. SAP HANA does not support communication with two agents using the same configuration.

If the agent is the same version as the one on the old machine, then you can migrate the following objects:

- Folders: `Camel`, `configuration/com.sap.hana.dp.adapterframework`, `LogReader`, `sec`, `secure_storage`, `ssl`, `lib`
- Files: `dpagentconfig.ini`, `dpagent.ini`

If the agents are different versions, then you can migrate the following objects:

- Folders: `sec`, `secure_storage`, `ssl`, `lib`
- Files: `dpagentconfig.ini`

### Note

After the migration, be sure to update the `dpagentconfig.ini` file by editing the `agent.hostname` parameter to match the host the agent is now on.

## 2.6 Register Data Provisioning Adapters

After configuring the Data Provisioning Agent, register adapters.

### Prerequisites

- Install and configure the data provisioning agent.
- If necessary, download and install any necessary JDBC libraries. For information about the proper JDBC library for your source, see the *Product Availability Matrix (PAM)*.

### Procedure

1. Register the adapter.
2. Configure the source system to which the adapter connects.

For information about the remote source configuration steps necessary for each adapter, see “Configure Data Provisioning Adapters”.

## Next Steps

Create a remote source in SAP HANA.

### ⚠ Caution

The OData adapter isn't part of the Data Provisioning Agent installation. The OData adapter is installed with the SAP HANA server and requires configuration that can't be done using the agent configuration tool.

### ⚠ Restriction

When the target table is made with a column store and the option `CS_DATA_TYPENAME` is set to `ST_MEMORY_LOB`, then the in-memory size is limited to less than 1 GB. To prevent this limitation, set the option to `LOB`. This solution applies to all adapters.

**Task overview:** [Configure Smart Data Integration \[page 20\]](#)

**Previous:** [Configure the Data Provisioning Agent \[page 37\]](#)

**Next task:** [Create a Remote Source \[page 147\]](#)

## Related Information

[Register Adapters with SAP HANA \[page 143\]](#)

[Manage Adapters from the Data Provisioning Agent Monitor \[page 145\]](#)

[Configure Data Provisioning Adapters \[page 181\]](#)

[OData \[page 419\]](#)

[Product Availability Matrix \(PAM\)](#) 

## 2.6.1 Register Adapters with SAP HANA

Before you can connect to remote sources using an adapter, you must register the adapter with SAP HANA.

### Prerequisites

The SAP HANA administrator user must have the following roles or privileges:

Table 31: Roles and Privileges

| Action              | Role or Privilege   |
|---------------------|---|
| Register an adapter | System privilege: ADAPTER ADMIN<br>Application privilege: sap.hana.im.dp.admin::Administrator |

**Note**

This application privilege is required only for the SAP HANA service for SAP BTP in the Neo environment.

**Note**

Before you register the adapter with the SAP HANA system, ensure that you've downloaded and installed the correct JDBC libraries. Place the files in the `<DPAgent_root>/lib` folder.

For more information about the supported JDBC libraries, see the *Product Availability Matrix (PAM)*.

## Procedure

1. Start the agent configuration tool and connect to SAP HANA.
2. **Optional:** To deploy a custom adapter, choose *Custom Adapters*.

**Note**

Data provisioning adapters delivered by SAP are automatically deployed on the agent during agent installation.

- a. Choose *Deploy Custom Adapter*.
  - b. Specify the location of the adapter's JAR files.
  - c. Return to the main menu.
3. Choose *Adapter Registration*.
  4. Choose *Register Adapter*.
  5. Specify the name of the adapter to register with SAP HANA.

**Note**

The adapter name must match the name displayed by the *Display Adapters* option.

6. Configure the source system to which the adapter connects, if necessary.

For example, log reader adapters require source configuration to enable real-time replication.

For complete information about source system configuration, see the relevant section for each adapter in "Configure Data Provisioning Adapters".



## Results

The adapter is registered with SAP HANA and can be selected when you create a remote source.

## Next Steps

### Note

For the SAP HANA service for SAP BTP in the Neo environment, you must restart the agent service to complete the adapter registration. If the registration succeeds and the service restart fails, or the registration of all adapters fails, the registration is rolled back.

## Related Information

[Configure Data Provisioning Adapters \[page 181\]](#)

[Start the Agent Configuration Tool \[page 40\]](#)

[SAP ECC Adapter Preferences \[page 512\]](#)

[Product Availability Matrix \(PAM\)](#)

## 2.6.2 Manage Adapters from the Data Provisioning Agent Monitor

Use the Data Provisioning Agent Monitor to perform basic administration tasks, such as adding adapters to or removing adapters from a Data Provisioning Agent instance.

## Prerequisites

The user must have the following roles or privileges to manage adapters:

Table 32: Roles and Privileges

| Action      | Role or Privilege  |
|-------------|--|
| Add adapter | <ul style="list-style-type: none"><li>Role: sap.hana.im.dp.monitor.roles::Operations</li><li>Application privilege: sap.hana.im.dp.monitor::AddLocationToAdapter</li><li>System privilege: ADAPTER ADMIN</li></ul> |

| Action          | Role or Privilege   |
|-----------------|---|
| Remove adapter  | <ul style="list-style-type: none"> <li>Role: sap.hana.im.dp.monitor.roles::Operations</li> <li>Application privilege: sap.hana.im.dp.monitor::RemoveLocationFromAdapter</li> <li>System privilege: ADAPTER ADMIN</li> </ul> |
| Update adapters | <ul style="list-style-type: none"> <li>Role: sap.hana.im.dp.monitor.roles::Operations</li> <li>System privilege: ADAPTER ADMIN</li> </ul>   |

## Context

Use the buttons in the [Agent Monitor](#) and [Agent Adapter Mapping](#) tables to perform an action.

## Procedure

- To add adapters to an agent instance, select the agent and click [Add Adapters](#) in the [Agent Monitor](#) table.
  - Select the desired adapters from the list of adapters deployed on the agent instance.
  - Click [Add Adapters](#).

The selected adapters appear in the [Adapter Agent Mapping](#) table.

- To remove an adapter from an agent instance, select the adapter and click [Remove Location](#) in the [Adapter Agent Mapping](#) table.
  - If the adapter is registered on only one agent instance, you can remove it with [CASCADE option](#).
  - Click [Remove Location](#).

The adapter is removed from the [Adapter Agent Mapping](#) table.

- To update all adapters for an agent, select the agent and click [Update Adapters](#) in the [Agent Monitor](#). All adapters registered for the selected agent are refreshed, and any new capabilities can be used by SAP HANA.
- To update a single adapter, select the adapter and click [Update](#) in the [Adapter Agent Mapping](#) table. The selected adapter is refreshed, and any new capabilities can be used by SAP HANA.

## Related Information

[Assign Roles and Privileges \[page 21\]](#)

## 2.7 Create a Remote Source

Using SAP HANA smart data integration, set up an adapter that can connect to your source database, and then create a remote source to establish the connection.

### Prerequisites

- The user who creates the remote source must have the following roles or privileges:

Table 33: Roles and Privileges

| Action                 | Role or Privilege                      |
|------------------------|--|
| Create a remote source | System privilege: CREATE_REMOTE_SOURCE |

- The Data Provisioning Server must be enabled.
- The Data Provisioning Agent must be installed and configured.
- The adapter must be configured and registered with SAP HANA.

### Context

You can create a remote source in more than one way.

#### [Create a Remote Source in the Web-Based Development Workbench \[page 148\]](#)

In SAP HANA smart data integration, you can create a remote source with the Web-based Development Workbench user interface.

#### [Create a Remote Source Using SQL Syntax \[page 149\]](#)

In SAP HANA smart data integration, you can create a remote source using SQL syntax.

#### [Creating Secondary User Credentials \[page 151\]](#)

You must use different syntax to create secondary user credentials for SAP HANA smart data integration adapters than the syntax for SAP HANA system adapters.

#### [Configure a Grantor for the HDI Container \[page 151\]](#)

Before you can build and run flowgraphs and replication tasks in SAP Web IDE, you must configure the grantor privilege for the HDI container.

**Task overview:** [Configure Smart Data Integration \[page 20\]](#)

**Previous task:** [Register Data Provisioning Adapters \[page 142\]](#)

**Next:** [Set Up Data Provisioning Monitoring \[page 154\]](#)

## Related Information

### 2.7.1 Create a Remote Source in the Web-Based Development Workbench

In SAP HANA smart data integration, you can create a remote source with the Web-based Development Workbench user interface.

#### Prerequisites

The user who creates the remote source must have the following roles or privileges:

Table 34: Roles and Privileges

| Action                 | Role or Privilege  |
|------------------------|--|
| Create a remote source | <ul style="list-style-type: none"><li>System privilege: CREATE_REMOTE_SOURCE</li></ul> |

#### Procedure

1. In the Web-based Development Workbench Catalog editor, expand the *Provisioning* node.
2. Right-click the *Remote Sources* folder and choose *New Remote Source*.
3. Enter the required information including the adapter and Data Provisioning Agent names.

Regarding user credentials, observe the following requirements:

- A remote source created with a secondary user can be used only for querying virtual tables.
  - If the remote source is used for designing a `.hdbreptask` or `.hdbflowgraph` enabled for real time, use **technical user**.
  - If you create a remote subscription using the CREATE\_REMOTE\_SUBSCRIPTION SQL statement, use **technical user**.
4. Select *Save*.

## Related Information

[Configure Data Provisioning Adapters \[page 181\]](#)

[CREATE\\_REMOTE\\_SOURCE Statement \[Smart Data Integration\] \(SAP HANA SQL and System Views Reference\) \[page 638\]](#)

## 2.7.2 Create a Remote Source Using SQL Syntax

In SAP HANA smart data integration, you can create a remote source using SQL syntax.

### Prerequisites

To create a remote source, you must have the following roles or privileges:

Table 35: Roles and Privileges

| Action                 | Role or Privilege  |
|------------------------|--|
| Create a remote source | <ul style="list-style-type: none"><li>System privilege: CREATE_REMOTE_SOURCE</li></ul> |

### Context

To create a remote source using SQL syntax, you must know the connection information for your source. For an existing remote source, the connection information is in an XML string in the CONFIGURATION statement.

Refer to the remote source configuration topic for each adapter in this guide to see sample SQL code. Change the variables to the correct values for your remote source. The example at the end of this topic illustrates a basic CONFIGURATION connection information XML string for a Microsoft SQL Server adapter.

After you create the remote source:

### Example: Basic Microsoft SQL Server Remote Source

```
CREATE REMOTE SOURCE "MySQLServerSource" ADAPTER "MssqlLogReaderAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="data_type_conversion" displayName="Data Type Conversion">
  <PropertyEntry name="map_char_types_to_unicode" displayName="Always Map
Character Types to Unicode">false</PropertyEntry>
  <PropertyEntry name="map_time_to_timestamp" displayName="Map SQL Server Data
Type Time to Timestamp">true</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="database" displayName="Database">
  <PropertyEntry name="pds_server_name" displayName="Host">myserver.sap.corp</
PropertyEntry>
  <PropertyEntry name="pds_port_number" displayName="Port Number">1433</
PropertyEntry>
  <PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc" displayName="CDC Properties">
  <PropertyEntry name="pdb_dcmode" displayName="Database Data Capture
Mode">MSCDC</PropertyEntry>
</PropertyGroup>
```

```
<PropertyGroup name="logreader" displayName="LogReader">
  <PropertyEntry name="skip_lr_errors" displayName="Ignore log record
processing errors">false</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
'WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>'
```

## Next Steps

- If you've recently updated the Data Provisioning Agent, the connection information XML string for your adapter could also have been updated. Refresh the adapter to get the latest connection information.
- To view the connection information for an existing remote source, run the following statement and check the CONNECTION\_INFO column:

```
SELECT * FROM "PUBLIC"."REMOTE_SOURCES"
```

### → Tip

To ensure you can view the entire XML string in the CONNECTION\_INFO column, enable the [Enable zoom of LOB columns](#) setting in your SAP HANA preferences.

- To view all of the configuration parameters for a given adapter type, run the following statement and check the CONFIGURATION column:

```
SELECT * FROM "PUBLIC"."ADAPTERS"
```

This information can be useful if you want to, for example, determine the name for a given parameter in the user interface, shown as *displayName*.

```
<PropertyEntry name="pds_database_name" displayName="Database
Name"><database_name></PropertyEntry>
<PropertyEntry name="pdb_dcmode" displayName="Database Data Capture
Mode">MSCDC</PropertyEntry>
```

## Related Information

[Configure Data Provisioning Adapters \[page 181\]](#)

[Update the Data Provisioning Agent \[page 175\]](#)

[CREATE REMOTE SOURCE Statement \[Smart Data Integration\] \[page 638\]](#)

## 2.7.3 Creating Secondary User Credentials

You must use different syntax to create secondary user credentials for SAP HANA smart data integration adapters than the syntax for SAP HANA system adapters.

The syntax for creating secondary user credentials for SAP HANA smart data integration adapters is as follows:

```
create credential for user <user_name> component 'SAPHANAFEDERATION'  
purpose <remote_source_name> type 'PASSWORD' using  
<CredentialEntry name="credential">  
  <user><user_name></user>  
  <password><password></password>  
</CredentialEntry>
```

## 2.7.4 Configure a Grantor for the HDI Container

Before you can build and run flowgraphs and replication tasks in SAP Web IDE, you must configure the grantor privilege for the HDI container.

### Prerequisites

To configure the grantor privilege, one or more remote sources must already be configured.

### Procedure

1. In SAP HANA, create a grantor database user with the rights to grant privileges to others.  
If necessary, create the grantor user and role, and grant the role to the user.

#### Note

Grant the role with ADMIN OPTION, as shown in the following example:

```
CREATE USER GEN_GRANTOR_USER PASSWORD Welcome1 NO  
FORCE_FIRST_PASSWORD_CHANGE;  
CREATE ROLE GEN_GRANTOR_ROLE;  
GRANT GEN_GRANTOR_ROLE TO GEN_GRANTOR_USER WITH ADMIN OPTION;
```

2. Grant the following privileges on the remote sources to the grantor role.
  - CREATE VIRTUAL TABLE
  - CREATE VIRTUAL FUNCTION
  - CREATE REMOTE SUBSCRIPTION
  - LINKED DATABASE
  - PROCESS REMOTE SUBSCRIPTION EXCEPTION

- ALTER
  - DROP
3. For the SAP HANA service for SAP BTP in the Cloud Foundry environment, use the SAP BTP cockpit to create a user-provided grantor service.
    - a. In the SAP BTP cockpit, navigate to your space and create a user-provided service instance.
    - b. Specify the name of the service credentials.

For example, a service named "remote\_system\_grant\_service" with the following credentials:

```
{
  "host": "<hostname>",
  "port": "<port_number>",
  "certificate": "<host_certificate>",
  "user": "GEN_GRANTOR_USER",
  "password": "Welcome1",
  "driver": "com.sap.db.jdbc.Driver",
  "tags": [
    "hana"
  ]
}
```

For more information, see [Create User-Provided Service Instances Using the Cockpit](#).

4. For SAP HANA on-premises, log into SAP HANA as XSA\_ADMIN and create a user-provided grantor service.
  - a. Log in using the XS command-line interface.

```
xs login -a https://<hostname>:<port> --skip-ssl-validation -u XSA_ADMIN
-p <password> -s SAP
```

- b. If you use a different space for your SAP Web IDE project, change the space. Otherwise, the default is "SAP".

For example, to change to the "PROD" space, use the following command:

```
xs t -s PROD
```

- c. Create a user-provided service (CUPS).

Create a service for the grantor database user with a service name of your choice.

For example, with a service named "remote\_system\_grant\_service":

```
xs cups remote_system_grant_service -p
"{\"host\": \"<hostname>\", \"port\": \"<port_number>\", \"user\": \"GEN_GRANTOR_USE
R\", \"password\": \"
Welcome1\", \"driver\": \"com.sap.db.jdbc.Driver\", \"tags\": [\"hana\"]}"
```

5. Add the grantor service to the database module in your SAP Web IDE project.

In the MTA development descriptor (mta.yaml), add the grantor service as a resource and build the project.

```
modules:
- name: hdb1
  type: hdb
  path: hdb1
  requires:
  - name: hdi_hdb1
    properties:
      TARGET_CONTAINER: ~{hdi-container-name}
  - name: grant_service
```



```

resources:
- name: hdi_hdb1
  properties:
    hdi-container-name: ${service-name}
    type: com.sap.xs.hdi-container
- name: grant_service
  type: org.cloudfoundry.existing-service
  parameters:
    service-name: remote_system_grant_service

```

6. Create a grantor file in your project.

#### ⓘ Note

First create a database module in your project if one doesn't already exist.

- a. Right-click *src* and choose *New - File*.

Specify the filename with an extension of "hdbgrants". For example, `grants.hdbgrants`.

#### ⓘ Note

If you're creating the dictionary for object search, the ALTER privilege is required.

- b. In the grantor file, specify the grantor service name and any remote sources that you want to use.

For example, for a remote source named "HanaRemoteSource":

```

{
  "remote_system_grant_service": {
    "object_owner": {
      "roles": [
        "GEN_GRANTOR_ROLE"
      ],
      "global_object_privileges": [{
        "name": "HanaRemoteSource",
        "type": "REMOTE SOURCE",
        "privileges": [
          "CREATE VIRTUAL TABLE", "CREATE REMOTE SUBSCRIPTION"
        ]
      }
    ]
  },
  "application_user": {
    "roles": [
      "GEN_GRANTOR_ROLE"
    ]
  }
}

```

7. Build the database module.

#### → Tip

To avoid errors, build starting from the database module instead of right-clicking the hdbgrants file and choosing *Build Selected File*.

## Next Steps

After you've successfully built the module, you can create virtual table (`.hdbvirtualtable`), flowgraph (`.hdbflowgraph`), and replication task (`.hdbreptask`) objects in the SAP Web IDE space.

## Related Information

[GRANT Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

## 2.8 Set Up Data Provisioning Monitoring

After you install SAP HANA smart data integration, you must take several actions to enable and access the monitoring user interfaces for Data Provisioning Agents, remote subscriptions, and tasks.

These actions allow you to access the Data Provisioning monitors by either typing the URL directly in your browser or through links in SAP HANA cockpit.

[Grant Roles to Users \[page 155\]](#)

Grant the appropriate roles to users who perform the various tasks in the Data Provisioning monitors.

**Parent topic:** [Configure Smart Data Integration \[page 20\]](#)

**Previous task:** [Create a Remote Source \[page 147\]](#)

**Next:** [Enabling Enterprise Semantic Services \[page 155\]](#)

## Related Information

[Download and Deploy the Data Provisioning Delivery Unit \[page 34\]](#)

[Monitoring Data Provisioning in the SAP HANA Web-based Development Workbench](#)

## 2.8.1 Grant Roles to Users

Grant the appropriate roles to users who perform the various tasks in the Data Provisioning monitors.

### Prerequisites

Ensure that you've been granted the SYSTEM privilege USER ADMIN to be able to create, alter, or delete users.

### Procedure

1. Log in to SAP HANA studio with a user name that has been granted the USER ADMIN system privilege.
2. Grant the role `sap.hana.im.dp.monitor.roles::Monitoring` to those that perform monitoring tasks.
  - a. In the *Systems* view, expand your SAP HANA server name and expand *Security*.
  - b. Double-click the user name.
  - c. On the *Granted Roles* tab, click the + icon in the upper left corner.
  - d. On the *Select Roles* dialog, type `dp` in the search string box.
  - e. Select role `sap.hana.im.dp.monitor.roles::Monitoring` and click *OK*.

This role `sap.hana.im.dp.monitor.roles::Monitoring` allows the user to access the user interfaces of SAP HANA Data Provisioning monitoring.

### Next Steps

Users can access the monitors from SAP HANA cockpit or view the monitors directly by entering the following URLs in a web browser:

- `<host name>:80<2 digit instance number>/sap/hana/im/dp/monitor/?view=DPAgentMonitor`
- `<host name>:80<2 digit instance number>/sap/hana/im/dp/monitor/?view=DPSubscriptionMonitor`
- `<host name>:80<2 digit instance number>/sap/hana/im/dp/monitor/?view=IMTaskMonitor`

## 2.9 Enabling Enterprise Semantic Services

Enterprise Semantic Services provides an API to enable searching for publication artifacts or run-time objects based on their metadata and contents. It is optional for SAP HANA smart data integration.

To enable Enterprise Semantic Services, an administrator does the following high-level tasks:

- Downloads the SAP HANA Enterprise Semantic Services delivery unit and installs it on the SAP HANA platform
- Grants roles and privileges to users
- Publishes datasets to the Enterprise Semantic Services knowledge graph, or in the case of an application that has already been configured to call the Enterprise Semantic Services REST API, the application populates the knowledge graph

#### [Setting Up the SAP HANA Instance for Enterprise Semantic Services \[page 156\]](#)

The Enterprise Semantic Services component supports both on-premise multitenant and SAP HANA cloud platform deployments.

#### [Download Enterprise Semantic Services Delivery Unit \[page 158\]](#)

Download the Enterprise Semantic Services delivery unit and deploy it to enable semantic searches of data sources.

#### [Importing the Enterprise Semantic Services Delivery Unit \[page 158\]](#)

To install Enterprise Semantic Services (ESS), import the downloaded ESS delivery unit.

#### [Install or Upgrade Enterprise Semantic Services \(install.html\) \[page 160\]](#)

After downloading and importing the Enterprise Semantic Services (ESS) delivery unit, install this component to enable semantic searches of data sources.

#### [Grant Enterprise Semantic Services Roles and Privileges to Users \[page 162\]](#)

After installing Enterprise Semantic Services, grant the necessary roles to the SAP HANA users who will interact directly or indirectly with Enterprise Semantic Services.

#### [Uninstall Enterprise Semantic Services \[page 163\]](#)

You can permanently uninstall Enterprise Semantic Services, for example in the case of an upgrade.

**Parent topic:** [Configure Smart Data Integration \[page 20\]](#)

**Previous:** [Set Up Data Provisioning Monitoring \[page 154\]](#)

**Next:** [Enable SAP HANA Smart Data Integration REST API \[page 163\]](#)

## Related Information

[SAP HANA Enterprise Semantic Services JavaScript API Reference](#)

[SAP HANA Enterprise Semantic Services REST API Reference](#)

## 2.9.1 Setting Up the SAP HANA Instance for Enterprise Semantic Services

The Enterprise Semantic Services component supports both on-premise multitenant and SAP HANA cloud platform deployments.

For details on supported versions, see the applicable *Product Availability Matrix*.

## Related Information

[On-Premise Multitenant Deployment \[page 157\]](#)

[SAP HANA smart data quality and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 1.0](#)

[SAP HANA smart data quality and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

### 2.9.1.1 On-Premise Multitenant Deployment

For a multitenant deployment, Enterprise Semantic Services requires the SAP HANA script server and access to multitenant database containers.

#### Prerequisites

- A SAP HANA instance has been installed with multiple containers
- At least one tenant database container has been created. For example, DBO.

#### Procedure

1. Add the scriptserver service to the tenant database.

For example, in the Web-based Development Workbench or SAP HANA studio, enter the following SQL statement:

```
ALTER DATABASE DBO ADD 'scriptserver';
```

#### Note

If the SAP HANA smart data quality component is already installed, then the scriptserver service has already been added.

2. Configure HTTP access to multitenant database containers.

See the *SAP HANA Administration Guide*.

## Related Information


[Configure HTTP\(S\) Access to Tenant Databases via SAP HANA XS Classic \(SAP HANA Administration Guide\)](#)

[Port Assignment in Tenant Databases \(SAP HANA Administration Guide\)](#)

## 2.9.2 Download Enterprise Semantic Services Delivery Unit

Download the Enterprise Semantic Services delivery unit and deploy it to enable semantic searches of data sources.

### Procedure

1. Go to the [SAP Software Download Center](#) .
2. Click [Access Downloads](#), under either [Installations & Upgrades](#) or [Support Packages & Patches](#).
3. In the search box at the top of the page, enter **hanaimes**.
4. From the list of available downloads, select the desired version. See the [Product Availability Matrix > Product Infrastructure Dependency](#) pages for a version of Enterprise Semantic Services that is compatible with your product version.
5. Click the [Add Selected Items to Download Basket](#) icon.
6. Select [Download Basket](#) and select the ZIP file to download it.
7. Within the downloaded ZIP file, locate the .tgz file and click [Extract](#) to put it into a folder of your choice.

### Related Information

[SAP HANA smart data integration Product Availability Matrix](#) 

## 2.9.3 Importing the Enterprise Semantic Services Delivery Unit

To install Enterprise Semantic Services (ESS), import the downloaded ESS delivery unit.

You can import the delivery using one of two interfaces:

- SAP HANA studio
- SAP HANA Application Lifecycle Management

### Related Information

[Import the ESS Delivery Unit with SAP HANA Studio \[page 159\]](#)

[Import the ESS Delivery Unit with SAP HANA Application Lifecycle Management \[page 159\]](#)

## 2.9.3.1 Import the ESS Delivery Unit with SAP HANA Studio

How to import the Enterprise Semantic Services (ESS) delivery unit using SAP HANA studio.

### Prerequisites

You have already downloaded the ESS delivery unit.

### Procedure

1. Log in to SAP HANA studio as user SYSTEM.
2. In the upper left corner, click **File > Import**.
3. On the *Import* dialog, type **delivery unit** into the search box for *Select an import source*.
4. Click *Next*.
5. Select *<your SAP HANA Server name>* for the target system, and click *Next*.
6. Select the `HANAIMESS.tgz` file that you downloaded.
7. Click *Finish*.
8. In *Job Log* view, the status should be `Completed successfully`.

## 2.9.3.2 Import the ESS Delivery Unit with SAP HANA Application Lifecycle Management

How to import the Enterprise Semantic Services (ESS) delivery unit using SAP HANA Application Lifecycle Management.

### Prerequisites

You have already downloaded the ESS delivery unit.

### Context

For multitenant database deployment, import the delivery unit on a tenant database, not on the system database.

## Procedure

1. If not already granted, grant the role `sap.hana.xs.lm.roles::Administrator` to the user name you will use to log in to SAP HANA Application Lifecycle Management.
  - a. In SAP HANA studio *Systems* view, expand the name of your SAP HANA server and choose **Security** **Users** **System**.
  - b. On the *Granted Roles* tab, click the green + icon in the upper left corner.
  - c. On the *Select Roles* dialog, type `lm` in the search string box.
  - d. Select role `sap.hana.xs.lm.roles::Administrator` and click *OK*.
2. Open SAP HANA Application Lifecycle Management by entering the following URL in a web browser:  
`<host name>:80<2-digit instance number>/sap/hana/xs/lm`
3. Log in with the user name you authorized in step 1.  
The first time you log in, a pop-up window appears asking you to enter a name for this server.
4. On the *Home* tab, click the *Delivery Units* tile.
5. Click *Import*.
6. Click *Browse*, navigate to where you downloaded the delivery unit, select the `.tgz` file, and click *Open*.
7. Click *Import*.

## Results

After successful import, the name of the delivery unit displays in the list on the left.

## 2.9.4 Install or Upgrade Enterprise Semantic Services (install.html)

After downloading and importing the Enterprise Semantic Services (ESS) delivery unit, install this component to enable semantic searches of data sources.

### Prerequisites

If you are upgrading ESS:

- Upgrade your SAP HANA instance if you need to upgrade to a new SPS revision.
- If installed, uninstall the DEMO delivery unit.
- If you are upgrading from a version earlier than 1.0 SPO3 Rev0 (1.3.0), first uninstall Enterprise Semantic Services.



## Context

- If you have ESS version SPS01 Patch 1, also known as 1.0 SP00 Rev1, or earlier, follow the procedure that requires the installation script `install.xsjs`.
- If you have ESS version SPS01 Patch 2, also known as 1.0 SP01 Rev2, or later, follow this procedure, which requires the installation script `install.html`.

## Procedure

1. Access the ESS installation URL using the following structure:

- For SAP HANA 1.0:

`http://<hostname>:port>/sap/hana/im/ess/setup/install.html`

- For SAP HANA 2.0:

`http://<tenant db name>.<hostname>:port>/sap/hana/im/ess/setup/install.html`

Refer to the *SAP HANA Administration Guide* for more information on HTTP access requirements regarding SSL, port numbers, and multitenant database containers.

2. Log in with the SYSTEM user. If the SYSTEM user is not available, then use any other administrative user and assign it the `sap.hana.im.ess.roles.setup::SE_Installer` role for the duration of the installation.
3. On the Welcome page, click *Run ESS Setup*.

You can monitor the details of the installation status.

4. Enter a password for ESS technical users and click *Submit*.
5. Ensure the `_HANA_IM_ESS`, `_HANA_IM_ESS_CTID` and `_HANA_IM_ESS_PROFILING` technical users have been created by the installation script in SAP HANA.

## Results

Successful installation is indicated with the message `Setup completed` including a status table that lists each setting.

At any point in the installation you can monitor its status by accessing the `install.html` URL. Any errors display with messages for corrective actions.

## Related Information

[Uninstall Enterprise Semantic Services \[page 163\]](#)

[Maintaining HTTP Access to SAP HANA \(SAP HANA Administration Guide\)](#)

## 2.9.5 Grant Enterprise Semantic Services Roles and Privileges to Users

After installing Enterprise Semantic Services, grant the necessary roles to the SAP HANA users who will interact directly or indirectly with Enterprise Semantic Services.

### Procedure

1. Log in to SAP HANA with a user name that has the *EXECUTE* privilege on the *GRANT\_ACTIVATED\_ROLE* procedure on the *Object Privileges* of the user.
2. In the *Systems* view, expand *Security* in one of the following database names:
  - If you are installing on SAP HANA Version 1.0, select *<your SYSTEM database name>* and expand *Security*.
  - If you are installing on SAP HANA Version 2.0, select *<your TENANT database name>* and expand *Security*.
3. Grant the appropriate role to each user by following these steps:
  - a. Double-click the user name.
  - b. On the *Granted Roles* tab, click the “+” icon in the upper left corner.
  - c. On the *Select Roles* dialog, type *ess* in the search string box.
  - d. Select the appropriate role for this user and click *OK*.

| Option                                      | Description   |
|---|---|
| <i>sap.hana.im.ess.roles::Administrator</i> | For users who will access the Enterprise Semantic Services Administration user interface  |
| <i>sap.hana.im.ess.roles::Publisher</i>     | For users who will access the Enterprise Semantic Services publication API to define content to be published in the knowledge graph.                          |
| <i>sap.hana.im.ess.roles::User</i>          | For users who will access the Enterprise Semantic Services consumption (read-only) APIs such as Search, Autocomplete, and content-type identification (CTID). |

4. Alternatively, you can open the SQL console of the SAP HANA studio and execute the following statements:

```
CALL
  "_SYS_REPO"."GRANT_ACTIVATED_ROLE"( 'sap.hana.im.ess.roles::Administrator ',
  '<USER_NAME> ' )
```

```
CALL "_SYS_REPO"."GRANT_ACTIVATED_ROLE"( 'sap.hana.im.ess.roles::Publisher ',
  '<USER_NAME> ' )
```

```
CALL "_SYS_REPO"."GRANT_ACTIVATED_ROLE"( 'sap.hana.im.ess.roles::User ',
  '<USER_NAME> ' )
```

## 2.9.6 Uninstall Enterprise Semantic Services

You can permanently uninstall Enterprise Semantic Services, for example in the case of an upgrade.

### Prerequisites

- If SAP Agile Data Preparation is installed, uninstall it first.
- Add the role `sap.hana.im.ess.role::Administrator` to the SYSTEM user or the user performing the uninstall.

### Procedure

1. Remove the delivery unit.
  - a. Enter the following URL in a web browser:

```
http://<<your_HANA_instance:port>>/sap/hana/xs/lm
```

- b. Choose **Products** > **Delivery Units**.
- c. Select `HANA_IM_ESS`.
- d. Click `Delete`.
- e. Click the checkbox `including objects and packages`.
- f. Confirm the deletion.

2. Remove the ESS users.

In the Web-based Development Workbench or SAP HANA studio, drop the Enterprise Semantic Services users. For example, in SAP HANA studio, enter the following SQL statements:

```
DROP USER _HANA_IM_ESS CASCADE;  
DROP USER _HANA_IM_ESS_PROFILING CASCADE;  
DROP USER _HANA_IM_ESS_CTID CASCADE
```

3. Remove the schema.

In the Web-based Development Workbench or SAP HANA studio, drop the HANA\_IM\_ESS schema. For example, in SAP HANA studio, enter the following SQL statement:

```
DROP SCHEMA SAP_HANA_IM_ESS CASCADE;
```

## 2.10 Enable SAP HANA Smart Data Integration REST API

Use the SAP HANA smart data integration REST API to programmatically execute and monitor flowgraphs and to process data for interactive data transformation within your application.

For more information, see the *SAP HANA Smart Data Integration REST API Developer Guide*.

**Parent topic:** [Configure Smart Data Integration \[page 20\]](#)

**Previous:** [Enabling Enterprise Semantic Services \[page 155\]](#)

## 3 Configure Smart Data Quality

To take advantage of SAP HANA smart data quality functionality, you must perform a few tasks.

### Procedure

1. Add the `scriptserver` service to the SAP HANA tenant database.
2. Download and deploy the smart data quality directories.
3. Configure the operation cache.
4. Set monitoring alerts to inform you when the directories expire.

### Related Information

[Directories \[page 165\]](#)

[Add or Remove Services in a Tenant Database \(SAP HANA Administration Guide\)](#)

[Configuring the Operation Cache](#)

[Creating Monitoring Alerts](#)

[Monitoring Alerts \(SAP HANA Administration Guide\)](#)

### 3.1 Directories

Download and deploy directories to take advantage of smart data quality functionality.

#### Context

The Cleanse and Geocode nodes rely on reference data found in directories that you download and deploy to the SAP HANA server.

If reference data isn't provided, the Cleanse node performs parsing, but doesn't perform assignment. Additionally, you're able to create and activate flowgraphs that include the Geocode node, but their execution fails.

You may need to download multiple directories, depending on your license agreement.

### Note

Before you install your directories, stop the Script Server, and then restart it once the installation is complete. Make sure that you don't have any running flowgraph tasks.

## Related Information

[Install or Update Directories on the SAP HANA Host Using Lifecycle Manager \[page 166\]](#)

[Install or Update Directories from a Web Browser Using Lifecycle Manager \[page 168\]](#)

[Integrate Existing Directories into Lifecycle Manager \[page 171\]](#)

[Uninstall Directories \[page 174\]](#)

[Address Directories & Reference Data](#)

## 3.1.1 Install or Update Directories on the SAP HANA Host Using Lifecycle Manager

Follow these steps the first time you install the directories on an SAP HANA host or update the directories after you have a release-dated folder.

### Procedure

1. Log into the SAP HANA machine.
2. Create a new folder for the directories. For example, `<filepath>/Directories`.

#### Note

The default location is where SAP HANA is installed. Choose a different directory path, so the directories and reference data are separate from the SAP HANA installation. If you decide to uninstall SAP HANA with the directories in the default path, then the directories are uninstalled also.

3. Set the directory folder owner to `sudo chown <sid>adm:sapsys/Directories`.

#### Note

In this document, when referring to the "sidadm", the "sid" is lowercase. When referring to the "SID", the "SID" is uppercase.

4. Open the SAP HANA Platform Lifecycle Management Web site `https://<hostname>:1129/lms1/HDBLCM/<SID>/index.html`. Log in with your `<sidadm>` user name and password.
5. Click [Download Components](#) and specify the download mode as [Download Archives on the SAP HANA Host](#), and then click [Next](#).
6. Enter your user ID and password, and click [Next](#).

Your user ID begins with an "S" followed by 10 digits and is tied to an account with active directories. For example, "S0123456789".

7. Click **Show Components** > **Installable and Updatable Components**.
8. Select **Component Type** > **Address Directories and Reference Data**.  
The list of directories that you can update or install appears. Select the directory and reference data to install or update. Click **Next**.
9. If you're updating the directories, you can skip this step because the path is already set. Otherwise, enter the directory path that you created in steps 2. Click **Next**.  
The directories are in a compressed file that must be extracted. You can specify the same extract directory as the download directory.

### Note

10. Verify the settings in the summary, then click **Download**.
11. After you've downloaded and extracted the directories, click **Prepare Update**.
12. On the **Select Components** window, choose the data to install or update and click **Next**.
13. In the **Specify Authorization** window, enter the system administrator password, database user name, and database user password. Click **Next** until you get to the **Define Reference Data Properties** window.
14. In the **Define Reference Data Properties** window, set the installation path for address directories and reference data. For example, <filepath>/Directories/installed. The location you specify here is the reference data path. Click **Next**.
15. On the **Review & Confirm** window, verify that the information is correct and then click **Update**.
16. Click **Close** to return to the **Lifecycle Manager** window.
17. (Optional) To verify that the directory is installed, open SAP HANA Studio and connect to the SYSTEM database.
18. Right-click on the system name and select **Configuration and Monitoring** > **Open Administration**.
19. On the Configuration tab, enter **dq** in the filter and press **Enter**.

The `dq_reference_data_path` is set with the reference data path you defined under the **Default** column. This path automatically has a dated folder at the end. For example, <filepath>/Directories/2017-07/.

20. (Optional) To delete old directory data, open a file browser and navigate to the directory location. Select the old release-dated folder and press **Delete**.

### Caution

Some directory data is updated monthly and other directory data is updated quarterly. Therefore, the monthly release folders can contain a link to the directories in an older release folder rather than to the actual directory data. Before deleting, be sure that those directories aren't in use.

21. Configure the operations cache to improve performance. See "Configuring the Operation Cache" in the *SAP HANA Smart Data Integration and Smart Data Quality Administration Guide*.
22. Set alerts to be notified of when the directories expire. Configure monitoring alerts from SAP HANA cockpit. For more information, see "Monitoring Alerts" in the *SAP HANA Administration Guide*.

## Related Information

[Configuring the Operation Cache](#)  
[Creating Monitoring Alerts](#)

### 3.1.2 Install or Update Directories from a Web Browser Using Lifecycle Manager

Follow these steps the first time you install the directories using a web browser or update the directories using a web browser after you have a release-dated folder.

#### Procedure

1. Log into the SAP HANA machine.
2. Create a new folder for the directories. For example, `<filepath>/Directories`.

#### Note

The default location is where SAP HANA is installed. Choose a different directory path, so the directories and reference data are separate from the SAP HANA installation. If you decide to uninstall SAP HANA with the directories in the default path, then the directories are uninstalled also.

3. Set the directory folder owner to `sudo chown <sid>adm:sapsys/Directories`.

#### Note

In this document, when referring to the “sidadm”, the “sid” is lowercase. When referring to the “SID”, the “SID” is uppercase.

4. Open the SAP HANA Platform Lifecycle Management Web site `https://<hostname>:1129/lms1/HDBLCM/<SID>/index.html`. Log in with your `<sidadm>` user name and password.
5. Click [Download Components](#) and specify the download mode as [Download Archives via the Web Browser](#), and then click [Next](#).
6. Enter your user ID and password, and click [Next](#).

Your user ID begins with an “S” followed by 10 digits and is tied to an account with active directories. For example, “S0123456789”.

7. Click [Show Components](#) [Installable and Updatable Components](#).
8. Select [Component Type](#) [Address Directories and Reference Data](#).

The list of directories that you can install or update appears. Select the directory and reference data to install or update. Click [Next](#).

9. Click [Download](#). If there are multiple directories, click [Download All](#). Wait for the directories to complete downloading.
10. Click [Upload/Extract Components](#).



11. Choose one of the methods:

- [The Archives are Accessible from the SAP HANA Host](#). Copy the Address Directories to a location that can be accessed by the <sidadm>. We recommend that the <sidadm> creates this directory, so the permissions are correct.
- [Upload Archives to the SAP HANA Host](#). See the steps for uploading archives in the topic [Upload Archives to the SAP HANA Host \[page 170\]](#).

12. Enter the shared location.

#### Note

If the location box turns red, either there's an invalid path or the location doesn't have the required permission for the <sidadm>.

13. Click Next to extract the Address Directories.

#### Note

If the location box turns red, either there's an invalid path or the location doesn't have the required permission for the <sidadm>.

14. Review and confirm the information, and then click [Next](#).

15. Click [Close](#) after the [Upload/Extract Components](#) is finished.

16. Click [Install or Update Additional Components](#).

17. Click [Add Software Locations](#).

18. Enter the path to the extracted folder from the previous step, and then click [Search also in Subfolder](#). Click [Next](#).

19. Select the Address Directories that you want to install or click [Select All](#).

#### Note

If a warning about "too loose permissions" is shown, you may ignore the message.

20. Enter the system administrator password, database user name, and database user password in the [Specify Authorization](#) window.

21. Set the installation path for address directories and reference data in the [Define Reference Data Properties](#) window. For example, <filepath>/Directories/installed. The location you specify here is the reference data path. Click [Next](#).

22. Verify that the information is correct on the [Review & Confirm](#) window, and then click [Update](#).

23. Click [Close](#) to return to the Lifecycle Manager window.

## Next Steps

To verify that the directories are installed:

1. Open SAP HANA Studio and connect to the SYSTEM database.
2. Right-click the system name and select [► Configuration and Monitoring ► Open Administration ►](#).
3. Type [dq](#) in the filter on the Configuration tab, and then press [Enter](#).

The `dq_reference_data_path` is set with the reference data path you defined under the *Default* column. This path automatically has a dated folder at the end. For example, `<filepath>/Directories/2017-07/`.

4. If you use Operation Caches, we recommend that you restart them:

#### Sample Code

```
ALTER SYSTEM ALTER CONFIGURATION ('scriptserver.ini', 'SYSTEM') SET  
  
('adapter_operation_cache', 'enable_adapter_operation_cache') = 'no' WITH  
RECONFIGURE
```

#### Sample Code

```
ALTER SYSTEM ALTER CONFIGURATION ('scriptserver.ini', 'SYSTEM') SET  
  
('adapter_operation_cache', 'enable_adapter_operation_cache') = 'yes' WITH  
RECONFIGURE
```

## Related Information

[Upload Archives to the SAP HANA Host \[page 170\]](#)

### 3.1.2.1 Upload Archives to the SAP HANA Host

If you installed or updated directories from a web browser using Lifecycle Manager and want to upload the archives to the SAP HANA Host, follow these steps.

#### Procedure

1. Click *Select Archives for Upload*. Enter the path to the location where the Address Directories were downloaded and select all ZIP files.
2. Click *Upload*.
3. Confirm the *Temporary Extract Path*, and then click *Next*.

#### Note

Make a note of this path, because you'll use it when adding software locations.

4. Click *Extract*, and then *Close*.
5. Click *Install or Update Additional Components*.
6. Click *Add Software Locations*, and enter the *Temporary Extract Path* from the earlier step.

7. Click the *Search also in subfolders* checkbox, and then click *Add*.
8. Click *Next*.
9. Click the Address Directories you want to install or click *Select All*, and then click *Next*.

#### Note

If a warning about “too loose permissions” is shown, you can ignore the message.

10. Enter the system administrator password, database user name, and database user password in the *Specify Authorization*.
11. Set the installation path for address directories and reference data in the *Define Reference Data Properties* window. For example, <filepath>/Directories/installed. The location you specify here is the reference data path. Click *Next*.
12. Verify that the information is correct on the *Review & Confirm* window, and then click *Update*.
13. Click *Close* to return to the *Lifecycle Manager* window.

## Next Steps

You can verify that the directories are installed by following the instructions at the end of the [Install or Update Directories from a Web Browser Using Lifecycle Manager \[page 168\]](#) topic.

## 3.1.3 Integrate Existing Directories into Lifecycle Manager

If you downloaded your directories from the Support Portal using Download Manager, use this procedure to update your directories.

### Prerequisites

You've downloaded your directories from the Support Portal.

### Context

Lifecycle Manager organizes your reference data to make installing and updating your directories easier by creating release-dated folders.

## Procedure

1. Open SAP HANA Studio and connect to the SYSTEM database.
2. On the *Configuration* tab, enter **dq** in the filter, and press **Enter**.
  - If a path is empty for the System and Databases columns, then continue to the next step.
  - If the paths for the System and Databases columns are different from each other, then update the System column to be the master reference data path by double-clicking the value in the System column. In the System section, enter the path in the *New Value* option. Delete any paths in the *New Value* option under the Databases section.

### Note

If you have multiple tenants that require different reference data paths, you can manage them outside of SAP HANA Lifecycle Manager.

3. Log into the SAP HANA machine.
4. Create a new folder for the directories. For example, `<filepath>/Directories`.

### Note

Choose a different directory path from the location where SAP HANA is installed. Separate locations ensure that the directories and reference data are separate from the SAP HANA installation. If you decide to uninstall SAP HANA with the directories in the same path as SAP HANA, then the directories are uninstalled also.

5. Set the directory folder owner to `sudo chown <sid> adm:sapsys/Directories`.

### Note

In this document, when referring to the “sidadm”, the “sid” is lowercase. When referring to the “SID”, the “SID” is uppercase.

6. Open the SAP HANA Platform Lifecycle Management Web site `https://<hostname>:1129/lmsl/HDBLCM/<SID>/index.html`. Log in with your `<sidadm>` username and password.
7. Click *Download Components* and specify the download mode.
8. Enter your user ID and password, and click *Next*.

Your user ID begins with an “S”, followed by 10 digits, and it’s tied to an account with active directories. For example, “S0123456789”.

9. Click **Show Components** **Installable and Updatable Components**.
10. Select **Component Type** **Address Directories and Reference Data**.

The list of directories that you can update or install appears. Select the directory and reference data to install or update. Click *Next*.

11. If you’re updating the directories, you can skip this step, because the path is already set. Otherwise, enter the directory path that you created in steps 4 through 5. Click *Next*.

The directories are in a compressed file that must be extracted. You can specify the same extract directory as the download directory.

### Note

12. Verify the settings in the summary, then click [Download](#).
13. After you've downloaded and extracted the directories, click [Prepare Update](#).
14. On the [Select Components](#) window, choose the data to install or update and click [Next](#).
15. In the [Specify Authorization](#) window, enter the system administrator password, database user name, and database user password. Click [Next](#) until you get to the [Define Reference Data Properties](#) window.
16. In the [Define Reference Data Properties](#) window, set the installation path for address directories and reference data. For example, `<filepath>/Directories/installed`. Use the path that you specified at the beginning of this procedure. The location you specify here is the reference data path. Click [Next](#).

#### Note

If you have set the path at the beginning of this procedure, you may not see this window.

17. On the [Review & Confirm](#) window, verify that the information is correct and then click [Update](#).
18. Click [Close](#) to return to the [Lifecycle Manager](#) window.
19. (Optional) To verify that the directory is installed, open SAP HANA Studio and connect to the SYSTEM database.
20. (Optional) On the [Configuration](#) tab, enter `dq` in the filter and press [Enter](#).

The `dq_reference_data_path` is set with the reference data path you defined under the [Default](#) column. This path automatically has a dated folder at the end. For example, `<filepath>/Directories/2017-07/`.

21. (Optional) To delete old directory data, open a file browser, and navigate to the directory location. Select the old release-dated folder and press [Delete](#).

#### Caution

Some directory data is updated monthly and other directory data is updated quarterly. Therefore, the monthly release folders may contain a link to the directories in an older release folder, rather than to the actual directory data. Before deleting, be sure that those directories aren't in use.

22. Configure the operations cache to improve performance. See "Configuring the Operation Cache" in the *SAP HANA Smart Data Integration and Smart Data Quality Administration Guide*.
23. Set alerts to be notified of when the directories expire. Configure monitoring alerts from the SAP HANA cockpit. For more information, see "Monitoring Alerts" in the *SAP HANA Administration Guide*.

## Related Information

[Configuring the Operation Cache](#)  
[Creating Monitoring Alerts](#)

## 3.1.4 Uninstall Directories

When you're finished using the directory information, you can uninstall the directories from the system.

### Procedure

1. Open SAP HANA Studio and connect to the SAP HANA Server as the SYSTEM user.
2. Right-click the system name and select ► *Configuration and Monitoring* ► *Open Administration* ►.
3. Click the *Configuration* tab and type `dq` in the *Filter* option.  
The `dq_reference_data_path` in the `scriptserver.ini` file appears in the list. Make a note of the system path. For example, `/<filepath>/Directories/installed/2017-05/`.
4. Right-click `dq_reference_data_path`, and then click *Delete*.
5. Select the system, and then click *Delete*.
6. Open a file browser and delete the folder that was in the `dq_reference_data_path`.
7. (Optional) To verify that the directories were deleted, click ► *View System Information* ► *Installed Components* ►.

# 4 Update Smart Data Integration

When updating your SAP HANA Smart Data Integration landscape to a new version, consider the steps that must be taken for each component.

[Update the Data Provisioning Agent \[page 175\]](#)

Update the Data Provisioning Agent by running the installation program in update mode.

[Install or Upgrade Enterprise Semantic Services \(install.html\) \[page 176\]](#)

After downloading and importing the Enterprise Semantic Services (ESS) delivery unit, install this component to enable semantic searches of data sources.

## Related Information

### 4.1 Update the Data Provisioning Agent

Update the Data Provisioning Agent by running the installation program in update mode.

For complete information about updating the Data Provisioning Agent in your landscape, see the *Data Provisioning Agent Installation and Update Guide*.

## Related Information

[Managing the Agent Installation on Linux](#)

[Managing the Agent Installation on Windows](#)

## 4.2 Install or Upgrade Enterprise Semantic Services (install.html)

After downloading and importing the Enterprise Semantic Services (ESS) delivery unit, install this component to enable semantic searches of data sources.

### Prerequisites

If you are upgrading ESS:

- Upgrade your SAP HANA instance if you need to upgrade to a new SPS revision.
- If installed, uninstall the DEMO delivery unit.
- If you are upgrading from a version earlier than 1.0 SP03 Rev0 (1.3.0), first uninstall Enterprise Semantic Services.

### Context

- If you have ESS version SPS01 Patch 1, also known as 1.0 SP00 Rev1, or earlier, follow the procedure that requires the installation script `install.xsjs`.
- If you have ESS version SPS01 Patch 2, also known as 1.0 SP01 Rev2, or later, follow this procedure, which requires the installation script `install.html`.

### Procedure

1. Access the ESS installation URL using the following structure:

- For SAP HANA 1.0:

`http://<hostname>:port/sap/hana/im/ess/setup/install.html`

- For SAP HANA 2.0:

`http://<tenant db name>.<hostname>:port/sap/hana/im/ess/setup/install.html`

Refer to the *SAP HANA Administration Guide* for more information on HTTP access requirements regarding SSL, port numbers, and multitenant database containers.

2. Log in with the SYSTEM user. If the SYSTEM user is not available, then use any other administrative user and assign it the `sap.hana.im.ess.roles.setup::SE_Installer` role for the duration of the installation.
3. On the Welcome page, click [Run ESS Setup](#).

You can monitor the details of the installation status.

4. Enter a password for ESS technical users and click [Submit](#).
5. Ensure the `_HANA_IM_ESS`, `_HANA_IM_ESS_CTID` and `_HANA_IM_ESS_PROFILING` technical users have been created by the installation script in SAP HANA.



## Results

Successful installation is indicated with the message `Setup completed` including a status table that lists each setting.

At any point in the installation you can monitor its status by accessing the `install.html` URL. Any errors display with messages for corrective actions.

## Related Information

[Uninstall Enterprise Semantic Services \[page 163\]](#)

[Maintaining HTTP Access to SAP HANA \(SAP HANA Administration Guide\)](#)

# 5 Uninstall Smart Data Integration

To uninstall SAP HANA Smart Data Integration, perform the required uninstallation tasks for each component in the landscape.

## [Undeploy the Delivery Unit \[page 178\]](#)

You can undeploy the Data Provisioning delivery unit through SAP HANA Application Lifecycle Management (ALM).

## [Uninstall the Data Provisioning Agent \[page 179\]](#)

Uninstall the Data Provisioning Agent from a host system using the uninstallation manager.

## [Uninstall Enterprise Semantic Services \[page 179\]](#)

You can permanently uninstall Enterprise Semantic Services, for example in the case of an upgrade.

## Related Information

### 5.1 Undeploy the Delivery Unit

You can undeploy the Data Provisioning delivery unit through SAP HANA Application Lifecycle Management (ALM).

#### Prerequisites

To delete the delivery unit with the SAP HANA Application Lifecycle Management, you must ensure the following prerequisites are met:

- You have access to the SAP HANA system.
- You have the privileges granted by a role based on the SAP HANA `sap.hana.xs.lm.roles::Administrator` user role template.

#### Procedure

1. Open SAP HANA Application Lifecycle Management.

SAP HANA Application Lifecycle Management is available on the SAP HANA XS Web server at the following URL:

`http://<WebServerHost>:80<SAPHANAinstance>/sap/hana/xs/lm`

2. Choose the *PRODUCTS* tab.
3. Choose the *Delivery Units* tab.
4. Delete the *HANA\_IM\_DP* delivery unit.

## Related Information

[SAP HANA Application Lifecycle Management \(ALM\)](#)

## 5.2 Uninstall the Data Provisioning Agent

Uninstall the Data Provisioning Agent from a host system using the uninstallation manager.

For complete information about uninstalling a Data Provisioning Agent from your landscape, see the *Data Provisioning Agent Installation and Update Guide*.

## Related Information

[Managing the Agent Installation on Linux](#)  
[Managing the Agent Installation on Windows](#)

## 5.3 Uninstall Enterprise Semantic Services

You can permanently uninstall Enterprise Semantic Services, for example in the case of an upgrade.

## Prerequisites

- If SAP Agile Data Preparation is installed, uninstall it first.
- Add the role `sap.hana.im.ess.role::Administrator` to the SYSTEM user or the user performing the uninstall.

## Procedure

1. Remove the delivery unit.
  - a. Enter the following URL in a web browser:

```
http://<<your_HANA_instance:port>>/sap/hana/xs/lm
```

- b. Choose ► *Products* ► *Delivery Units* ▾.
  - c. Select *HANA\_IM\_ESS*.
  - d. Click *Delete*.
  - e. Click the checkbox *including objects and packages*.
  - f. Confirm the deletion.
2. Remove the ESS users.

In the Web-based Development Workbench or SAP HANA studio, drop the Enterprise Semantic Services users. For example, in SAP HANA studio, enter the following SQL statements:

```
DROP USER _HANA_IM_ESS CASCADE;  
DROP USER _HANA_IM_ESS_PROFILING CASCADE;  
DROP USER _HANA_IM_ESS_CTID CASCADE
```

3. Remove the schema.

In the Web-based Development Workbench or SAP HANA studio, drop the HANA\_IM\_ESS schema. For example, in SAP HANA studio, enter the following SQL statement:

```
DROP SCHEMA SAP_HANA_IM_ESS CASCADE;
```

# 6 Configure Data Provisioning Adapters

Data provisioning adapters can connect to a variety of sources to move data into SAP HANA, and well as other use cases.

In general, the adapters described in this topic are delivered with the Data Provisioning Agent. For information about configuring your adapter, see the documentation about each adapter in this guide.

### Note

Before configuring your adapters and remote sources, make sure that the Data Provisioning Agent is configured and that the necessary JDBC libraries are installed.

If your source isn't covered by these adapters, you can use the Adapter SDK to create custom adapters to suit your needs. For more information, see the [Data Provisioning Adapter SDK Guide](#).

For information about using adapters for replication or transformation, see the following guides:

- [Modeling Guide for SAP HANA Web-based Development Workbench](#)
- [Modeling Guide for SAP Web IDE and SAP Business Application Studio](#)

For information about supported versions for each adapter, see the [Product Availability Matrix \(PAM\)](#).

Table 36: Data Provisioning Adapters

Each adapter has both a human-readable name that is used in documentation and an internal technical name that is used when creating remote sources or configuring the adapter.

| Adapter Name                                     | Technical Name       | Description   |
|--|----------------------|---|
| <a href="#">Agent Management [page 186]</a>      | AgentMgmtAdapter     | Allows SAP HANA to access and execute Data Provisioning Agent functions.  |
| <a href="#">Apache Camel Facebook [page 191]</a> | CamelFacebookAdapter | Connects to and retrieves data from Facebook.<br><br>This adapter is a predelivered component that is based on the Apache Camel adapter.  |
| <a href="#">Apache Camel Informix [page 193]</a> | CamelInformixAdapter | Retrieves data from an Informix source. It can also write back to an Informix virtual table.<br><br>This adapter is a predelivered component that is based on the Apache Camel adapter.   |
| <a href="#">Apache Camel JDBC [page 195]</a>     | CamelJDBCAdapter     | Connects to most databases for which SAP HANA smart data integration doesn't already provide a predelivered adapter.<br><br>In general, the Camel JDBC adapter supports any database that has SQL-based data types and functions, and a JDBC driver.<br><br>This adapter is a predelivered component that is based on the Apache Camel adapter. |

| Adapter Name   | Technical Name                               | Description  |
|--|--|--|
| <a href="#">Apache Camel Microsoft Access [page 202]</a>   | CamelAccessAdapter                           | Retrieves data from a Microsoft Access source.<br>This adapter is a predelivered component that is based on the Apache Camel adapter.  |
| <a href="#">Apache Cassandra [page 205]</a>                | CassandraAdapter                             | Retrieves data from an Apache Cassandra remote source.<br>This adapter is a predelivered component that is based on the Apache Camel adapter.  |
| <a href="#">Apache Impala [page 214]</a>                   | ImpalaAdapter                                | Retrieves data from an Apache Impala source.<br>This adapter is a predelivered component that is based on the Apache Camel adapter.  |
| <a href="#">Cloud Data Integration [page 220]</a>          | CloudDataIntegrationAdapter                  | Retrieves data from a Cloud Data Integration (CDI) service endpoint.   |
| <a href="#">Data Assurance [page 232]</a>                  | DataAssuranceAdapter                         | Connects to an SAP HANA remote source to use the Data Assurance option to monitor the quality of data replication.   |
| <a href="#">File [page 234]</a>                            | FileAdapter                                  | Retrieves data from formatted text files or SharePoint source data. You can also write back to a virtual table or an HDFS target file.   |
| <a href="#">File Datastore Adapters [page 275]</a>         | FileAdapterDatastore<br>SFTPAdapterDatastore | Reads from a wide variety of sources by using the SAP Data Services engine as the underlying technology.   |
| <a href="#">Hive [page 295]</a>                            | HiveAdapter                                  | Retrieves data from Apache Hadoop via Apache Hive.   |
| <a href="#">IBM DB2 Log Reader [page 306]</a>              | DB2LogReaderAdapter                          | Retrieves data from IBM DB2. It can also receive changes that occur to tables in real time. You can also write back to a virtual table.  |
| <a href="#">IBM DB2 Mainframe [page 353]</a>               | DB2MainframeAdapter                          | Retrieves data from IBM DB2 for z/OS. IBM DB2 iSeries, formerly known as AS/400, is also supported.  |
| <a href="#">Microsoft Excel [page 358]</a>                 | ExcelAdapter                                 | Retrieves data from a Microsoft Excel file or SharePoint source data.  |
| <a href="#">Microsoft Outlook [page 369]</a>               | OutlookAdapter                               | Retrieves data from Microsoft Outlook.   |
| <a href="#">Microsoft SQL Server Log Reader [page 371]</a> | MssqlLogReaderAdapter                        | Retrieves data from Microsoft SQL Server. It can also receive changes that occur to tables in real time through log reading or triggers. You can also write back to a virtual table. |
| <a href="#">OData [page 419]</a>                           | ODataAdapter                                 | Retrieves data from an OData service. You can also write to an OData target.   |
| <a href="#">Oracle Log Reader [page 428]</a>               | OracleLogReaderAdapter                       | Retrieves data from Oracle. It can also receive changes that occur to tables in real time through log reading or triggers. You can also write back to a virtual table.               |
| <a href="#">PostgreSQL Log Reader [page 476]</a>           | PostgreSQLLogReaderAdapter                   | Batch-loads or replicates change data in real time from a PostgreSQL database to SAP HANA.   |
| <a href="#">SAP ABAP [page 487]</a>                        | ABAPAdapter                                  | Retrieves data from virtual tables through RFC for ABAP tables and ODP extractors. It also provides change data capture for ODP extractors.  |

| Adapter Name                                     | Technical Name   | Description   |
|--|--|---|
| <a href="#">SAP ASE LTL [page 500]</a>           | ASELTLAdapter  | Retrieves data from SAP ASE. It can also receive changes that occur to tables in real time. You can also write back to a virtual table. This adapter uses Log Transferring Language (LTL) technology exclusively.   |
| <a href="#">SAP ECC [page 510]</a>               | ASELTLECCAdapter<br>DB2ECCAdapter<br>MssqlECCAdapter<br>OracleECCAdapter | Retrieves data from an SAP ERP system running on a supported database. The only difference between these adapters and each corresponding log reader or LTL adapter is that these adapters use the data dictionary in the SAP ERP system when browsing metadata. |
| <a href="#">SAP HANA [page 527]</a>              | HanaAdapter<br>HanaAdapterV2   | Provides real-time changed-data capture capability in order to replicate data from a remote SAP HANA database to a target SAP HANA database. You can also write back to a virtual table. Use this adapter to extract data from an ECC on an SAP HANA source.    |
| <a href="#">SDI DB2 LTL Mainframe [page 548]</a> | DB2LTLMainframeAdapter   | Provides real-time replication functionality for IBM DB2 on z/OS sources. This adapter uses Log Transferring Language (LTL) technology exclusively.   |
| <a href="#">SOAP [page 566]</a>                  | SoapAdapter  | Connects to a web service using the HTTP protocol to download data. This adapter is a SOAP web services client and uses virtual functions instead of virtual tables to expose server-side operations as it closely relates to how the operation is invoked.     |
| <a href="#">Teradata [page 569]</a>              | TeradataAdapter  | Retrieves data from Teradata. It can also receive changes that occur to tables in real time. You can also write back to a virtual table.  |
| <a href="#">Twitter [page 579]</a>               | TwitterAdapter   | Retrieves data from Twitter. It can also receive new data from Twitter in real time.  |

#### Note

This adapter doesn't come preinstalled with the Data Provisioning Agent; you must install it separately after you install the agent.

#### Note

Data provisioning adapters allow you to specify virtual IP addresses for source systems as a parameter for the remote source, and they allow you to change the virtual IP addresses when the remote source is suspended.

## Related Information

[Adapter Functionality](#)

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

[Register Data Provisioning Adapters \[page 142\]](#)

## 6.1 Log-based and Trigger-based Replication Modes

Some data provisioning adapters support both log-based and trigger-based replication.

When determining which mode to use for your replication scenario, consider the following comparison of the log-based and trigger based replication modes.

Table 37: Comparison of Replication Modes

| Consideration              | Log-based Replication   | Trigger-based Replication   |
|----------------------------|---|---|
| Risks                      | <p>Truncation of transaction logs may be blocked.</p> <p>If there are replication exceptions that need to be processed and the source system logs have already been archived, a missing log file issue may occur.</p>   | <p>Source system transaction performance could be impacted by triggers on source tables.</p> <p>This is generally mitigated by capturing only primary keys and later retrieving the full records based on a join with the source table.</p>   |
| Performance                | <p>All transactions for all tables must be read, even when replicating only a single table.</p> <p>The adapter leverages the source log reading APIs, which read and parse all redo logs and return transactions specific to the tables being replicated.</p>   | <p>Triggers are specific to the exact tables being replicated, resulting in faster performance.</p>   |
| Supplemental Logging       | <p>Full supplemental logging is required on the table being replicated, and primary/unique key supplemental logging is required on system tables.</p>   | <p>Table-level or database-level supplemental logging is not required.</p>  |
| Privileges and Permissions | <p>Numerous source database permissions are required for log-based replication.</p> <p>For more information, see the following topics:</p> <ul style="list-style-type: none"> <li>• <a href="#">Oracle Database Permissions [page 430]</a></li> <li>• <a href="#">Create Users and Grant Privileges [page 374]</a></li> </ul> | <p>Fewer source database permissions are required for trigger-based replication.</p> <p>For more information, see the following topics:</p> <ul style="list-style-type: none"> <li>• <a href="#">Required Permissions for Oracle Trigger-Based Replication [page 444]</a></li> <li>• <a href="#">Required Permissions for SQL Server Trigger-Based Replication [page 390]</a></li> <li>• <a href="#">User Permissions [page 529]</a></li> </ul> |



| Consideration          | Log-based Replication  | Trigger-based Replication  |
|------------------------|--|--|
| Source System Impact   | <p>Log-based replication has minimal impact on the source system.</p> <p>No additional storage is needed, aside from maintaining a small number of tables that store replication-related metadata.</p>   | <p>Additional source system storage is required for shadow and queue tables.</p> <p>For each subscribed table, the data provisioning adapter maintains a queue table for replication, and creates a shadow table with the same columns as the source table. The shadow table is cleared after the data is replicated to the target.</p> <p>When the primary key-only option is used, the shadow table contains only the respective primary keys.</p> <p>The number of primary keys, number of tables being replicated, and volume of changes can all increase the size of the shadow tables.</p> |
| Exception Handling     | <p>Replication exceptions do not impact the source.</p>  | <p>Replication exceptions cause data to stop being pulled from the shadow and queue tables, while the triggers continue to record changes.</p> <p>As a result, the shadow and queue tables will grow until the exception is processed.</p>   |
| Source System Upgrades | <p>Log-based replication causes no impact when upgrading your SAP source systems.</p> <p>Depending on your settings, you may need to reinitialize smart data integration objects after upgrading the source system.</p> <p>For example, if the <i>Table Subscribing Mode</i> parameter for the Microsoft SQL Server adapter is set to <i>Native Mode</i>, you may need to repeat the steps in <a href="#">Configure the Primary Data Server for the First Time [page 377]</a>.</p> | <p>For some SAP systems such as SAP ECC and SAP ERP, the replication triggers can block upgrades until they are dropped from the source tables.</p> <p>With the latest versions of Basis, the triggers are automatically dropped and do not block the upgrade.</p> <p>In all cases, you must reconfigure replication for the affected tables after the upgrade is complete.</p>  |
| Log Reading APIs       | <p>Log-based replication is dependent on log reading API support in the source database.</p> <p>For example, the LogMiner API used by the log-based replication mode is no longer supported starting with Oracle 19c.</p>  | <p>Trigger-based replication has no additional dependencies on the source database version.</p>  |
| LOB Replication        | <p>LOB replication performed through log reading APIs produces unexpected results and is not recommended.</p>  | <p>LOB replication is supported.</p>   |

## Related Information

[Oracle Trigger-Based Replication \[page 442\]](#)

[Microsoft SQL Server Trigger-Based Replication \[page 389\]](#)

[SAP HANA \[page 527\]](#)

## 6.2 Data Provisioning Adapters

### 6.2.1 Agent Management

The Agent Management adapter is a data provisioning adapter that allows SAP HANA to access and execute Data Provisioning Agent functions.

#### Adapter Functionality

This adapter supports the following functionality:

- Remotely restart the Data Provisioning Agent
- Provide access to query statistics via virtual table

#### 6.2.1.1 Configure an Access Token

Before you can use the Agent Management adapter, you must set an access token to use when you create a remote source.

#### Context

Configure the access token in the agent's secure storage.

#### Procedure

1. At the command line, navigate to `<DPAgent_root>/bin`.
2. Start the agent configuration tool with the `setSecureProperty` parameter.
  - On Windows, `agentcli.bat --setSecureProperty`

- On Linux, `./agentcli.sh --SetSecureProperty`
3. Choose *Set AgentMgmtAdapter Access Token* and specify the token.

## Results

The access token is saved in the Data Provisioning Agent's secure storage.

## Next Steps

Create a remote source using the Agent Management adapter, and specify the same access token.

### 6.2.1.2 Agent Management Remote Source Configuration

Configuration settings for providing SAP HANA with access to an Agent Management source. Also included is sample code for creating a remote source using the SQL console.

Configure the following options to allow SAP HANA to access and execute agent functions.

| Category   | Option           | Description   |
|--|------------------|---|
| Credentials                                      | Credentials Mode | <i>Technical user</i> or <i>Secondary user</i><br><br>Select one of the choices depending on the purpose of the remote source you want to create.   |
| Credentials > Agent Mgmt Adapter<br>Access Token | Access Token     | The same password as the adapter <i>Access Token</i> configured in the agent secure storage. If this parameter is left blank or is different from the <i>Access Token</i> , the remote source is not allowed to access the agent. |

The following code sample illustrates how to create a remote source using the SQL console.

## Access Token

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "AgentMgmtAdapterSrc" ADAPTER "AgentMgmtAdapter" AT
LOCATION AGENT "MyAgent"
```

```

CONFIGURATION '<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties/>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AgentMgmtAdapterAccessToken">
  <password>token</password>
</CredentialEntry>';

```

## 6.2.1.3 Remote Source Tables

The remote source provides tables that reflect the content of the query statistics files, and they can be imported as virtual tables.

After a remote source is created, you can browse the remote source. Each of the configured query statistics files is shown as a remote table under the remote source and can be imported as a virtual table.

### Query Statistics

For each initial load query executed by the agent, the agent framework captures and stores statistics in three files stored in `<DPAgent_root>/log/stats`. Because memory statistics do not apply for non-streaming queries, the columns in *QueryMemoryStatistics* will have default values for these queries: 0 for integers, and epoch time for timestamps.

When each file is older than one day and a new SQL query is executed, it is rolled over to a file with the last modified date as a suffix. A maximum of 5 rolled-over files for each statistics file is retained, and older files are deleted.

#### → Tip

The `UNIQUE_ID` column appears in all files and has the same value in each for a given query execution. The `UNIQUE_ID` is the timestamp value in milliseconds since epoch time, and can be used to join tables.

Table 38: Virtual Tables

| Table                    | Description  |
|--------------------------|--|
| QueryExecutionStatistics | Displays query execution statistics stored in <code>query_stats.txt</code> . |
| QueryMemoryStatistics    | Displays query memory statistics stored in <code>memory_stats.txt</code> .   |
| QuerySqlStatements       | Displays query SQL statements stored in <code>sql_stats.txt</code> .         |

Table 39: QueryExecutionStatistics

| Column Name  | Data Type | Dimension |
|--------------|-----------|-----------|
| UNIQUE_ID    | BIGINT    |           |
| IS_STREAMING | NVARCHAR  | 5         |
| ROWS_SENT    | BIGINT    |           |
| FETCH_SIZE   | INTEGER   |           |

| Column Name     | Data Type | Dimension |
|-----------------|-----------|-----------|
| MAX_ROW_SIZE    | INTEGER   |           |
| START_TIMESTAMP | TIMESTAMP |           |
| END_TIMESTAMP   | TIMESTAMP |           |
| REWRITE_TIME    | INTEGER   |           |
| EXECUTE_TIME    | INTEGER   |           |
| FETCH_TIME      | INTEGER   |           |
| SERIALIZE_TIME  | INTEGER   |           |
| SEND_TIME       | INTEGER   |           |

Table 40: QueryMemoryStatistics

| Column Name                     | Data Type | Dimension |
|---------------------------------|-----------|-----------|
| UNIQUE_ID                       | BIGINT    |           |
| SERIALIZER_QUEUE_PEAK_COUNT     | BIGINT    |           |
| SERIALIZER_QUEUE_PEAK_SIZE      | BIGINT    |           |
| SERIALIZER_QUEUE_PEAK_TIMESTAMP | TIMESTAMP |           |
| SERIALIZER_QUEUE_TOTAL_COUNT    | BIGINT    |           |
| SERIALIZER_QUEUE_TOTAL_SIZE     | BIGINT    |           |
| SERIALIZER_POOL_CAPACITY        | BIGINT    |           |
| SERIALIZER_POOL_PEAK_SIZE       | BIGINT    |           |
| SERIALIZER_POOL_PEAK_TIMESTAMP  | TIMESTAMP |           |
| RESPONSE_QUEUE_PEAK_COUNT       | BIGINT    |           |
| RESPONSE_QUEUE_PEAK_SIZE        | BIGINT    |           |
| RESPONSE_QUEUE_PEAK_TIMESTAMP   | TIMESTAMP |           |
| RESPONSE_QUEUE_TOTAL_COUNT      | BIGINT    |           |
| RESPONSE_QUEUE_TOTAL_SIZE       | BIGINT    |           |
| RESPONSE_POOL_CAPACITY          | BIGINT    |           |
| RESPONSE_POOL_PEAK_SIZE         | BIGINT    |           |
| RESPONSE_POOL_PEAK_TIMESTAMP    | TIMESTAMP |           |

Table 41: QuerySqlStatements

| Column Name           | Data Type | Dimension |
|-----------------------|-----------|-----------|
| UNIQUE_ID             | BIGINT    |           |
| AGENT_TIME_ZONE       | NVARCHAR  | 256       |
| AGENT_LOCAL_TIMESTAMP | TIMESTAMP |           |
| AGENT_NAME            | NVARCHAR  | 256       |

| Column Name      | Data Type | Dimension |
|------------------|-----------|-----------|
| STATEMENT_STRING | NVARCHAR  | 5000      |
| REWRITTEN_STRING | NVARCHAR  | 5000      |

## 6.2.1.4 Virtual Procedure: Restart Agent

Restart a Data Provisioning Agent.

The Restart Agent virtual procedure restarts a remote agent by sending a shutdown request to the agent's administration port. After the agent has been stopped, the agent service daemon is responsible for starting the agent.

The service daemon starts the agent after waiting for a time period defined by the following `dpagentconfig.ini` settings:

- `service.retry.maxRetries=10`
- `service.retry.waitTime=30`

With the default settings, the service daemon waits 300 seconds until it restarts the agent. Additional information about the service daemon actions can be found in `dpagent servicedaemon.log`.

Table 42: Virtual Procedure Parameters

| INOUT | Parameter | Type  | Description                         |
|-------|-----------|-------|-------------------------------------|
| OUT   | param_1   | TABLE | Table describing the procedure call |

## Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE SYSTEM.RESTART_AGENT_<postfix> (
  OUT param_1 TABLE (RESULT NVARCHAR(1024))) CONFIGURATION '{
  "__DP_UNIQUE_NAME__": "RESTART_AGENT",
  "__DP_VIRTUAL_PROCEDURE__": true
}' AT "<remote_source_name>";
```

## Example

```
--Call the procedure to restart the agent
call SYSTEM.RESTART_AGENT_<postfix>(?);
```

## 6.2.2 Apache Camel Facebook

Overview of this SAP HANA Smart Data Integration adapter's features and functionality

The Apache Camel Facebook adapter is created based on Camel Adapter. The adapter uses the Facebook component (<http://camel.apache.org/facebook.html>) to access Facebook APIs. Facebook data of the configured Facebook user such as friends, families, and movies, are exposed to SAP HANA server by virtual tables by the Camel Facebook Adapter.

This adapter supports the following functionality:

- Virtual table as a source
- CAP\_SELECT

### 6.2.2.1 Set up the Camel Facebook Adapter

By default, Camel Facebook Adapter is not available in Data Provisioning Agent. To use it, you must perform setup tasks.

#### Procedure

1. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of Camel Facebook Adapter.

```
<Adapter type="CamelFacebookAdapter" displayName="Camel Facebook Adapter">
  <RemoteSourceDescription>
    <PropertyGroup name="configuration" displayName="Configuration"/>
    <CredentialEntry name="app_credential" displayName="App Credential"
userDisplayName="App ID" passwordDisplayName="App Secret"/>
    <CredentialEntry name="user_credential" displayName="User Credential"
userDisplayName="User ID" passwordDisplayName="User Access Token"/>
  </RemoteSourceDescription>
  <Capabilities>
    CAP_SELECT,
    CAP_WHERE,
    CAP_SIMPLE_EXPR_IN_WHERE,
    CAP_EXPR_IN_WHERE,
    CAP_NESTED_FUNC_IN_WHERE,
    CAP_METADATA_DICTIONARY,
    CAP_METADATA_ATTRIBUTE
  </Capabilities>
  <RouteTemplate>facebook.xml</RouteTemplate>
</Adapter>
```

2. Download Facebook4J, and put it in the `<DPAgent_root>/camel/lib` directory.

#### Note

See the SAP HANA Smart Data Integration Product Availability Matrix for information about version compatibility with these downloads.

## Related Information

[Product Availability Matrix](#)

[Facebook4J](#)

[Apache Camel downloads](#)

### 6.2.2.2 Camel Facebook Adapter Remote Source Configuration

Configuration settings for accessing a Camel Facebook source. Also included is sample code for creating a remote source using the SQL console.

The Camel Facebook adapter has the following remote source configuration parameters. You use all of these parameters to configure Facebook component options; See `<DPAgent_root>/camel/facebook.xml`. If you need to specify non-default values for Facebook component options, you can add more remote source parameters in the adapter configuration in `adapters.xml`, and update the Facebook component bean in `<DPAgent_root>/camel/facebook.xml` accordingly. See <http://camel.apache.org/facebook.html> for a complete list of these options.

Facebook requires the use of OAuth for all client application authentication. To use the Camel Facebook adapter with your account, you need to create a new application within Facebook at <https://developers.facebook.com/apps> and grant the application access to your account. The Facebook application's ID and secret allow access to Facebook APIs that do not require a current user. A user access token is required for APIs that require a logged in user. You can find more information about obtaining a user access token at <https://developers.facebook.com/docs/facebook-login/access-tokens/>.

| Category        | Option            | Description                 |
|-----------------|-------------------|-----------------------------|
| App Credential  | App ID            | Facebook application ID     |
|                 | App Secret        | Facebook application Secret |
| User Credential | User ID           | Facebook user ID            |
|                 | User Access Token | The user access token.      |

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyFacebookSource" ADAPTER "CamelFacebookAdapter" AT
LOCATION AGENT "MyAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?'>
<ConnectionProperties name="configuration">
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="app_credential">
<user>myappuserid</user>
<password>myappusertoken</password>
```



```
</CredentialEntry>
<CredentialEntry name="user_credential">
<user>myuserid</user>
<password>myusertoken</password>
</CredentialEntry>'
```

## Related Information

[Store Remote Data Source Credentials Securely \[page 68\]](#)

## 6.2.3 Apache Camel Informix

Use the Camel Informix adapter to connect to an IBM Informix remote source.

### Note

Before you register the adapter with the SAP HANA system, ensure that you've downloaded and installed the correct JDBC libraries. Place the files in the `<DPAgent_root>/lib` folder.

For more information about the supported JDBC libraries, see the *Product Availability Matrix (PAM)*.

This adapter supports using a virtual table as a source.

## Related Information

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

### 6.2.3.1 Set Up the Camel Informix Adapter

By default, Camel Informix Adapter is not available in Data Provisioning Agent. To use it, you must perform setup tasks.

## Procedure

1. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of Camel Informix Adapter.

```
<Adapter type="CamelDatabaseAdapter" displayName="Camel database Adapter">
```

```

    <RemoteSourceDescription>
      <PropertyGroup name="configuration" displayName="Configuration">
        <PropertyEntry name="host" displayName="Host"
description="Host name" isRequired="true"/>
        <PropertyEntry name="port" displayName="Port"
description="Port number" isRequired="true"/>
        <PropertyEntry name="dbname" displayName="Database"
description="Database Name" isRequired="true"/>
        <PropertyEntry name="servername" displayName="Server Name"
description="Server Name" isRequired="false"/>
        <PropertyEntry name="delimident" displayName="delimident"
description="delimident" isRequired="false"/>
      </PropertyGroup>
      <CredentialEntry name="db_credential" displayName="Credential"
userDisplayName="user" passwordDisplayName="password"/>
    </RemoteSourceDescription>
    <Capabilities>
      <Informix List of Capabilities>
    </Capabilities>
    <RouteTemplate>jdbc.xml</RouteTemplate>
  </Adapter>

```

2. Copy `<DPAgent_root>/camel/samples/sample-jdbc.xml` to `<DPAgent_root>/camel/` and rename to `jdbc.xml`.
3. Download the Informix jdbc driver `ifxjdbc.jar`, and put it in the `<DPAgent_root>/camel/lib` directory.

## 6.2.3.2 Camel Informix Remote Source Configuration

Configure the following options in SAP HANA smart data access to configure your connection to an Informix remote source. Also included is sample code for creating a remote source using the SQL console.

| Category                 | Option                      | Description   |
|--------------------------|-----------------------------|---|
| Configuration            | Host                        | Host name   |
|                          | Port                        | Port number   |
|                          | Database Name               | Database name   |
|                          | Server Name                 | Server name   |
|                          | Delimident                  | If set to <i>True</i> , the Informix database object name is enclosed with double quotation marks.  |
| Configuration > Security | Use Agent Stored Credential | Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.<br><br>The default value is <i>False</i> .                  |
| Credentials              | Credentials Mode            | <i>Technical user</i> or <i>Secondary user</i><br><br>Select one of the choices depending on the purpose of the remote source you want to create. |

| Category        | Option   | Description                       |
|-----------------|----------|-----------------------------------|
| User Credential | User     | The Informix user name            |
|                 | Password | The Informix user name's password |

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyInformixSource" ADAPTER "CamelInformixAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="generic" displayName="Generic">
<PropertyEntry name="instance_name" displayName="Instance Name"
isRequired="true">MyInformixSource</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="host" displayName="Host"
isRequired="true">myhost.sap.corp</PropertyEntry>
<PropertyEntry name="port" displayName="Port Number" isRequired="true">32566</
PropertyEntry>
<PropertyEntry name="dbname" displayName="Database Name"
isRequired="true">mydb</PropertyEntry>
<PropertyEntry name="servername" displayName="Server name"
isRequired="true">myserver</PropertyEntry>
<PropertyEntry name="delimident" displayName="delimident"
isRequired="true">true</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="db_credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

## Related Information

[Store Remote Data Source Credentials Securely \[page 68\]](#)

## 6.2.4 Apache Camel JDBC

Use the Camel JDBC adapter to connect to most databases for which SAP HANA smart data integration doesn't already provide a pre-delivered adapter. In general, the Camel JDBC adapter supports any database that has SQL-based data types and functions, and a JDBC driver.

### Note

Adapters based on the Camel framework are intended for generic low-volume, simple, and infrequent SQL queries to data sources that don't have dedicated SAP HANA smart data integration adapters. Expect Camel-based adapters to have a higher memory footprint, slower performance, and fewer SQL pushdown capabilities compared to dedicated adapters.

### → Tip

If you're using MS Access or IBM Informix, use the Camel adapters specific to those databases.

## Adapter Functionality

This adapter supports the following functionality:

- SELECT, INSERT, UPDATE, and DELETE
- Virtual table as a source
- Virtual table as a target using a Data Sink node in a flowgraph

## Related Information

[Apache Camel Microsoft Access \[page 202\]](#)

[Apache Camel Informix \[page 193\]](#)

### 6.2.4.1 Set up the Camel JDBC Adapter

By default, Camel JDBC Adapter isn't available in Data Provisioning Agent. To use it, you must perform setup tasks.

#### Procedure

1. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of Camel JDBC Adapter.

```
<Adapter type="CamelJdbcAdapter" displayName="Camel Jdbc Adapter">
  <RemoteSourceDescription>
    <PropertyGroup name="configuration" displayName="Configuration">
      <PropertyEntry name="dbtype" displayName="Database Type"
description="Database Type" defaultValue="other" isRequired="true">
        <Choices>
          <Choice name="access" displayName="Access" />
          <Choice name="informix" displayName="Informix" />
        </Choices>
      </PropertyEntry>
    </PropertyGroup>
  </RemoteSourceDescription>
</Adapter>
```

```

        <Choice name="other" displayName="Other"/>
    </Choices>
</PropertyEntry>
<PropertyEntry name="filepath" displayName="Access file path"
description="Access file path" isRequired="false">
    <Dependencies>
        <Dependency name="dbtype" value="access"/>
    </Dependencies>
</PropertyEntry>
<PropertyEntry name="filename" displayName="Access file name"
description="Access file name" isRequired="false">
    <Dependencies>
        <Dependency name="dbtype" value="access"/>
    </Dependencies>
</PropertyEntry>
<PropertyEntry name="host" displayName="Host"
description="Host name" isRequired="false"/>
<PropertyEntry name="port" displayName="Port"
description="Port number" isRequired="false"/>
<PropertyEntry name="dbname" displayName="Database"
description="Database Name" isRequired="false"/>
<PropertyEntry name="servername" displayName="Server Name"
description="Server Name" isRequired="false"/>
<PropertyEntry name="delimident" displayName="delimident"
description="delimident" defaultValue="false" isRequired="false"/>
    <Choices>
        <Choice name="true" displayName="True"/>
        <Choice name="false" displayName="False"/>
    </Choices>
<PropertyEntry name="driverClass" displayName="JDBC Driver
Class" description="JDBC Driver Class" isRequired="false"/>
<PropertyEntry name="url" displayName="JDBC URL"
description="JDBC URL" isRequired="false"/>
</PropertyGroup>
<CredentialEntry name="db_credential" displayName="Credential"
userDisplayName="user" passwordDisplayName="password"/>
</RemoteSourceDescription>
<Capabilities>
    CAP_AND_DIFFERENT_COLUMNS,
    CAP_TRUNCATE_TABLE,
    CAP_LIKE,
    CAP_IN,
    CAP_AND,
    CAP_OR,
    CAP_DISTINCT,
    CAP_HAVING,
    CAP_ORDERBY,
    CAP_ORDERBY_EXPRESSIONS,
    CAP_GROUPBY,
    CAP_SELECT,
    CAP_INSERT,
    CAP_UPDATE,
    CAP_DELETE,
    CAP_EXCEPT,
    CAP_INTERSECT,
    CAP_AGGREGATES,
    CAP_AGGREGATE_COLNAME,
    CAP_DIST_AGGREGATES,
    CAP_INSERT_SELECT,
    CAP_JOINS,
    CAP_JOINS_OUTER,
    CAP_BI_SUBSTRING,
    CAP_BI_NOW,
    CAP_BI_UPPER,
    CAP_BI_LOWER,
    CAP_BI_LCASE,
    CAP_BI_UCASE,
    CAP_BI_CONCAT,

```

```

CAP_BI_LTRIM,
CAP_BI_RTRIM,
CAP_BI_TRIM,
CAP_WHERE,
CAP_SIMPLE_EXPR_IN_PROJ,
CAP_EXPR_IN_PROJ,
CAP_NESTED_FUNC_IN_PROJ,
CAP_SIMPLE_EXPR_IN_WHERE,
CAP_EXPR_IN_WHERE,
CAP_NESTED_FUNC_IN_WHERE,
CAP_SIMPLE_EXPR_IN_INNER_JOIN,
CAP_EXPR_IN_INNER_JOIN,
CAP_NESTED_FUNC_IN_INNER_JOIN,
CAP_SIMPLE_EXPR_IN_LEFT_OUTER_JOIN,
CAP_EXPR_IN_LEFT_OUTER_JOIN,
CAP_NESTED_FUNC_IN_LEFT_OUTER_JOIN,
CAP_SIMPLE_EXPR_IN_ORDERBY,
CAP_EXPR_IN_ORDERBY,
CAP_NESTED_FUNC_IN_ORDERBY,
CAP_NONEQUAL_COMPARISON,
CAP_OR_DIFFERENT_COLUMNS,
CAP_PROJECT,
CAP_BI_SECOND, ,
CAP_BI_MINUTE,
CAP_BI_HOUR,
CAP_BI_MONTH,
CAP_BI_YEAR,
CAP_BI_COT,
CAP_BI_ABS,
CAP_BI_ACOS,
CAP_BI_ASIN,
CAP_BI_ATAN,
CAP_BI_ATAN2,
CAP_BI_CEILING,
CAP_BI_COS,
CAP_BI_EXP,
CAP_BI_FLOOR,
CAP_BI_LN,
CAP_BI_CEIL,
CAP_BI_LOG,
CAP_BI_MOD,
CAP_BI_POWER,
CAP_BI_SIGN,
CAP_BI_SIN,
CAP_BI_SQRT,
CAP_BI_TAN,
CAP_BI_ROUND,
CAP_BI_ASCII,
CAP_BI_RIGHT,
CAP_BI_LEFT,
CAP_BI_TO_BIGINT,
CAP_BI_TO_DECIMAL,
CAP_BI_TO_DOUBLE,
CAP_BI_TO_REAL,
CAP_BI_TO_SMALLINT,
CAP_BI_TO_INT,
CAP_BI_TO_INTEGER
CAP_BI_COALESCE,
CAP_BI_IFNULL,
CAP_BI_NULLIF,
CAP_BIGINT_BIND
</Capabilities>
<RouteTemplate>jdbc-general.xml</RouteTemplate>
</Adapter>

```

2. Download the appropriate JDBC file, and copy it to the `<DPAgent_root>/camel/lib` directory.

## 6.2.4.2 Camel JDBC Remote Source Configuration

Configure the following options to create a connection to a remote database. Also included is sample code for creating a remote source using the SQL console.

| Category                 | Option                      | Description  |
|--------------------------|-----------------------------|--|
| Configuration            | Database Type               | Specifies the type of database to which you want to connect.   |
|                          | JDBC Driver Class           | Specifies the JDBC driver class for the database you're using.<br><br>For example, <code>com.mysql.cj.jdbc.Driver</code> for MySQL 8.0.  |
|                          | Additional Driver Folder    | Specifies an additional local folder to search for the database driver class in addition to the default path ( <code>&lt;DPAgent_root&gt;/camel/lib</code> ).<br><br>For example, <code>/Applications/Eclipse.app/Contents/MacOS/aws</code>  |
|                          | JDBC URL                    | Specifies the URL for the JDBC driver.   |
| Configuration > Security | Use Agent Stored Credential | Set to <code>True</code> to use credentials that are stored in the Data Provisioning Agent secure storage.<br><br>The default value is <code>False</code> .  |
| Credentials              | Credentials Mode            | Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials. <ul style="list-style-type: none"> <li><b>Technical User:</b> A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><b>Secondary User:</b> A unique access credential on the remote source assigned to a specific user.</li> </ul> |
| User Credentials         | Database user name          | Specifies the database user name.  |
|                          | Database user password      | Specifies the password for the database user.  |

### Example SQL Configuration for Netezza

```
CREATE REMOTE SOURCE "MyNetezzaSource" ADAPTER "CamelJdbcAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?'>
<ConnectionProperties name="configuration">
  <PropertyEntry name="dbtype" displayName="Database Type"
isRequired="true">netezza</PropertyEntry>
  <PropertyEntry name="driverClass" displayName="JDBC Driver Class"
isRequired="false">org.netezza.Driver</PropertyEntry>
  <PropertyEntry name="url" displayName="JDBC URL"
isRequired="false">jdbc:netezza://<host name>:<port number>/<database name></
PropertyEntry>
```

```

</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="db_credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry

```

## Example SQL Configuration for Vertica

```

CREATE REMOTE SOURCE "MyVerticaSource" ADAPTER "CamelJdbcAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configuration">
<PropertyEntry name="dbtype" displayName="Database Type"
isRequired="true">vertica</PropertyEntry>
<PropertyEntry name="driverClass" displayName="JDBC Driver Class"
isRequired="false">com.vertica.jdbc.Driver</PropertyEntry>
<PropertyEntry name="url" displayName="JDBC URL"
isRequired="false">jdbc:vertica://<host name>:<port number>/<database name></
PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="db_credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry

```

## Related Information

[Store Remote Data Source Credentials Securely \[page 68\]](#)

### 6.2.4.3 Connect to MySQL Using the Camel JDBC Adapter

You can connect to MySQL using the Camel JDBC adapter.

#### Procedure

1. Download and place the `mysql-connector-java-<version>-bin.jar` file under `<DPAgent_root>/camel/lib` folder. If there is no `/lib` folder, create one.
2. Append relevant property strings to the `JDBC URL` parameter in the remote source configuration:
  - To allow MySQL to treat double quotes (") as an identifier quote character:  
`sessionVariables=sql_mode=ANSI_QUOTES`
  - To show only objects under the same category: `nullCatalogMeansCurrent=true`



For example, `jdbc:mysql://<hostname>:3307/<database>?sessionVariables=sql_mode=ANSI_QUOTES&nullCatalogMeansCurrent=true`

3. Restart the Data Provisioning Agent.

## Related Information

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

[Camel JDBC Remote Source Configuration \[page 199\]](#)

### 6.2.4.4 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

#### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. In the *Agent Preferences* menu, choose *Set Agent Preferences*.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

#### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Agent Configuration Parameters \[page 112\]](#)

## 6.2.5 Apache Camel Microsoft Access

Read Microsoft Access data.

The Apache Camel Microsoft Access adapter is created based on Camel Adapter. Using the adapter, you can access Microsoft Access database data via virtual tables.

### Note

The Camel Access adapter can be used only when the Data Provisioning Agent is installed on Microsoft Windows.

This adapter supports the following functionality:

- Virtual table as a source

## 6.2.5.1 Set Up the Camel Microsoft Access Adapter

Set up the Camel Microsoft Access adapter.

### Context

By default, Camel Microsoft Access adapter is not available in Data Provisioning Agent. To use it, you must do the following:

### Procedure

1. In Microsoft Access, in the Tables window, right-click *MSysObjects*, and select *Navigation Options* to show system objects.
2. In the Info window of Microsoft Access, right-click the *Users and Permissions* button, and select *User and Group Permissions* to give an admin user all permissions on MSysObjects.
3. Enable macros in the Microsoft Access Trust Center.
4. Run the following command:

```
Sub currentuser()  
  strDdl = "GRANT SELECT ON MSysObjects TO Admin;"  
  CurrentProject.Connection.Execute strDdl  
End Sub
```

5. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of CamelAccessAdapter.

Uncomment the following:

```
<Adapter type="CamelAccessAdapter" displayName="Camel access Adapter">  
  ...  
</Adapter>
```

## 6.2.5.2 Microsoft Access Remote Source Configuration

Configure the following options in smart data access to configure your connection to a Microsoft Access remote source. Also included is sample code for creating a remote source using the SQL console.

| Category      | Option           | Description   |
|---------------|------------------|---|
| Configuration | Access File Path | Specifies the path to the Microsoft Access database file. |
|               | Access File Name | Specifies the name of the Microsoft Access database file. |

| Category                 | Option                      | Description   |
|--------------------------|-----------------------------|---|
| Configuration > Security | Use Agent Stored Credential | Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.<br><br>The default value is <i>False</i> .                  |
| Credentials              | Credentials Mode            | <i>Technical user</i> or <i>Secondary user</i><br><br>Select one of the choices depending on the purpose of the remote source you want to create. |
|                          | User                        | The user name for the Microsoft Access account.   |
|                          | Password                    | The password for the Microsoft Access account.  |

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyAccessSource" ADAPTER "CamelAccessAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="table" displayName="table">
<PropertyEntry name="filepath" displayName="Access file path">C:/access_data</
PropertyEntry>
<PropertyEntry name="filename" displayName="Access file name">database1.mdb</
PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="db_credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

## Related Information

[Store Remote Data Source Credentials Securely \[page 68\]](#)

## 6.2.6 Apache Cassandra

Apache Cassandra is a free and open-source distributed NoSQL database management system designed to handle large amounts of data across many commodity servers, providing high availability with no single point of failure.

The Cassandra adapter is specially designed for accessing and manipulating data from Cassandra Database.

### Note

The minimum supported version of Apache Cassandra is 1.2.

### Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Virtual table as a target using a Data Sink node in a flowgraph
- Kerberos authentication
- SSL support

In addition, this adapter supports the following capabilities:

- SELECT, INSERT, DELETE, UPDATE, WHERE, DISTINCT, LIMIT, ORDERBY

### Related Information

[SAP HANA Smart Data Integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

### 6.2.6.1 Cassandra SSL Configuration

Configure SSL for connecting to your Cassandra remote source.

To enable SSL, on Cassandra you must import the server certificates and enable client authentication.

### Related Information

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

## 6.2.6.1.1 Enable SSL on Cassandra

You must enable SSL on your Cassandra remote source before you can connect to it.

### Procedure

1. Prepare the server certificates.
2. Edit the `cassandra.yaml` file as follows:

```
client_encryption_options:
  enabled: true
  optional: false
  keystore: .keystore
  keystore_password: Sybase123
  require_client_auth: false
  truststore: .truststore
  truststore_password: Sybase123
  # More advanced defaults below:
  protocol: ssl
  store_type: JKS
  cipher_suites: [TLS_RSA_WITH_AES_128_CBC_SHA,
TLS_RSA_WITH_AES_256_CBC_SHA]
```

3. Export the certificates from all Cassandra nodes and copy them to the Data Provisioning Agent host.

```
keytool -export -alias dse_node0 -file dse_node0.cer -keystore .keystore
```

4. Import the certificates into the Data Provisioning Agent truststore.

```
$ keytool -import -v -trustcacerts -alias dse_node0 -file dse_node0.cer
-keystore <installation_path>/ssl/cacerts
$ keytool -import -v -trustcacerts -alias dse_node1 -file dse_node1.cer
-keystore <installation_path>/ssl/cacerts
```

5. Restart Cassandra.
6. In the SAP HANA smart data integration Cassandra remote source configuration options, set `Use SSL` to `True`, and set `Use Client Authentication` as desired.

### Related Information

[Cassandra Remote Source Configuration \[page 210\]](#)

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

## 6.2.6.1.2 Enable Client Authentication

Enable client authentication when you are using SSL.

### Context

To enable client authentication, you must edit a Cassandra file and properly configure your remote source.

### Procedure

1. Edit the `cassandra.yaml` file.

```
client_encryption_options:
  enabled: true
  optional: false
  keystore: .keystore
  keystore_password: Sybase123
  require_client_auth: true
  truststore: .truststore
  truststore_password: Sybase123
  # More advanced defaults below:
  protocol: ssl
  store_type: JKS
  cipher_suites: [TLS_RSA_WITH_AES_128_CBC_SHA,
TLS_RSA_WITH_AES_256_CBC_SHA]
  # More advanced defaults below:
  protocol: ssl
  store_type: JKS
  cipher_suites: [TLS_RSA_WITH_AES_128_CBC_SHA,
TLS_RSA_WITH_AES_256_CBC_SHA]
```

2. Generate the private and public key pair for the Data Provisioning Agent node.

```
keytool -genkey -alias dpagent -keyalg RSA -keystore cacerts
```

Leave the key password the same as the keystore password, and export the public key.

```
keytool -export -alias dpagent -file dpagent.cer -keystore cacerts
```

3. Copy the `dpagent.cer` file to each Cassandra node, and import it into the Cassandra truststore.

```
keytool -import -v -trustcacerts -alias dpagent -file dpagent.cer
-keystore .truststore
```

4. Restart Cassandra.
5. Enable client authentication when creating a remote source by setting the *Use Client Authentication* parameter to *True*.

## Related Information

[Cassandra Remote Source Configuration \[page 210\]](#)

### 6.2.6.2 Enable Kerberos Authentication

The Cassandra adapter by default allows user name and password authentication. However, you can improve security by enabling Kerberos authentication.

#### Procedure

1. On each node, confirm DNS is working:

```
$ hostname
node1.example.com
```

2. On each node, confirm that NTP is configured and running:

```
$ ntpq -p
remote          refid          st t when poll reach  delay  offset
jitter
=====
*li506-17.member 209.51.161.238 2  u 331 1024 377  80.289  1.384  1.842
-tock.eoni.com   216.228.192.69 2  u 410 1024 377  53.812  1.706 34.692
+time01.muskegon 64.113.32.5    2  u 402 1024 377  59.378  -1.635 1.840
-time-a.nist.gov .ACTS.         1  u 746 1024 151 132.832 26.931 55.018
+golem.canonical 131.188.3.220  2  u 994 1024 377 144.080 -1.732 20.072
```

3. Install the Kerberos client software.

RHEL-based systems

```
$ sudo yum install krb5-workstation krb5-libs krb5-pkinit-openssl
```

Debian-based systems

```
$ sudo apt-get install krb5-user krb5-config krb5-pkinit
```

SUSE systems

```
$ sudo zypper install krb5-client
```

4. Edit the `/etc/krb5.conf` file to add the KDC domain configuration.
5. Create a user for the client.

```
cassandra@cqlsh:dp_test> create user 'cass@EXAMPLE.COM' with password
'Sybase123' superuser;
```

6. Prepare the keytab for each Cassandra node.

```
addprinc -randkey cassandra/node1.example.com
```



```
addprinc -randkey HTTP/node1.example.com
addprinc -randkey cassandra/node2.example.com
addprinc -randkey HTTP/node2.example.com
...
ktadd -k dse.keytab cassandra/FQDN
ktadd -k dse.keytab HTTP/FQDN
```

7. Copy keytabs to the related Cassandra nodes, and edit the `dse.yaml` file.

```
kerberos_options:
  keytab: resources/dse/conf/dse.keytab
  service_principal: cassandra/_HOST@EXAMPLE.COM
  http_principal: HTTP/_HOST@EXAMPLE.COM
  qop: auth
```

8. Edit the `cassandra.yaml` file.

```
authenticator: com.datastax.bdp.cassandra.auth.KerberosAuthenticator
```

9. Restart Cassandra.
10. Prepare the keytab for the DP Agent. The principal must have the value of the user created previously in this procedure.

```
addprinc -randkey cass@EXAMPLE.COM
ktadd -k dpagent.keytab cass@EXAMPLE.COM
```

11. Copy the `dpagent.keytab` file to the DP Agent host, and create your remote source.

## Related Information

[Cassandra Remote Source Configuration \[page 210\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

## 6.2.6.3 Cassandra Remote Source Configuration

Configure the following options for a connection to an Apache Cassandra remote source. Also included is sample code for creating a remote source using the SQL console.

| Category              | Option                              | Description  |
|-----------------------|-------------------------------------|--|
| Connection            | Hosts                               | <p>The list of host names and ports Cassandra used to connect to the Cassandra cluster.</p> <p>The hosts and ports should be provided in the following format:</p> <pre>host1[:port1] [,host2[:port2],host3[:port3]...]</pre> <p>If the port number is not provided for a host, the default port 9042 will be used for the host.</p> <p>Only one host is needed to discover the cluster topology, but it is usually a good idea to provide more so the driver can revert if the first one is down.</p> |
|                       | Authentication Mechanism            | <p><i>User Name and Password</i> (Default): Use user name and password to perform the authentication.</p> <p><i>Kerberos</i>: Use Kerberos to perform the authentication.</p>  |
|                       | Paging Status                       | Specify whether to enable paging when getting the results of a query from Cassandra. The default value is <i>On</i> .  |
|                       | Read Timeout (milliseconds)         | Specify the number of milliseconds the driver waits for a response from a given Cassandra node, before considering it unresponsive.  |
|                       | Connect Timeout (milliseconds)      | Specify the number of milliseconds the driver waits to establish a new connection to a Cassandra node before giving up.  |
| Data Type Conversion  | Map TEXT/VARCHAR to NVARCHAR (5000) | Cassandra data types TEXT and VARCHAR are mapped to NCLOB in HANA, which makes it impossible to use these columns as query conditions in a WHERE clause. Set the value to <i>True</i> to map to NVARCHAR instead. The default value is <i>False</i> .  |
|                       | Map ASCII to VARCHAR (5000)         | The Cassandra data type ASCII is mapped to CLOB in HANA, which makes it impossible to use these columns as query conditions in a WHERE clause. Set the value to <i>True</i> to map to VARCHAR instead. The default value is <i>False</i> .   |
| Load Balancing Policy | Use Round Robin Policy              | <p>Specify whether to use the Round Robin Policy. The default value is <i>False</i>.</p> <p>You can use either <i>Round Robin Policy</i> or <i>DC Aware Round Robin Policy</i>, but not both.</p>  |

| Category | Option                          | Description   |
|----------|---------------------------------|---|
|          | Use DC Aware Round Robin Policy | Specify whether to use the DC Aware Round Robin Policy. The default value is <i>False</i> .<br><br>You can use either <i>DC Aware Round Robin Policy</i> or <i>DC Aware Round Robin Policy</i> , but not both.  |
|          | Use Token Aware Policy          | Specify whether to use the Token Aware Policy. The default value is <i>False</i> .<br><br>Either <i>Round Robin Policy</i> or <i>DC Aware Round Robin Policy</i> must be used as your child policy if this parameter is set to <i>True</i> .  |
|          | Use Latency Aware Policy        | Specify whether to use the Latency Aware Policy. The default value is <i>False</i> .<br><br>Either <i>Round Robin Policy</i> or <i>DC Aware Round Robin Policy</i> must be used as your child policy if this parameter is set to <i>True</i> .  |
| Security | Use SSL                         | Specify whether to connect to Cassandra using SSL. The default value is <i>False</i> .  |
|          | Use Client Authentication       | Specify whether to connect to Cassandra using client authentication. The default value is <i>False</i> .<br><br>This parameter works only if <i>Use SSL</i> is set to <i>True</i> .   |
|          | Use Agent Stored Credential     | Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.   |
| Kerberos | Realm                           | Optional when using Kerberos. Authenticate using a principal from this realm instead of the systems default realm. The <i>Realm</i> option must be used together with the Key Distribution Center ( <i>KDC</i> ).   |
|          | KDC                             | Optional when using Kerberos. The address of the KDC to be used with the specified Realm, which has to be used together with <i>Realm</i> .   |
|          | Service Name                    | The SASL protocol name to use, which should match the user name of the Kerberos service principal used by the DSE server.   |
|          | Use Keytab                      | Set this to <i>True</i> if you want the module to get the technical user's key from the keytab. The default value is <i>False</i> .<br><br>If <i>Key Tab</i> is not set, then the module locates the keytab from the Kerberos configuration file. If it is not specified in the Kerberos configuration file, then the module looks for the file <code>&lt;user .home&gt;&lt;file .separator&gt;krb5.keytab</code> . |
|          | Keytab                          | Set this to the file name of the keytab to get the technical user's secret key.   |

| Category    | Option           | Description   |
|-------------|------------------|---|
|             | Use Ticket Cache | <p>Set this to true if you want the ticket-granting ticket (TGT) to be obtained from the ticket cache. Set this option to <i>False</i> if you do not want this module to use the ticket cache. The default value is <i>False</i>.</p> <p>This module searches for the ticket cache in the following locations:</p> <ul style="list-style-type: none"> <li>• On Solaris and Linux, in <code>/tmp/krb5cc_&lt;uid&gt;</code>, where the uid is a numeric user identifier.</li> <li>• If the ticket cache is not available in <code>/tmp/krb5cc_&lt;uid&gt;</code>, or if you are on a Windows platform, the module looks for the cache as <code>&lt;user.home&gt;&lt;file.separator&gt;krb5cc_&lt;user.name&gt;</code>. You can override the ticket cache location by using the <i>Ticket Cache</i> parameter.</li> <li>• For Windows, if a ticket cannot be retrieved from the file ticket cache, the module uses Local Security Authority (LSA) API to get the TGT.</li> </ul> |
|             | Ticket Cache     | Set this to the name of the ticket cache that contains the user's TGT. If this is set, <i>Use Ticket Cache</i> must also be set to true; otherwise, a configuration error is returned.  |
| Credentials | Credentials Mode | Select <i>Technical user</i> or <i>Secondary user</i> depending on the purpose of the remote source you want to create.   |
|             | User             | The user used to connect to Cassandra database. If Kerberos is used, the user should be the client principal and also a Cassandra user.   |
|             | Password         | The password of the Cassandra user.   |

## SQL

```
CREATE REMOTE SOURCE "cassandra_rs" ADAPTER "CassandraAdapter" AT LOCATION AGENT
"CassandraAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="connection" displayName="Connection">
    <PropertyEntry name="hosts" displayName="Host names and
ports">oakl00548161a.amer.global.corp.sap</PropertyEntry>
    <PropertyEntry name="auth_mech" displayName="Authentication
Mechanism">user_password</PropertyEntry>
    <PropertyEntry name="paging_status" displayName="Paging Status">true</
PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="load_balancing_policy" displayName="Load Balancing
Policy">
```

```

    <PropertyEntry name="use_rr_policy" displayName="Use Round Robin
Policy">false</PropertyEntry>
    <PropertyEntry name="use_dc_aware_rr_policy" displayName="Use DC Aware
Round Robin Policy">false</PropertyEntry>
    <PropertyEntry name="shuffle_replicas" displayName="Shuffle
Replicas">true</PropertyEntry>
    <PropertyEntry name="use_latency_aware_policy" displayName="Use Latency
Aware Policy">false</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="security" displayName="Security">
    <PropertyEntry name="use_ssl" displayName="Use SSL">false</PropertyEntry>
    <PropertyEntry name="use_client_auth">false</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="kerberos" displayName="Kerberos">
    <PropertyEntry name="krb_realm" displayName="Realm"
allowAlterWhenSuspended="true"></PropertyEntry>
    <PropertyEntry name="krb_kdc" displayName="KDC"
allowAlterWhenSuspended="true"></PropertyEntry>
    <PropertyEntry name="krb_protocol" displayName="Protocol"
allowAlterWhenSuspended="true"></PropertyEntry>
    <PropertyEntry name="krb_use_keytab" displayName="Use Key Tab"
allowAlterWhenSuspended="true"></PropertyEntry>
    <PropertyEntry name="krb_keytab" displayName="Key Tab" description="Key
Tab" allowAlterWhenSuspended="true"></PropertyEntry>
    <PropertyEntry name="krb_use_ticket_cache" displayName="Use Ticket
Cache" allowAlterWhenSuspended="true"></PropertyEntry>
    <PropertyEntry name="krb_ticket_cache" displayName="Ticket Cache"
allowAlterWhenSuspended="true"></PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>cassandra</user>
  <password>cassandra</password >
</CredentialEntry>';

```

## Related Information

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

[Enable SSL on Cassandra \[page 206\]](#)

[Enable Client Authentication \[page 207\]](#)

[Store Remote Data Source Credentials Securely \[page 68\]](#)

### 6.2.6.4 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

#### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. In the *Agent Preferences* menu, choose *Set Agent Preferences*.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Agent Configuration Parameters \[page 112\]](#)

## 6.2.7 Apache Impala

The Apache Impala adapter is a data provisioning adapter that is used to access Apache Impala tables.

An Impala table can be internal table, external table, or partition table. Impala tables could be stored as data files with various file formats. Also, they can be Kudu tables stored by Apache Kudu. Different table types have different sets of operations to support. For example, tables stored as data files do not support UPDATE and DELETE SQL, as well as PRIMARY KEY. However, Kudu tables support them.

An Impala table type is transparent to the Impala adapter. The Impala adapter supports all of these types of tables and cares about column metadata only. The Impala adapter supports operations that are legal to the back end Impala table.

## Required JDBC Drivers

The Impala adapter requires you to install the Impala JDBC connector in DPAgent. Follow the steps below to install the Impala JDBC connector:

1. Download the latest Impala JDBC connector from <https://www.cloudera.com/downloads/connectors/impala/jdbc.html>.
2. From that ZIP file, unzip `Cloudera_ImpalaJDBC41_<version_number>.zip`, and put all jar files into the `<DPAgent_root>/lib/impala` directory. Create the directory if it does not exist.

## Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- SELECT, WHERE, JOIN, DISTINCT, TOP, LIMIT, ORDER BY, GROUP BY

## Related Information

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

### 6.2.7.1 Apache Impala Remote Source Configuration

Configure the following options for a connection to an Apache Impala remote source. Also included is sample code for creating a remote source using the SQL console.

| Category   | Option | Description                                 |
|------------|--------|---|
| Connection | Host   | Impala host name or IP address.             |
|            |        | Impala server port. Default value is 21050. |

| Category | Option  | Description  |
|----------|---|--|
|          |   | <p>Authentication mechanism that is used to connect to the Impala Server. Choose from the following values:</p> <ul style="list-style-type: none"> <li>No Authentication (0 in SQL)</li> <li>Kerberos (1 in SQL)</li> <li>User Name (The LDAP bind name) (2 in SQL)</li> <li>User Name and Password (Default) (Used for LDAP authentication) (3 in SQL)</li> </ul>   |
| Security | Enable SSL Encryption                           | <p>Specify whether to connect to Impala Server using SSL.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The CA certificate for the remote source must be imported into the adapter truststore on the Data Provisioning Agent host.</p> </div>  |
|          | Use Agent Stored Credential                     | Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.   |
|          | Allow Self-Signed Server SSL Certificate        | Specify whether to allow the server to use a self-signed SSL certificate. This property is meaningful only if SSL is enabled.  |
|          | Require Certificate Name Match Server Host Name | Specify whether to require that a CA-issued SSL certificate name must match the Impala Server host name. This property is meaningful only if SSL is enabled.   |
| Kerberos | Realm   | Optional. If specified, you can omit the realm part (for example @EXAMPLE.COM) of the <i>Impala Service Principal</i> and <i>User Principal</i> properties.  |
|          | KDC   | Kerberos Key Distribution Center (KDC). This property is optional and meaningful only if the <i>Realm</i> parameter is specified. If the <i>Realm</i> parameter is not specified, the parameter must be manually configured in <code>&lt;DPAgent_root&gt;/krb5/krb5.conf</code> for the realm of <i>Impala Service Principal</i> and <i>User Principal</i> .   |
|          | Impala Service Principal                        | Specify the Kerberos principal of the Impala service.  |
|          | User Principal                                  | Specify the Kerberos principal of the connection user.   |
|          | Use Keytab                                      | <p>Set this to <i>True</i> if you want the module to get the technical user's key from the keytab. The default value is <i>False</i>.</p> <p>If <i>Key Tab</i> is not set, then the module locates the keytab from the Kerberos configuration file. If it is not specified in the Kerberos configuration file, then the module looks for the file <code>&lt;user.home&gt;&lt;file.separator&gt;krb5.keytab</code>.</p> |
|          | Keytab  | Set this to the file name of the keytab to get the technical user's secret key.  |



| Category                  | Option                               | Description   |
|---------------------------|--------------------------------------|---|
|                           | Use Ticket Cache                     | <p>Set this to true if you want the ticket-granting ticket (TGT) to be obtained from the ticket cache. Set this option to <i>False</i> if you do not want this module to use the ticket cache. The default value is <i>False</i>.</p> <p>This module searches for the ticket cache in the following locations:</p> <ul style="list-style-type: none"> <li>• On Solaris and Linux, in <code>/tmp/krb5cc_&lt;uid&gt;</code>, where the uid is a numeric user identifier.</li> <li>• If the ticket cache is not available in <code>/tmp/krb5cc_&lt;uid&gt;</code>, or if you are on a Windows platform, the module looks for the cache as <code>&lt;user.home&gt;&lt;file.separator&gt;krb5cc_&lt;user.name&gt;</code>. You can override the ticket cache location by using the <i>Ticket Cache</i> parameter.</li> <li>• For Windows, if a ticket cannot be retrieved from the file ticket cache, the module uses Local Security Authority (LSA) API to get the TGT.</li> </ul> |
|                           | Ticket Cache                         | <p>Set this to the name of the ticket cache that contains the user's TGT. If this is set, <i>Use Ticket Cache</i> must also be set to true; otherwise, a configuration error is returned.</p>   |
| Data Type Mapping         | Map Impala STRING to                 | <p>Specify to which SAP HANA type the Impala STRING is mapped. Choose from the following values:</p> <ul style="list-style-type: none"> <li>• <i>CLOB</i></li> <li>• <i>VARCHAR(5000)</i></li> </ul>  |
|                           | Map Impala VARCHAR(length > 5000) to | <p>Specify to which SAP HANA type the Impala VARCHAR(length &gt; 5000) is mapped. Choose from the following values:</p> <ul style="list-style-type: none"> <li>• <i>NCLOB</i></li> <li>• <i>NVARCHAR(5000)</i></li> </ul>   |
| Schema Alias Replacements | Schema Alias                         | <p>Schema name to be replaced with the schema given in <i>Schema Alias Replacement</i>.</p> <p>If given, accessing tables under this alias is considered to be accessing tables under the schema given in <i>Schema Alias Replacement</i></p>   |
|                           | Schema Alias Replacement             | <p>Schema name to be used to replace the schema given in <i>Schema Alias</i>.</p>   |

| Category   | Option  | Description  |
|--|---|--|
| Credentials  | Credentials Mode                                | Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials. <ul style="list-style-type: none"> <li><b>Technical User:</b> A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><b>Secondary User:</b> A unique access credential on the remote source assigned to a specific user.</li> </ul> |
| <div style="background-color: #f0f0f0; padding: 5px; border: 1px solid #ccc;"> <p><b>Note</b></p> <p>Depending on the value you chose for the <code>Authentication Mechanism</code> parameter, the credentials that appear will be different.</p> </div> |   |  |
|  | Credential (User Name and Password) > User Name | User name. Required only if the <code>Authentication Mechanism</code> parameter is set to <code>User Name and Password</code> .  |
|  | Credential (User Name and Password) > Password  | Password. Required only if the <code>Authentication Mechanism</code> parameter is set to <code>User Name and Password</code> .   |
|  | Credential (User Name) > User Name              | User name. Required only if the <code>Authentication Mechanism</code> parameter is set to <code>User Name</code> .   |
|  | Credential (Kerberos) > Password                | Kerberos password. Required only if the <code>Authentication Mechanism</code> parameter is set to <code>Kerberos</code> .  |

## User and Password Parameters for LDAP Authentication

The Impala adapter's `User Name` and `Password` remote source parameters are used when the Impala server requires LDAP authentication. The `User Name` parameter is the LDAP user name. The `Password` parameter is the LDAP bind password. Depending on the LDAP bind name pattern configuration in Impala Server, you may need to provide values for either of these parameters:

- If `ldap_domain` is configured, the `User Name` is replaced with a string `username@ldap_domain`.
- If `ldap_baseDN` is configured, the `User Name` is replaced with a distinguished name (DN) of the form `uid=userid,ldap_baseDN`. This is equivalent to a Hive option.
- If `ldap_bind_pattern` is configured, the `User Name` is replaced with the string `ldap_bind_pattern`, where all instances of the string `#UID` are replaced with the user ID. For example, an `ldap_bind_pattern` of `user=#UID,OU=house,CN=boat` with a user name of `Customer1` constructs a bind name of `user=Customer1,OU=house,CN=boat`.

See [https://www.cloudera.com/documentation/enterprise/latest/topics/impala\\_ldap.html](https://www.cloudera.com/documentation/enterprise/latest/topics/impala_ldap.html) for more information.

## Sample SQL Remote Source Configuration

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyImpalaSource" ADAPTER "ImpalaAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="connection" displayName="Connection">
<PropertyEntry name="host" displayName="Host" >myhost.sap.corp</PropertyEntry>
<PropertyEntry name="port" displayName="Port">21050</PropertyEntry>
<PropertyEntry name="auth_mech" displayName="Authentication Mechanism">0</
PropertyEntry>
</PropertyGroup>
<PropertyGroup name="data_type_mapping">
<PropertyEntry name="string_to_default">true</PropertyEntry>
<PropertyEntry name="varchar_5000plus_to_default">true</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

### Related Information

[Using a Schema Alias \[page 347\]](#)

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

[Store Remote Data Source Credentials Securely \[page 68\]](#)

## 6.2.7.2 Kerberos Realm and KDC

You can configure the Kerberos environment, known as its context, either through the `krb5.conf` file or through remote source parameters.

You must configure the Kerberos realm's Key Distribution Center (KDC) host name or address through either the `krb5.conf` file or adapter remote source parameters.

### Through the `krb5.conf` File

<DPAgent\_root>/krb5/krb5.conf is a standard Kerberos V5 configuration file. Initially, it is an empty configuration file containing `[libdefaults]`, `[realms]` and `[domain_realm]` headers. You can configure

KDC under the `[realms]` section. Also, if the default realm is not configured in the file, you need to configure it under the `[libdefaults]` section. The following is an example, where the configured realm is `EXAMPLE.COM`.

```
[libdefaults]
    default_realm = EXAMPLE.COM
[realms]
    EXAMPLE.COM = {
        kdc = kdc.example.com
    }
[domain_realm]
```

### Note

Do not remove any existing configurations in this file. Changes to this file take effect immediately without the need to restart the Data Provisioning Agent.

## Through Adapter Remote Source Parameters

You can configure the realm and KDC through the adapter remote source parameters *Realm* and *KDC*; you need to specify both. This is a shortcut to editing `<DPAgent_root>/krb5/krb5.conf`. The adapter writes the configuration to the `krb5.conf` if absent when the adapter connects to KDC.

## 6.2.8 Cloud Data Integration

The Cloud Data Integration adapter is a data provisioning adapter that is used to access data sources using the OData-based Cloud Data Integration (CDI) interface.

### Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Browse metadata
- Data query
- Real-time replication

In addition, this adapter supports the following capabilities:

Table 43: Global Settings

| Functionality               | Supported? |
|-----------------------------|------------|
| SELECT from a virtual table | Yes        |

| Functionality                                | Supported?   |
|--|--|
| INSERT into a virtual table                  | No   |
| Execute UPDATE statements on a virtual table | No   |
| Execute DELETE statements on a virtual table | No   |
| Different capabilities per table             | Yes  |
| Different capabilities per table column      | No   |
| Real-time                                    | Yes, determined by the <code>deltaEnabled</code> annotation in the <code>entitySet</code> metadata |

Table 44: Select Options

| Functionality                               | Supported? |
|---|------------|
| Select individual columns                   | Yes        |
| Add a WHERE clause                          | Yes        |
| JOIN multiple tables                        | No         |
| Aggregate data via a GROUP BY clause        | Yes        |
| Support a DISTINCT clause in the select     | No         |
| Support a TOP or LIMIT clause in the select | Yes        |
| ORDER BY                                    | Yes        |
| GROUP BY                                    | Yes        |

## 6.2.8.1 Configuring Cloud Data Integration Data Logs

Enable data logs to track OData requests, records, and response links for Cloud Data Integration (CDI) adapter remote sources.

### Procedure

1. Enable CDI data logging on the Data Provisioning Agent.
  - a. In `<DPAgent_root>/dpagentconfig.ini`, add the parameter `cdi.enableDataLog=true`.
  - b. Restart the Data Provisioning Agent.
2. Configure the CDI data log.

- a. Create or edit the CDI data log configuration file.

By default, the configuration file is located at `<DPAgent_root>/log/cdidata.txt`.

- b. For each CDI object that you want to log, add a line to the configuration file.

You can specify either remote table names or remote subscription IDs.

For example, to enable data logging for the `/ABAP_CDS/I_GLACCOUNTLINEITEMRAWDATA/Facts` remote table and the `remote_subscription_123` remote subscription, add two lines to the configuration file:

```
/ABAP_CDS/I_GLACCOUNTLINEITEMRAWDATA/Facts
remote_subscription_123
```

### Note

Specify remote subscriptions using the ID found in the `remote_subscriptions` table.

- c. **Optional:** You can comment out lines to disable logging for individual remote objects in the configuration file.

For example, to disable logging for the `remote_subscription_123` remote subscription, comment out that line in the configuration file:

```
/ABAP_CDS/I_GLACCOUNTLINEITEMRAWDATA/Facts
#remote_subscription_123
```

You don't need to restart the agent or stop replication for this change to take effect.

## Results

An individual CSV log file for each remote object specified in the configuration is generated in the `<DPAgent_root>/log` directory.

By default, individual log files have a maximum size of 100 MB. When a log reaches the maximum file size, it's zipped and retained until the total size of all zipped log files reaches 500 MB. You can configure the maximum size and retention period for data logs with the following agent configuration parameters in `<DPAgent_root>/dpagentconfig.ini`: `cdi.dataLogSizeMB`, `cdi.dataLogBackupTotalSizeMB`, and `cdi.dataLogBackupRetentionDays`.

## Related Information

[Agent Configuration Parameters \[page 112\]](#)

## 6.2.8.2 Cloud Data Integration Remote Source Configuration

Configure your connection to a Cloud Data Integration remote source.

| Category      | Option          | Description   |
|---------------|-----------------|---|
| Configuration | Host            | Host name or IP address of the Cloud Data Integration provider service.   |
|               | Port            | (Optional) Port number used to access the Cloud Data Integration service.   |
|               | Protocol        | Protocol used by the Cloud Data Integration provider service. <ul style="list-style-type: none"><li>• <a href="#">HTTP</a></li><li>• <a href="#">HTTPS</a></li></ul> The default value is <a href="#">HTTP</a> .  |
|               | Service Path    | Administration path of the Cloud Data Integration provider service.<br><br>The service path follows the hostname and port in the service provider URL.<br><br>For example, for SAP S/4HANA, the service path is usually <code>/sap/opu/odata4/sap/cdi/default/sap/cdi/0001</code> .     |
|               | Root Path       | (Optional) Root path of the CDI provider to use to filter the specific service provider.<br><br>For example, if you specify a root path of <code>/ABAP_CDS</code> , the CDI architecture tree becomes two layers, and you see only providers under the <code>ABAP_CDS</code> namespace. |
|               | Page Size       | (Optional) Maximum size of each page returned for the CDI remote source.<br><br>The default value is <code>10000</code> .   |
|               | Subscription ID | (Optional) Subscription ID.   |

| Category | Option   | Description   |
|----------|--|---|
|          |  | <div> <p><b>Note</b></p> </div> <div> <p>This parameter isn't used for SAP HANA Smart Data Integration or SAP Datasphere scenarios.</p> </div>  |
|          | <p>Subscription Mode</p> | <p>(Optional) Subscription mode for the CDI remote source.</p> <ul style="list-style-type: none"> <li> <p><i>Stateful</i>: The remote subscription state changes to <b>MAT_COMP_BEG_MARKER</b> shortly after real-time replication starts, while the adapter is reading initial load (first delta link) data. When auto-correction data is read from the first delta link, the remote subscription state changes to <b>AUTO_CORRECT_CHANGE_DATA</b>. After the initial load completes, the remote subscription state changes to <b>APPLY_CHANGE_DATA</b>.</p> </li> <li> <p><i>Stateless</i>: The remote subscription state changes to <b>APPLY_CHANGE_DATA</b> almost immediately after starting real-time replication, while the adapter reads initial load (first delta link) data in the background. You can monitor initial load completion from the first delta link statistics in the <a href="#">M_REMOTE_SOURCE_STATISTICS</a> view. For more information, see <a href="#">Monitoring Statistics Reference</a> and filter on the "CloudDataIntegrationAdapter" component.</p> </li> </ul> <div> <p><b>Tip</b></p> </div> <div> <p>For high-volume data sources, using the <i>Stateless</i> mode can avoid errors related to a filled persistence data store that can occur with the <i>Stateful</i> mode.</p> </div> |



| Category | Option               | Description  |
|----------|----------------------|--|
|          |                      | The default value is <i>Stateful</i> .   |
|          | Extraction Mode      | <p>(Optional) Extraction mode to use when accessing the remote source.</p> <ul style="list-style-type: none"> <li><i>DELTA</i></li> <li><i>FULL</i></li> </ul> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>This parameter isn't used for SAP HANA Smart Data Integration or SAP Datasphere scenarios.</p> </div>  |
|          | Poll period          | <p>(Optional) Polling period for real-time replication, in minutes.</p> <p>The default value is <i>5</i>.</p>  |
|          | Enable Admin Service | <p>(Optional) Specifies whether to enable the CDI admin service API.</p> <p>When you enable the admin service, you can view CDI adapter information directly from views in SAP HANA to monitor replication or diagnose and troubleshoot issues.</p> <ul style="list-style-type: none"> <li><i>True</i>: The admin service is enabled and a new <b>CDI_ADMIN_SERVICE</b> namespace appears in the remote source tree.</li> <li><i>False</i>: The admin service is disabled.</li> </ul> <p>The default value is <i>False</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>→ Tip</b></p> <p>To enable the admin service for all CDI adapters on the Data Provisioning Agent, you can set the <code>cdi.enableAdminService</code> parameter to <b>true</b> in <code>&lt;DPAgent_root&gt;/dpagentconfig.ini</code>.</p> </div> |
|          | Delete Subscription  | <p>(Optional) Specifies whether to delete the subscription specified in the <i>Subscription ID</i> parameter.</p>  |

| Category   | Option                             | Description   |
|------------|------------------------------------|---|
|            |                                    | <p><b>Note</b></p> <p>This parameter isn't used for SAP HANA Smart Data Integration or SAP Datasphere scenarios.</p>  |
|            | OData Max Page Size                | <p>(Optional) Value to use for the maximum page size.</p> <ul style="list-style-type: none"> <li><b>Page Size:</b> The adapter uses the value configured in the <i>Page Size</i> parameter as the preferred OData maximum page size.</li> <li><b>Fetch Size:</b> The adapter calculates the value based on the metadata and column datatypes to determine the preferred OData maximum page size.</li> </ul> <p>The default value is <i>Page Size</i>.</p> |
|            | Default String Length              | <p>(Optional) Default NVARCHAR length for SAP HANA tables. Any length specified in the Edm.String property in the provider \$metadata overrides this value.</p> <p>Values less than or equal to 5000 map to NVARCHAR(&lt;size&gt;), and values greater than 5000 map to NCLOB.</p> <p>The default value is <i>5001</i>.</p>   |
|            | HTTP Response Content-length Limit | <p>(Optional) Maximum length of the HTTP response, in bytes.</p> <p>The default value is <i>-1</i> (no limit).</p>  |
| Connection | Version                            | <p>OData version to use for connections.</p> <p>This adapter supports only <i>V4</i>.</p>   |
|            | HTTP Headers                       | <p>(Optional) Custom HTTP headers to add to the connection, specified as a semicolon-separated string.</p> <p>For example, a value of <b>header1=value1;header2=value2</b> adds two custom HTTP headers: <b>header1:value1</b> and <b>header2:value2</b>.</p>   |

| Category | Option                  | Description  |
|----------|-------------------------|--|
|          | Max HTTP Response Size  | <p>(Optional) Maximum size of HTTP responses, in MB.</p> <p>Responses larger than this value generate an I/O exception.</p> <p>The default value is <i>-1</i> (no limit).</p>            |
|          | HTTP Connection Timeout | <p>(Optional) Time to wait when opening the HTTP connection, in seconds.</p> <p>A value of <i>-1</i> means no connection timeout limitation.</p> <p>The default value is <i>120</i>.</p> |
|          | HTTP Socket Timeout     | <p>(Optional) Time to wait when reading data from the HTTP connection, in seconds. A value of <i>-1</i> means no socket timeout limitation.</p> <p>The default value is <i>600</i>.</p>  |
|          | Use Proxy               | <p>(Optional) Specifies whether to use a proxy for HTTP requests.</p> <p>The default value is <i>No</i>.</p>   |
|          | Proxy Host              | <p>Host name for the proxy.</p> <p>Required only when <i>Use Proxy</i> is set to <i>Yes</i>.</p>   |
|          | Proxy Port              | <p>Port number for the proxy.</p> <p>Required only when <i>Use Proxy</i> is set to <i>Yes</i>.</p>   |
|          | Proxy SCP Account       | <p>(Optional) SCP account used in the proxy.</p> <p>This parameter is usually configured for the SAP Cloud Connector.</p>  |
|          | Proxy Location ID       | <p>(Optional) Location ID used in the proxy.</p> <p>This parameter is usually configured for the SAP Cloud Connector.</p>  |
|          | Proxy Force to Use HTTP | <p>(Optional) Specifies whether to force all HTTP requests to use the HTTP protocol.</p>   |

| Category | Option               | Description   |
|----------|----------------------|---|
|          |                      | This parameter is usually configured for the SAP Cloud Connector.   |
|          | Rewrite Virtual Host | <p>(Optional) Specifies whether to rewrite the host and port in all HTTP requests using the host and port configured in the connection properties.</p> <p>This parameter is usually <i>True</i> for the SAP Cloud Connector, because it has a different virtual hostname and port number configured.</p>  |
|          | Require CSRF Header  | <p>(Optional) Specifies whether the service requires the CSRF Header to make change operations.</p> <p>The default value is <i>No</i>.</p> <p>For SAP S/4HANA and SAP Analytics Cloud providers, this value is usually <i>Yes</i>.</p>  |
|          | Authentication       | <p>Authentication method used to connect to the Cloud Data Integration service.</p> <ul style="list-style-type: none"> <li>• <i>No Authentication</i></li> <li>• <i>Username and Password</i></li> <li>• <i>OAuth 2.0</i></li> <li>• <i>X.509 Client Certificate</i></li> </ul> <p>The default value is <i>No Authentication</i>.</p> <p>When the authentication method is <i>X.509 Client Certificate</i>, the private key and certificate are populated at runtime from a PSE you must configure for the remote source. For example:</p> <pre>CREATE PSE &lt;pse_name&gt;; ALTER PSE &lt;pse_name&gt; SET OWN CERTIFICATE '&lt;pem_key&gt;&lt;pem_cert&gt;&lt;pem_chain&gt;&lt;pem_rootca&gt;';</pre> |

| Category | Option                | Description  |
|----------|-----------------------|--|
|          |                       | <p>You must then create the remote source without credentials and manually add the PSE:</p> <pre>CREATE CREDENTIAL COMPONENT 'SAPHANAFEDERATION' PURPOSE '&lt;remote_source_name&gt;' TYPE 'X509' PSE &lt;pse_name&gt;;</pre>  |
| OAuth2   | OAuth2 Grant Type     | <p>(Optional) Grant type used for OAuth 2.0 authentication.</p> <ul style="list-style-type: none"> <li>• <i>User Name and Password</i></li> <li>• <i>Client Credentials</i></li> <li>• <i>Password with Confidential Client</i></li> <li>• <i>SAML Bearer Assertion</i></li> </ul> <p>The default value is <i>Client Credentials</i>.</p> <p>Valid only when <i>Authentication</i> is set to <i>OAuth 2.0</i>.</p> |
|          | OAuth2 Token Endpoint | <p>(Optional) API endpoint used to retrieve an access token for authentication.</p> <p>Required only when <i>Authentication</i> is set to <i>OAuth 2.0</i>.</p>  |
|          | OAuth2 Scope          | <p>(Optional) OAuth 2.0 scope, if applicable.</p> <p>Required only when <i>Authentication</i> is set to <i>OAuth 2.0</i>.</p>  |
|          | OAuth2 Resource       | <p>(Optional) OAuth 2.0 resource, if applicable.</p> <p>Required only when <i>Authentication</i> is set to <i>OAuth 2.0</i>.</p>   |
|          | OAuth2 Response Type  | <p>(Optional) Specifies whether the authorization server responds with an access token or authorization code.</p> <ul style="list-style-type: none"> <li>• <i>None</i></li> <li>• <i>Token</i></li> </ul> <p>The default value is <i>None</i>.</p>   |

| Category   | Option                            | Description  |
|--|-----------------------------------|--|
|  |                                   | Required only when <i>Authentication</i> is set to <i>OAuth 2.0</i> .  |
|  | OAuth2 Token Request Content Type | <p>(Optional) Content type of the OAuth 2.0 token request.</p> <ul style="list-style-type: none"> <li><i>URL Encoded</i></li> <li><i>JSON</i></li> </ul> <p>The default value is <i>URL Encoded</i>.</p>             |
|  | OAuth2 API Endpoint               | <p>(Optional) API endpoint to use to request a SAML assertion.</p> <p>Required only when <i>Authentication</i> is set to <i>OAuth 2.0</i> and <i>OAuth2 Grant Type</i> is set to <i>SAML Bearer Assertion</i>.</p>   |
|  | OAuth2 Company ID                 | <p>(Optional) Company ID to use to request a SAML assertion.</p> <p>Required only when <i>Authentication</i> is set to <i>OAuth 2.0</i> and <i>OAuth2 Grant Type</i> is set to <i>SAML Bearer Assertion</i>.</p>     |
|  | OAuth2 User ID                    | <p>(Optional) User ID to use to request a SAML assertion.</p> <p>Required only when <i>Authentication</i> is set to <i>OAuth 2.0</i> and <i>OAuth2 Grant Type</i> is set to <i>SAML Bearer Assertion</i>.</p>        |
| Credentials                                      | Credentials Mode                  | <p><i>None</i>, <i>Technical user</i>, or <i>Secondary user</i></p> <p>Select one of the choices depending on the purpose of the remote source that you want to create.</p> <p>The default value is <i>None</i>.</p> |
| Credentials > Credential (Username and Password) | Username                          | <p>User name to use when connecting with basic authentication.</p> <p>Required only when <i>Authentication</i> is set to <i>Username and Password</i></p>  |
|  | Password                          | <p>Password to use when connecting with basic authentication.</p> <p>Required only when <i>Authentication</i> is set to <i>Username and Password</i></p>   |

| Category                                   | Option         | Description   |
|--|----------------|---|
| Credentials > OAuth2 User Credential       | User           | <p>(Optional) User name to use when connecting with OAuth 2.0 authentication.</p> <p>Valid only when <i>Authentication</i> is set to <i>OAuth 2.0</i> and <i>OAuth2 Grant Type</i> is set to <i>User Name and Password</i>.</p> |
|  | Password       | <p>(Optional) Password to use when connecting with OAuth 2.0 authentication.</p> <p>Valid only when <i>Authentication</i> is set to <i>OAuth 2.0</i> and <i>OAuth2 Grant Type</i> is set to <i>User Name and Password</i>.</p>  |
| Credentials > OAuth2 Client Credential     | Client ID      | <p>(Optional) Client ID or API key to use when connecting.</p> <p>Valid only when <i>Authentication</i> is set to <i>OAuth 2.0</i>.</p>   |
|  | Client Secret  | <p>(Optional) Client secret to use when requesting an access token.</p> <p>Valid only when <i>Authentication</i> is set to <i>OAuth 2.0</i>.</p>  |
| Credentials > OAuth2 SAML Assertion        | SAML Assertion | <p>(Optional) SAML assertion generated by a third-party identity provider.</p> <p>Required only when <i>Authentication</i> is set to <i>OAuth 2.0</i> and <i>OAuth2 Grant Type</i> is set to <i>SAML Bearer Assertion</i>.</p>  |
| Credentials > Proxy User Name and Password | Proxy User     | <p>(Optional) User name for the proxy server used to connect to the remote source.</p> <p>Valid only when <i>Use Proxy</i> is set to <i>Yes</i>.</p>  |
|  | Proxy Password | <p>(Optional) Password for the proxy server used to connect to the remote source.</p> <p>Valid only when <i>Use Proxy</i> is set to <i>Yes</i>.</p>   |
| Credentials > Proxy Token                  | Proxy Token    | <p>(Optional) Token used for the proxy.</p> <p>This parameter is usually configured for the SAP Cloud Connector.</p> <p>Valid only when <i>Use Proxy</i> is set to <i>Yes</i>.</p>  |

| Category  | Option                            | Description   |
|---|-----------------------------------|---|
| Credentials > X.509 Client Certificate          | X.509 Client Certificate          | X.509 client certificate to use when authenticating with the remote source.<br><br>Required only when <i>Authentication</i> is set to <i>X.509 Client Certificate</i> .             |
| Credentials > X.509 Client Private Key          | X.509 Client Private Key          | (Optional) X.509 client private key to use when authenticating with the remote source.<br><br>Valid only when <i>Authentication</i> is set to <i>X.509 Client Certificate</i> .     |
| Credentials > X.509 Client Private Key Password | X.509 Client Private Key Password | (Optional) Password to use when authenticating with an encrypted X.509 client private key.<br><br>Valid only when <i>Authentication</i> is set to <i>X.509 Client Certificate</i> . |

## 6.2.9 Data Assurance

Use the Data Assurance adapter to connect to an SAP HANA remote source to use the Data Assurance option to monitor the quality of data replication from an SAP HANA source to an SAP HANA target.

The Data Assurance adapter compares row data and schema between two or more databases, and reports discrepancies. It's a scalable, high-volume, and configurable data comparison product, allowing you to run comparison jobs even during replication by using a "wait and retry" strategy that eliminates any down time.

### Note

The Data Assurance Monitoring UI is currently available on SAP HANA XS Classic.

## Landscape and Credentials

Data Assurance functionality is primarily driven by the Data Assurance adapter. It fires queries on the source and target databases to fetch data. We recommend that you separate the Data Provisioning Agent running the Data Assurance adapter and the Data Provisioning Agent running the SAP HANA adapter used for replication. This separation helps avoid resource sharing between the two use cases and helps minimize the performance impact on the existing replication setup.

However, running Data Assurance on a separate Data Provisioning Agent means that the agent can't get the credentials for the remote source from the SAP HANA database. Therefore, the remote source credentials must be added to the Data Provisioning Agent's local secure storage, so that Data Assurance can load them as needed.



By default, you must use the agent command-line configuration tool (agentcli) to store credentials and then restart the agent. If you set the `force.update.the.credential.in.secure.store` parameter to `true` in `agentconfig.ini`, you can also set the credentials automatically when you configure your remote source.

## Privileges for Creating a Data Assurance Adapter

If you create an adapter as a user other than SYSTEM, you need additional privileges. Run the following SQL commands for the DA\_REPO1 example user:

```
-- Create virtual procedure and tables permission needed for data assurance
adapter to create virtual objects
GRANT CREATE VIRTUAL TABLE ON REMOTE SOURCE "da_repo_1" to DA_REPO1;
GRANT CREATE VIRTUAL PROCEDURE ON REMOTE SOURCE "da_repo_1" to DA_REPO1;

-- To create a job integrated with a subscription and fetch subscriptions and
virtual tables,
-- grant select for your subscription to DA user.
GRANT CREATE VIRTUAL TABLE ON REMOTE SOURCE "hanaadapter1" to DA_REPO1;
GRANT CREATE REMOTE SUBSCRIPTION ON REMOTE SOURCE "hanaadapter1" to DA_REPO1;

-- Fetch the underlying physical tables related to subscriptions and virtual
tables,
-- by granting select for those tables to DA user. Grant select on the schema.
GRANT SELECT ON "SYSTEM" to DA_REPO1
GRANT SELECT ON "HANA_ALL_TYPE_TEST_TAB" to DA_REPO1;
GRANT SELECT ON "T_HANA_ALL_TYPE_TEST_TAB_MO" to DA_REPO1;
```

## Adapter Functionality

This adapter supports the comparison of source and target tables.

### Note

Only remote subscriptions with a replication behavior of *Initial + realtime* or *Realtime only* are supported. If you use a remote subscription with other replication behaviors, the Data Assurance Monitor UI generates an error.

### Note

To ensure optimum speed and efficiency, assign Data Assurance to its own specific Data Provisioning Agent. Don't use agent groups with Data Assurance.

## Related Information

[Creating and Monitoring Data Assurance Jobs](#)  
[Store Remote Data Source Credentials Securely \[page 68\]](#)

## 6.2.9.1 Data Assurance Adapter Remote Source Configuration

Configure the following options for a connection to an SAP HANA remote source to configure and use Data Assurance functionality.

| Option                           | Description   |
|----------------------------------|---|
| Repository Type                  | Specifies the repository type for the Data Assurance adapter. <ul style="list-style-type: none"><li>HANA: Creates a repository on your target SAP HANA system.</li></ul> The default value is <i>HANA</i> .   |
| Fetch Mode                       | Specifies how to fetch data from data sources for the Data Assurance adapter.<br>The default value is <i>Auto</i> .   |
| Repository Host                  | Specifies the SAP HANA host name for the Data Assurance repository.   |
| Repository Port                  | Specifies the port number for the Data Assurance repository.  |
| HANA Host                        | Specifies the host name for the target SAP HANA Server to which the Data Provisioning Agent is connected.   |
| HANA Port                        | Specifies the port for the target SAP HANA Server to which the Data Provisioning Agent is connected.  |
| Credentials Mode                 | Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials. <ul style="list-style-type: none"><li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li><li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li></ul> |
| Logon > Username                 | The SAP HANA user name  |
| Logon > Password                 | The SAP HANA password   |
| Repository Credential > Username | Specifies the username for the repository (SAP HANA)  |
| Repository Credential > Password | Specifies the password for the repository (SAP HANA)  |

### Related Information

[Store Remote Data Source Credentials Securely \[page 68\]](#)

## 6.2.10 File

Use the File adapter to read formatted and free-form text files.

The File adapter enables SAP HANA users to read formatted and free-form text files. In contrast to the File Datastore adapters, use the File adapter for the following scenarios:

- SharePoint access
- SharePoint on Office365
- Pattern-based reading; reading multiple files in a directory that match a user-defined partition
- Five system columns are included, including row num, file location, and so on
- Real-time file replication

To specify a file format such as a delimiter character, you must create a configuration file with the extension `.cfg` to contain this information. Then each file can be read and parsed through this format, returning the data in columns of a virtual table.

For free-form, unstructured text files, you do not need to designate a file format definition, and you can use the `FILECONTENTROWS` virtual table to view the data.

## Authorizations

Keep the following in mind when accessing files:

- Ensure that the user account under which the Data Provisioning Agent is running has access to the files on the local host, a shared directory, or a SharePoint site.
- If the files are located on the same host as the Data Provisioning Agent, the files must be located in the same directory, or a subdirectory, of the Data Provisioning Agent root directory.

## Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Virtual table as a target using a Data Sink in a flowgraph; only INSERT is supported.

### Note

Writing to SharePoint is not supported.

- SharePoint source support
- HDFS target file support, except from SharePoint
- Kerberos authentication for HDFS target files
- Real-time change data capture

### Note

Only rows appended to a file initiate the capture. Only APPEND is supported. Using any other command, such as DELETE, UPDATE, and so on, may shut down replication altogether.

Also, the addition of a file to the virtual table's directory initiates the capture. This functionality is not supported for HDFS source files.

In addition, this adapter supports the following capabilities:

- SELECT, INSERT

## Related Information

[File Datastore Adapters \[page 275\]](#)

### 6.2.10.1 File Adapter Remote Source Configuration

Determine the configuration parameters for your File adapter remote source. You can use the code samples below for creating a remote source using the SQL console.

The available parameters might change depending on which options you choose.

#### Note

To use a Data Provisioning Agent installed on Linux to connect to the SharePoint site, enable basic authentication on the SharePoint server.

| Category       | Option         | Description  |
|----------------|----------------|--|
| Configurations | Source Options | <ul style="list-style-type: none"> <li>• <i>Local File System</i>: Specifies that the source is a file on a local system.</li> <li>• <i>SharePoint Server</i>: Specifies that the source is on a SharePoint server.</li> <li>• <i>SharePoint on Office365</i>: Specifies that the Microsoft Excel source is on an Office365 server.</li> </ul> |

**Note**

Whichever you select *Local File System*, *SharePoint Server*, or *SharePoint on Office365*, the File adapter remote source only displays the file format definitions (.cfg files) under the Data Provisioning Agent local folder that you specify in the remote source. It never displays files or directories on the SharePoint server directly, which is different than the Microsoft Excel Adapter with SharePoint scenario. You need to provide the path to the source file on the SharePoint site in the

| Category | Option                                   | Description  |
|----------|--|--|
|          |  | <p>CFG file, then create the virtual table in the file format definitions.</p>   |
|          | Target Options                           | <p>The path to the folder that you want to access on the local file system where the Data Provisioning Agent is deployed.</p> <p><i>Remote HDFS</i>: Specifies that the target file is on a remote HDFS system.</p>  |
|          | Root Directory                           | <p>The root directory for your data files. This is used for security. No remote source can reach beyond this directory for data files. The root directory must exist before you can create a remote source.</p> <p><b>Note</b></p> <p>Do not use a link directory or directory shortcut for a value in this parameter.</p> <p>If you are using a shared network directory, enter the path as follows:</p> <pre>\\&lt;host_name&gt;\&lt;directory&gt;</pre> |
|          | Directory of the file format definitions | <p>Location where you store your file format definition files. This directory must exist before you can create a remote source. Include the full path and file name.</p> <p><b>Note</b></p> <p>Do not use a linked directory or directory shortcut for a value in this parameter.</p>  |
|          | Use Decryption for Reading               | <ul style="list-style-type: none"> <li><i>None</i></li> <li><i>PGP</i>: Select to access PGP-encrypted source files. Additional options include <i>PGP Secret Key Path</i>, <i>Third-party Public Key Path</i>, and <b>Credentials</b> &gt; <i>PGP Secret Key Credential</i> &gt; <i>Password</i> .</li> </ul>   |

| Category                                     | Option                        | Description   |
|--|-------------------------------|---|
|  | PGP Secret Key Path           | For PGP-encrypted source files. Only enabled when <i>Use Decryption for Reading</i> is set to <i>PGP</i> .  |
|  | Third-party Public Key Path   | For PGP-encrypted source files. Only enabled when <i>Use Decryption for Reading</i> is set to <i>PGP</i> .  |
| SharePoint on Office365 Client Configuration | Authentication Mode           | Choose the type of credentials needed to access SharePoint on Office365 <ul style="list-style-type: none"> <li>Client Credential (default):</li> <li>Username Password:</li> </ul>  |
|  | Site URL                      | Enter the site URL, in the form of <code>https://&lt;company&gt;.sharepoint.com/sites/&lt;siteName&gt;</code>   |
|  | Application ID                | Enter the application ID, as defined in the Microsoft Azure Portal.   |
|  | Tenant ID                     | Enter the tenant ID, as defined in the Microsoft Azure Portal.  |
|  | Local Folder Path             | The path to the folder that you want to access on the local file system where the Data Provisioning Agent is deployed.  |
| ConnectionInfo > HDFS Configuration          | Host Name                     | The remote URL to connect to the remote HDFS, usually defined in <code>core-site.xml</code> .   |
|  | Port Number                   | Port number to connect to the remote HDFS, usually defined in <code>core-site.xml</code> .  |
|  | Target File Location          | The location to store copied target files in a remote HDFS. For example, you might want to copy a target file from a local to a remote HDFS.  |
|  | Hadoop User Name              | The user of the Hadoop system when logging in. This can also be the owner of the file location where you want to put the copied target files. Make sure you have the proper permissions to access this location.  |
|  | HDFS Authentication Mechanism | Choose <i>Kerberos</i> to implement Kerberos authentication. You are then required to complete the necessary parameters in the <i>Kerberos Configuration for HDFS</i> option group.<br><br>Choose <i>No Authentication</i> if you are not using Kerberos. |

| Category                        | Option           | Description  |
|---------------------------------|------------------|--|
| Kerberos Configuration for HDFS | Realm            | <p>(Optional when using Kerberos) Authenticate using a principal from this realm instead of the systems default realm. Specify the realm for the technical user.</p> <p>The <i>Realm</i> option must be used together with KDC.</p>  |
|                                 | KDC              | <p>(Optional when using Kerberos) The address of the technical user's KDC (Key Distribution Center) to be used with the specified realm. This must be used together with the <i>Realm</i> option.</p>  |
|                                 | HDFS Principal   | The HDFS Service principal name.   |
|                                 | Client Principal | Specify the Kerberos principal of the connection user.   |
|                                 | Use Keytab       | <p>Set this to <i>True</i> if you want the module to get the technical user's key from the keytab. The default value is <i>False</i>.</p> <p>If <i>Key Tab</i> is not set, then the module locates the keytab from the Kerberos configuration file. If it is not specified in the Kerberos configuration file, then the module looks for the file <code>&lt;user.home&gt;&lt;file.separator&gt;krb5.keytab</code>.</p>   |
|                                 | Keytab           | Set this to the path and file name of the keytab to get the technical user's secret key.   |
|                                 | Use Ticket Cache | <p>Set this to true if you want the ticket-granting ticket (TGT) to be obtained from the ticket cache. Set this option to <i>False</i> if you do not want this module to use the ticket cache. The default value is <i>False</i>.</p> <p>This module searches for the ticket cache in the following locations:</p> <ul style="list-style-type: none"> <li>On Solaris and Linux, in <code>/tmp/krb5cc_&lt;uid&gt;</code>, where the uid is a numeric user identifier.</li> <li>If the ticket cache is not available in <code>/tmp/krb5cc_&lt;uid&gt;</code>, or if</li> </ul> |

| Category   | Option            | Description   |
|--|-------------------|---|
|  |                   | <p>you are on a Windows platform, the module looks for the cache as <code>&lt;user.home&gt;&lt;file.separator&gt;krb5cc_&lt;user.name&gt;</code>. You can override the ticket cache location by using the <i>Ticket Cache</i> parameter.</p> <ul style="list-style-type: none"> <li>For Windows, if a ticket cannot be retrieved from the file ticket cache, the module uses Local Security Authority (LSA) API to get the TGT.</li> </ul>  |
|  | Ticket Cache      | Set this to the name of the ticket cache that contains the user's TGT. If this is set, <i>Use Ticket Cache</i> must also be set to true; otherwise, a configuration error is returned.  |
| ConnectionInfo > SharePoint Server Configuration | Server URL        | <p>Enter the URL for the server where the SharePoint source is located.</p> <p>If you create a new SharePoint site on the server, be sure to include the name of the site at the end of the URL. For example, if your server name is <code>http://&lt;server_name&gt;/</code> and your new site name is <code>site1</code>, your URL would be <code>http://&lt;server_name&gt;/site1</code>.</p>  |
|  | Local Folder Path | <p>The download folder path. This folder is created under the <code>&lt;DPAgent_root&gt;/</code> directory automatically.</p> <p>The local folder path is the location on the Data Provisioning Agent computer's local drive where you want to place your source data files, which the Data Provisioning Agent will download from the SharePoint server</p> <p>For example, if you enter a value for this parameter such as <code>download/sharepoint</code>, create the following path: <code>&lt;DPAgent_root&gt;/download/sharepoint</code>.</p> |
| Credentials                                      | Credentials Mode  | <i>Technical user</i> or <i>Secondary user</i>  |



| Category                                  | Option                            | Description  |
|---|-----------------------------------|--|
|   |                                   | Select one of the choices depending on the purpose of the remote source you want to create.  |
| Credentials > AccessTokenEntry            | Password                          | A password. An access token protects the files from access from different agents. Use this password when creating a remote source.       |
| Credentials > PGP Secret Key Credential   | Password                          | Enter the password to enable access to PGP-encrypted sources. Only enabled when <i>Use Decryption for Reading</i> is set to <i>PGP</i> . |
| Credentials > SharePoint Login            | SharePoint User (Domain\Username) | The domain and user name for the SharePoint account.   |
|   | SharePoint Password               | The password for the SharePoint account.   |
| Credentials > Credential (Kerberos)       | Password                          | The password for the Kerberos-protected HDFS.  |
| SharePoint on Office365 Client Credential | Client Credential                 | Enter the client secret you created on the Microsoft Azure Portal.   |
| SharePoint on Office365 Username Password | Username                          | Enter the username of your Microsoft account.  |
|   | Password                          | Enter the password of your Microsoft account.  |

## Kerberos Setup for HDFS Target

- If you use Keytab and not Ticket Cache, specify the keytab file path in the *Keytab* parameter.
- If you are using Ticket Cache and not Keytab, specify the ticket cache file path in the *Ticket Cache* parameter. Then, you can use any password (such as "abc" or "123" for the *Credential (Kerberos)* parameter, because a password is required in Web IDE.
- Also, if you are using Ticket Cache and not Keytab, you can leave the ticket cache file path blank, but then you must use the correct password for the *Password of Credential (Kerberos)* option

## Remote Source Configuration Using the SQL Console

The following code samples illustrate how to create a remote source using the SQL console.

## Example: Local file system

### Sample Code

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
  <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
  <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
  <PropertyEntry name="source_options">local</PropertyEntry>
  <PropertyEntry name="target_options">local</PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AccessTokenEntry">
  <password>mytoken</password>
</CredentialEntry>';
```

## Example: Local file system with real-time

### Sample Code

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Connection>
  <ConnectionProperties>
    <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
    <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
    <PropertyEntry name="usecdc">true</PropertyEntry>
    <PropertyEntry name="source_options">local</PropertyEntry>
    <PropertyEntry name="target_options">local</PropertyEntry>
  </ConnectionProperties>
  <WITH CREDENTIAL TYPE 'PASSWORD' USING
  <CredentialEntry name="AccessTokenEntry">
    <password>mytoken</password>
  </CredentialEntry>';
```

## Example: HDFS as target

### Sample Code

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
  <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
  <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
  <PropertyEntry name="target_options">hdfs</PropertyEntry>
  <PropertyEntry name="host">hdfs:/myhost.sap.corp</PropertyEntry>
```

```

    <PropertyEntry name="port_number">8020</PropertyEntry>
    <PropertyEntry name="target_hdfs_file_location">/user/sap</PropertyEntry>
    <PropertyEntry name="hadoop_user_name">myuser</PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
' <CredentialEntry name="AccessTokenEntry">
    <password>mytoken</password>
</CredentialEntry>' ;

```

## Example: SharePoint location

### Sample Code

```

CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
    <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
    <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
    <PropertyEntry name="source_options">SharePoint</PropertyEntry>
    <PropertyEntry name="target_options">local</PropertyEntry>
    <PropertyGroup name="SharePoint">
        <PropertyEntry name="spurl">http://myhost.sap.corp/mysharepointsite</
PropertyEntry>
        <PropertyEntry name="spdir">download/sharepoint</PropertyEntry>
    </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
' <CredentialEntry name="AccessTokenEntry">
    <password>mytoken</password>
</CredentialEntry>
<CredentialEntry name="sharePointCredential">
    <user>mydomain\mysharepointuser</user>
    <password>mypassword</password>
</CredentialEntry>' ;

```

## Example: Microsoft SharePoint on Office365

```

CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
    <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
    <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
    <PropertyEntry name="source_options">SharePoint365</PropertyEntry>
    <PropertyEntry name="target_options">local</PropertyEntry>
    <PropertyGroup name="SharePoint365">
        <PropertyEntry name="authenticationMode">ClientCredential</PropertyEntry>
        <PropertyEntry name="siteUrl">https://mycompany.sharepoint.com/sites/
mysharepointsite</PropertyEntry>
        <PropertyEntry name="applicationId">myApplicationID</PropertyEntry>
        <PropertyEntry name="tenantId">myTenantId</PropertyEntry>
        <PropertyEntry name="sp365dir">download/sharepoint</PropertyEntry>

```

```

</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
' <CredentialEntry name="AccessTokenEntry">
<password>mytoken</password>
</CredentialEntry>
<CredentialEntry name="sharePoint365ClientCredential">
<password>myClientSecret</password>
</CredentialEntry>' ;

```

## Related Information

[HDFS Target Files](#)

[Accessing Files On a Shared Network \[page 271\]](#)

[Connect to a SharePoint Remote Source \[page 268\]](#)

[Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365 \[page 273\]](#)

[Configure Your Microsoft Azure Application \[page 274\]](#)

## 6.2.10.2 File Adapter Preferences

Configuration parameters for the File adapter.

| Parameter                  | Description  |
|----------------------------|--|
| Root directory             | The root directory for your data files. No remote source can reach beyond this directory for data files.                           |
| File format root directory | The root directory for your file format definitions. No remote source can reach beyond this directory for format files.            |
| Access Token               | A password. An access token protects the files from access from different agents. Use this password when creating a remote source. |

## 6.2.10.3 Configuration Files

Configuration files enable the application to read the file format accurately. You must have a configuration file when using the File adapter.

You can create file format configuration files either within SAP HANA Web IDE using the command line or by creating a text file.

Using Web IDE can speed up the process of creating your file format configuration files. Using the command line or a text file to create the configuration file requires that you use a separate text editor to enter the options and values manually into an empty file.

## 6.2.10.3.1 File Format Configuration Files

Create a file format configuration file to work with the data file used by the File adapter.

Each configuration file is a text file and must match the following format:

- The first line must contain a comment or a description. This line is ignored during processing.
- A set of key-value pairs to specify the various parsing options.
- A set of COLUMN=<name>;<SAP HANA datatype>;<optional description>

### Example

```
File format to read US census data, see https://www.census.gov/econ/cbp/download/
FORMAT=CSV
FORCE_FILENAME_PATTERN=us_county_census_%.txt
FORCE_DIRECTORY_PATTERN=
CODEPAGE=
LOCALE=
COLUMN_DELIMITER=,
ROW_DELIMITER=\r\n
ESCAPE_CHAR=
TEXT_QUOTES="
TEXT_QUOTES_ESCAPE_CHAR=
SKIP_HEADER_LINES=1
QUOTED_TEXT_CONTAIN_ROW_DELIMITER=false
DATEFORMAT=yyyy.MM.dd HH:mm:ss
COLUMN=FIPSTATE;VARCHAR(2);FIPS State Code
COLUMN=EMP;INTEGER;Total Mid-March Employees with Noise
COLUMN=QP1_NF;VARCHAR(1);Total First Quarter Payroll Noise Flag
COLUMN=CENSTATE;VARCHAR(2);Census State Code
COLUMN=CENCTY;VARCHAR(3);Census County Code
COLUMN=PARTITION
COLUMNSTARTENDPOSITION=
```

### Fixed-Format Files

Fixed file formats are also supported (FORMAT=fixed). The formatting can be specified using the COLUMNSTARTENDPOSITION parameter or the ROW\_DELIMITER and ROWLENGTH parameters.

### Example

```
Fixed file format
FORMAT=FIXED
FORCE_FILENAME_PATTERN=fixed%.txt
CODEPAGE=UTF-8
LOCALE=
ROW_DELIMITER=\r\n
SKIP_HEADER_LINES=1
COLUMNSSTARTENDPOSITION=0-1;2-7;8-15
```

```
ROWLENGTH=16  
COLUMN=COL1;VARCHAR(2)  
COLUMN=COL2;VARCHAR(6)  
COLUMN=COL3;VARCHAR(8)
```

## SharePoint Format Files

The FORCE\_FILENAME\_PATTERN and FORCE\_DIRECTORY\_PATTERN parameters are important when working with a SharePoint source.

### Example

If your file exists in a subfolder, be sure to include that in the path for the FORCE\_DIRECTORY\_PATTERN parameter.

```
FORCE_FILENAME_PATTERN=<file_name>.txt  
FORCE_DIRECTORY_PATTERN=<root_directory><local_folder_path>/<folder_name>
```

#### Note

The FORCE\_DIRECTORY\_PATTERN should be an absolute path that includes the root directory, local folder path, and folder path on the Sharepoint server.

## 6.2.10.3.1.1 Format Parameters

Format parameters for files.

### Global

| Parameter   | Description and Examples   |
|---|--|
| FORCE_FILENAME_PATTERN<br>FORCE_DIRECTORY_PATTERN | <p>You might want to execute a simple <code>select * from &lt;virtualtable&gt;</code> without a WHERE clause on a directory. In that case, every file in the root directory and subdirectories is read according to this virtual table format definition. That process might take a while and produce many errors.</p> <p>However, if the virtual table maps to files in a particular directory or directory tree, or only to particular file names, you can specify this information in the virtual table directly. For example:</p> <ul style="list-style-type: none"><li>Reading all files in that directory only:<pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata</pre></li><li>Reading all files in that directory and subdirectories:<pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata/%</pre></li><li>Reading all files in directories that start with "plan":<pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plan% :</pre></li><li>Reading a file such as <code>plan20120101.txt</code>:<pre>FORCE_FILENAME_PATTERN=plan%.txt</pre></li><li>Reading files inside the directory and matching the provided name pattern:<pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata FORCE_FILENAME_PATTERN=plan%.txt</pre></li></ul> |

**Note**

The path you use in the FORCE\_DIRECTORY\_PATTERN parameter is case sensitive. For example, if you set the Root Directory remote source parameter to "C:\", you must match that case in the FORCE\_DIRECTORY\_PATTERN parameter.

| Parameter               | Description and Examples   |
|-------------------------|--|
| FORMAT                  | <p>Specifies the format of the data source file:</p> <ul style="list-style-type: none"> <li>• CSV (default)</li> <li>• FIXED</li> <li>• XML</li> <li>• JSON</li> </ul>   |
| CODEPAGE                | <p>The character encoding with which the file is read. By default, the operating system default codepage is used. In case the file has a Byte Order Mark, this codepage is always used. Valid values of the Java installation can be found by creating a virtual table for CODEPAGE and querying its contents.</p>   |
| ROW_DELIMITER           | <p>A character sequence indicating the end of a row in the file. In case they are non-printable characters, they can be provided when encoded as /d65536 or /xFFFF or as Unicode notation /u+FFFF. Alternatively, the typical \r and \n are supported as well. Examples:</p> <ul style="list-style-type: none"> <li>• \n Unix standard</li> <li>• \r\n Windows standard</li> <li>• \d13\d10 Windows standard, but characters provided as a decimal number</li> <li>• \x0D\x0A Windows standard, but characters provided as a hex number</li> </ul> |
| SKIP_HEADER_LINES       | <p>In case the file has a header, the number of lines to be skipped is entered here.</p> <p>When SKIP_HEADER_LINES=0, it means that the writer will not add a header to the newly created data file.</p> <p>When SKIP_HEADER_LINES&gt;0, it will add a header to the newly created data file.</p>  |
| ERROR_ON_COLUMNCOUNT    | <p>By default, a row with fewer columns than defined is considered okay. By setting this parameter to true, it is expected that all rows of the file have the number of columns defined.</p>   |
| LOCALE                  | <p>The decimal and date conversion from the strings in the file into native numbers or dates might be locale-specific. For example, the date "14. Oktober 2000" when you are using a German locale works. However, for all other languages, this date does not work.</p> <p>Valid values for the locale can be found by querying a virtual table based on the LOCALE table of the adapter.</p>   |
| WRITEBACK_NUMBER_FORMAT | <p>Instructs the File adapter to respect the LOCALE parameter when writing decimal values.</p> <p>Default: <i>True</i></p> <p>The decimal number follows the column definition of the CFG file if set to <i>True</i>. If WRITEBACK_NUMBER_FORMAT=false, the decimal number is plain and keeps the origin fraction digits, and it does not follow the decimal definition in the CFG file.</p>   |



| Parameter   | Description and Examples  |
|---|---|
| DATEFORMAT<br>TIMEFORMAT<br>SECONDDATEFORMAT<br>TIMESTAMPFORMAT | The file format can use these data types for date/time-related values. Each can have a different format string. The syntax of the format string is the Java SimpleDateFormat syntax.                                  |
| LENIENT   | Controls automatic date and time format conversion when the value exceeds the range.<br><br>For example, when this parameter is set to <i>True</i> , the 14th month of 2016 is converted to the second month of 2017. |
| EXPONENTIAL   | Defines the exponential character used for decimal numbers.<br><br>For example, <i>e</i> for 1.05097214923805e-06 or <i>E</i> for 1.05097214923805E-06.<br><br>Default: <i>E</i>                                      |
| COLUMN  | Multiple entries consist of the columnname;datatype, where the data type is any normal SAP HANA data type.  |

## CSV only

| Parameter        | Description and Examples  |
|------------------|---|
| COLUMN_DELIMITER | The character sequence indicating the next column. If non-printable characters are used, then either the \d65536, \xFFFF, or \u+FFFF encoding works. The default value is "". In addition: <ul style="list-style-type: none"> <li>“;” as the column separator; for example, 2000 ; IT Costs ; 435 . 55</li> <li>“ ” uses the pipe character as a delimiter</li> <li>“\d09” uses an ASCII tab character as a delimiter</li> </ul>  |
| TEXT_QUOTES      | Sometimes text data is enclosed in quotes so a column delimiter inside the text does not break the format. The line 2000 ; IT Costs ; software related only ; 435 . 55 would appear as 4 columns because the text contains a semicolon as well. If the file was created with quotes like 2000 ; " IT Costs ; software related only " ; 435 . 55, then there is no such issue, but the file parser must act more carefully and not just search for the next column delimiter. It must check if the text is inside the text quote character or outside. |
| ESCAPE_CHAR      | Another way to deal with inline special characters is to escape them; for example, 2000 ; IT Costs \ ; software related only ; 435 . 55. Here the \ is an escape character and indicates that the subsequent character is to be taken literally, not as a column delimiter.   |

| Parameter                         | Description and Examples   |
|-----------------------------------|--|
| TEXT_QUOTES_ESCAPE_CHAR           | How to make quotes appear inside the text; for example, <code>IT Costs ; "software related" only</code> . One option the file creator might have used is to use the global escape character: <code>2000 ; "IT Costs ; \"software related\" only" ; 435.55</code> . Another popular method is to have the quotes escaped by another quote like in <code>2000 ; "IT Costs ; ""software related"" only" ; 435.55</code> . In that case, both the <code>TEXT_QUOTE="</code> and the <code>TEXT_QUOTE_ESCAPE_CHAR="</code> are set to the <code>"</code> character. |
| QUOTED_TEXT_CONTAIN_ROW_DELIMITER | The default value is <i>False</i> , which tells the parser that regardless of any quotes or escape characters, the text inside a row never contains the row delimiter character sequence. In this case, the parser can break the file into rows faster, can search only for the character sequence, and only the column parsing has to consider the escape and quote characters. If set to true, parsing is slower.  |

## Fixed-Width only

| Parameter               | Description and Examples   |
|-------------------------|--|
| COLUMNSSTARTENDPOSITION | In a fixed-width file, the column positions must be specified for each column. Examples: <ul style="list-style-type: none"> <li>• <code>0-3;4-11;12-37;38-53</code> defines that the first 4 characters are the first column, the next 8 contain the data for the second column, and so on. Columns must be in the proper order.</li> <li>• <code>0;4;12;38</code> is equivalent to the previous example, but the last column ends with the line end</li> <li>• <code>0;4;12;38-53</code> can be used as well. In fact, for every column you can either specify the start and end position or just the start.</li> </ul>   |
| ROWLENGTH               | In fixed-width files, there does not need to be a row delimiter. Often the file has some and then they must be stripped away. The following examples assume that the last data character is at index 53 as specified the <code>COLUMNSTARTENDPOSITION</code> example. <ul style="list-style-type: none"> <li>• <code>ROWLENGTH=56 ROW_DELIMITER=</code> would work for a file that has a row delimiter. The payload text ranges from <code>0..53</code>; therefore, it is 54 characters long plus two characters for <code>\r\n</code>. The last column does not contain the <code>\r\n</code> because it is instructed to end at index 53.</li> <li>• <code>ROWLENGTH=54 ROW_DELIMITER=\r\n</code> is equivalent to the previous example. Each row is expected to be 54 characters plus 2 characters long. The main advantage of this notation is that <code>COLUMNSSTARTENDPOSITION=0;4;12;38</code> would work and the trailing <code>\r\n</code> is stripped away. In the previous example, the last column would start at 38 and end at index 55 due to <code>rowlength=56</code> and therefore contain the <code>\r\n</code> characters in the last column.</li> </ul> |

## XML and JSON only

| Parameter        | Description and Examples   |
|------------------|--|
| SCHEMA_LOCATION  | The absolute path to the XML schema file <filename>.xsd. For example:<br><pre>SCHEMA_LOCATION=Z:\FileAdapter\XMLSchema\example.xsd</pre> |
| TARGET_NAMESPACE | The target namespace defined in the XML schema. For example:<br><pre>TARGET_NAMESPACE=NISTSchema-negativeInteger-NS</pre>                |
| ROOT_NAME        | The XML node to use to display the hierarchy structure. For example:<br><pre>ROOT_NAME=root</pre>  |
| CIRCULAR_LEVEL   | The maximum recursive level in the XML schema to display. For example:<br><pre>CIRCULAR_LEVEL=3</pre>                                    |

### 6.2.10.3.2 Generate a File-Format Configuration File for a Virtual Table with SAP Business Application Studio

Use SAP Business Application Studio to create file-format configuration files used by the Flowgraph Editor.

#### Prerequisites

Ensure the SAP HANA database (HDB) module exists for your application project.

#### Context

File-format configuration files enable you to use CSV and fixed-format files to process your data for virtual tables in the Flowgraph Editor.

To create a configuration file in SAP Business Application Studio, perform the following steps:

#### Procedure

1. Create a virtual table artifact.

Right-click the `src` folder in the application's database module and choose **New File...**, then enter a file name with the `.hdbvirtualtable` extension. For example, `myVT.hdbvirtualtable`.

2. Open the new virtual-table artifact for editing.

Right-click the `.hdbvirtualtable` file, and then choose **Open With... > Virtual Table File Format Editor**.

The Virtual Table File Format Editor displays details of the selected virtual-table artifact in the following panes:

- **Options**  
Shows all of the settings for the file location and file content. The required settings have an asterisk (\*) next to them. In the top-right pane, you can copy and paste a few lines from your data file to test the options you have set in the left pane.  
For a complete list of options and descriptions, see *Related Information*.
- **Simulation**  
Test the options you set settings and run a preliminary simulation on the virtual table artifact.
- **Results**  
View the results of the tests run in the simulation pane.

3. Enter the remote source name and remote object identifier.

These identifiers help determine the location and the configuration file that it references. In the following example, the remote source name is **Remote** and the remote object identifier is **Object**:

#### Sample Code

```
VIRTUAL TABLE DUMMY AT "REMOTE" . "<NULL>" . "<NULL>" . "OBJECT"
```

4. Enter a file-name pattern.

This action associates all files using this pattern with the file-format definition. For example, `%.txt` applies to all files with a `.TXT` extension, and `123%.txt` applies to all text files that begin with the value "123".

5. Choose the file-format type.

You can choose between the following file-format types:

| Option | Description                           |
|--------|---------------------------------------|
| CSV    | Uses the comma-separated-value format |
| Fixed  | Uses the fixed-width format           |

6. Set the required options based on the file format type selected in the previous step.

- **CSV** format:  
Set the column delimiter that is used to separate the values in your file. Frequently, this delimiter is a comma (,), but you can also use other values such as a semicolon (;), colon (:), pipe (|), and so on.
- **Fixed** format:  
Enter the row length and the column start and end numbers. The row length should be the value of the entire row, including spaces and delimiters. The column start and end numbers are the length of each column. You can enter the span of the column, or only the starting number of the column. For example, `0-3;4-14;15-27` and `0;4;15` each return three columns with a total row length of 28.


7. Add columns to your virtual table or define names for the column-headers.

In the *Virtual Table Format Settings* section, you can use the fields provided to add one or more columns to your virtual table, for example, by clicking the + icon and setting the name, description, and type of each new column. Depending on the type you select, you may also need to provide additional information about length, precision, and scale options.

If you choose to test your settings, you can see the columns you've added in the *Simulation* pane.

You can run the simulation on your file and choose  (Copy Simulation Table Header) to copy the detected header information as columns.

#### 8. Test your settings.

To test your settings, copy several lines from your data file and paste them into the *Simulation* pane. Then choose  (*Run Simulation*) at the top of the *Simulation* pane to start the test and display the simulated results in the *Results* pane.

#### 9. Save your settings.

When you've completed the settings and simulation, click *Save*.

You can either create a configuration file that serves as the file-format definition, or you can use the virtual table as the file-format definition. The advantage of a virtual table is that you can use the table as an object in a flowgraph. For example, you can reference it as an SAP HANA Object in the Data Source and Data Target, and in any nodes where you can call a procedure in the flowgraph. If you created a virtual table, the configuration file is automatically created and placed in the file adapter with the name `<remote_object_identifier>.cfg`. If you're creating a configuration file, continue with the following steps.

#### 10. Optional: Create a configuration file:

1. Right-click the `.hdbvirtualtable` file in the project explorer and choose *Convert to Configuration*.
2. In the project explorer, right-click the `myVT.cfg.txt` file, choose *Rename...*, then delete the `.txt` extension from the filename so that it ends in `.cfg`, for example, `myVT.cfg`.
3. Display the contents of the new virtual-table file-format configuration file.

The following code sample shows an example of a simple virtual-table configuration file:

#### Sample Code

`myVT.cfg`

```
File Format Description
FORMAT=CSV
FORCE_FILENAME_PATTERN=% .csv
PARTITIONS=0
CODEPAGE=utf-8
LOCALE=en_US
SKIP_HEADER_LINES=0
ROW_DELIMITER=\n
QUOTED_TEXT_CONTAIN_ROW_DELIMITER=false
COLUMN_DELIMITER=,
EXPONENTIAL=E
LENIENT=true
```

## Related Information

[Format Parameters \[page 247\]](#)

## 6.2.10.3.2.1 File Format Options

Lists the options available for generating the file format definition in SAP Web IDE.

### Remote Source

| Option                   | Description  |
|--------------------------|--|
| Remote Source Name       | Enter the name of the remote source, which helps locate the remote source.   |
| Remote Object Identifier | Enter the ID of the object on the remote source, which helps identify the configuration file that it references. If the configuration file does not exist under that identifier, a configuration file is created when the virtual table is deployed. |
| Description              | Enter an optional description of the remote source.  |

### File Location

| Option           | Description   |
|------------------|---|
| Filename Pattern | Enter a file name pattern that indicates the files that are used automatically with this file format definition. For example, if you enter 123%, all files that begin with 123 automatically use this file format definition. |

| Option               | Description   |
|----------------------|---|
| Directory Pattern    | <p>Enter a directory pattern that indicates the location of the files used with this file format definition. You can use the directory pattern alone, or with the filename pattern setting, to narrow the virtual tables that use this file format definition. You might want to execute a simple <code>select * from &lt;virtualtable&gt;</code> without a WHERE clause on a directory and name of the file. In that case, every single file in the root directory and subdirectories is read and parsed according to this virtual table format definition. Processing might take a while and produce many errors. However, if the virtual table maps to files in a particular directory, directory tree, or to particular file names only, you can specify this information in the virtual table directly. For example:</p> <ul style="list-style-type: none"> <li>• Read all files in one directory only:<br/> Directory Pattern=<code>/usr/sap/FileAdapter/FileServer/plandata</code></li> <li>• Read all files in the directory and subdirectories:<br/> Directory Pattern=<code>/usr/sap/FileAdapter/FileServer/plandata/%</code></li> <li>• Read all files in directories that start with "plan"<br/> Directory Pattern=<code>/usr/sap/FileAdapter/FileServer/plan%:</code></li> <li>• Read files like <code>plan20120101.txt</code><br/> Filename Pattern=<code>plan%.txt</code></li> <li>• Read files inside the directory and match the provided name pattern</li> </ul> <pre>Directory Pattern=/usr/sap/FileAdapter/FileServer/plandata Filename Pattern=plan%.txt</pre> |
| Number of Partitions | Enter the number of partitions for parallel processing, which can improve performance. Entering 0 means that the data is run serially.  |

## File Content Specification (general options)

| Option               | Description  |
|----------------------|--|
| Format               | Choose the data source file type, CSV (comma-separated value), or Fixed (fixed-width files). The option you select here displays format-specific options.  |
| Code Page            | Select the character encoding for the file. By default, the operating system default is used. When the file has a Byte Order Mark, this code page is always used. Valid values of the Java installation can be found by creating a virtual table for the code page and querying its contents. If you chose JSON or XML as the format, then set the code page to UTF-8. |
| Locale               | The locale option sets the decimal and date conversion from the strings in the file into native numbers or dates. For example, the month and day "14. Oktober 2017" are valid in German, but is not valid in other languages. Valid values for the locale can be found by querying a virtual table based on the LOCALE table of the adapter.                           |
| Skipped Leader Lines | If the file contains header information such as metadata that is not used in the actual data columns, enter the number of lines to be skipped.   |

| Option        | Description   |
|---------------|---|
| Row Delimiter | <p>Enter the character sequence indicating the end of a row in the file. When the delimiters are nonprintable characters, they can be provided encoded as /d65536 or /xFFFF or as Unicode notation /u+FFFF. Alternatively, the typical \r and \n are supported as well. Examples:</p> <ul style="list-style-type: none"> <li>• \n Unix standard</li> <li>• \r\n Windows standard</li> <li>• \d13\d10 Windows standard, but characters provided as a decimal number</li> <li>• \x0D\x0A Windows standard, but characters provided as a hex number</li> </ul> |

## File Content Specification (CSV only)

| Option                             | Description   |
|------------------------------------|---|
| Column Delimiter                   | <p>Enter the character sequence indicating the next column. If nonprintable characters are used, then encoding \d65536, \xFFFF, or \u+FFFF works.</p> <ul style="list-style-type: none"> <li>• ; The semicolon is the column separator, so a line looks like <code>2000 ; IT Costs ; 435 . 55</code></li> <li>•   Use the pipe character as the delimiter</li> <li>• \d09 Use an ASCII tab character as the delimiter</li> </ul>  |
| Escape Character                   | <p>If you have special characters in your data such as quotation marks or semicolons, enter an escape character to use the character literally. For example, <code>2000 ; IT Costs \ ; software related only ; 435 . 55</code>. In this example, the \ char is an escape char and indicates that the subsequent character, the semicolon (;), is to be taken literally, not as a column delimiter.</p>  |
| Text Quotes Character              | <p>If you have text data enclosed in quotes, you can specify a character to indicate that the quotes are part of the data, and not a delimiter. The line <code>2000 ; IT Costs ; software related only ; 435 . 55</code> would appear as 4 columns because the text contains a semicolon as well. If the file was created with quotes like <code>2000 ; " IT Costs ; software related only " ; 435 . 55</code>, then the semicolon within the quotes is not interpreted as a column delimiter.</p>  |
| Text Quotes Escape Character       | <p>Specify how to make quotes appear inside the text, like in <code>IT Costs ; " software related " only</code>. One option the file creator might have used is to use the global escape character: <code>2000 ; " IT Costs ; \"software related \" only " ; 435 . 55</code>. Another popular method is to have the quotes escaped by another quote like in <code>2000 ; " IT Costs ; " "software related" " only " ; 435 . 55</code>. In that case both the Character for Text Quotes=" and the Text Quotes Escape Character=" are set to the " character.</p> |
| Quoted Text Contains Row Delimiter | <p>When disabled (off), indicates that any quotes or escape characters in text inside a row does not contain the row delimiter character. In this case, processing is faster. When enabled (on), processing is slower because the system looks for quotes or escape characters in the rows.</p>   |



## File Content Specification (Fixed Format only)

| Option                         | Description  |
|--------------------------------|--|
| Row Length                     | <p>In fixed width files, you do not need to set a row delimiter. Often the file has some delimiters, and then they must be stripped away. The following examples show that the last data character is at index 53:</p> <ul style="list-style-type: none"><li>Setting <code>RowLength</code> to 56 and leaving the <code>Row Delimiter</code> setting empty works for a file that has a row delimiter. The payload text ranges from 0 to 53 (therefore is 54 characters long when counting the 0) plus two characters for <code>\r\n</code>. However, the last column does not contain the <code>\r\n</code>, and is told to index at 53.</li><li>Setting <code>RowLength</code> to 54 and <code>Row Delimiter</code> to <code>\r\n</code> is equivalent to the example in the previous bullet. Each row is expected to be 54 characters plus 2 characters long. The main advantage of this notation is that setting the <code>Columns Start and End Position</code> parameter to <code>0;4;12;38</code> works well, because the trailing <code>\r\n</code> is stripped away. In the example in the previous bullet, the last column would start at 38 and end at index 55, because the row length is 56 and contain the <code>\r\n</code> characters in the last column.</li></ul> |
| Columns Start and End Position | <p>Enter the column positions for each column. Example:</p> <ul style="list-style-type: none"><li><code>0-3;4-11;12-37;38-53</code> defines that the first 4 characters are the first column, the next 8 contain the data for the second column, and so on. Columns must be in the proper order.</li><li><code>0;4;12;38</code> is equivalent to the example in the previous bullet. The last column ends with the line end.</li><li><code>0;4;12;38-53</code> can be used as well. In fact, every single column can either specify the start and end position or just the start.</li></ul>  |

## Virtual Table Format Settings

| Option                       | Description  |
|------------------------------|--|
| Exponential Character        | Enter a character that identifies any exponents in the data.   |
| Date Format                  | Choose from the available date and time formats or enter a custom date or time format. Each option can have a different format string. The syntax of the format string is the Java <code>SimpleDateFormat</code> syntax. |
| Seconddate Format            |  |
| Time Format                  |  |
| Timestamp Format             |  |
| Convert Invalid Date or Time | Enable the option to correct automatically invalid date or time values. For example, the 27th hour changes to 3 am.  |

## Virtual Table Columns (Add Columns dialog)

| Option      | Description  |
|-------------|--|
| Name        | Enter the column name.   |
| Description | Enter a description of the column.   |
| Type        | Select the column type based on the data in the column.                              |
| Length      | Enter the number of characters of the longest value in the column.                   |
| Precision   | Enter the total number of digits in the value. Used for Decimal data types.          |
| Scale       | Enter the number of digits to the right of the decimal. Used for Decimal data types. |

### 6.2.10.3.3 Generate the Configuration File with SAP Web IDE

Use SAP Web IDE to create file format configuration files so that your CSV and fixed-format files can be used in processing your data in the Flowgraph Editor.

#### Prerequisites

Ensure the SAP HANA database (HDB) module exists. For more information, see the *SAP HANA Developer Guide for XS Advanced Model*.

#### Context

To create a file format configuration file in SAP Web IDE:

#### Procedure

1. Create a virtual table by right-clicking the `src` folder and choosing **New > File**, then enter a file name with the `.hdbvirtualtable` extension. For example, `myVT.hdbvirtualtable`.
2. Right-click the `.hdbvirtualtable` file, and then choose **Open With > File Format Editor**.  
The File Format Editor is separated into three panes. The options pane shows all of the settings for the file location and file content. The required settings have an asterisk (\*) next to them. In the top-right pane, you can copy and paste a few lines from your data file to test the options you have set in the left pane. For a complete list of options and descriptions, see [File Format Options \[page 260\]](#).
3. Enter the remote source name and remote object identifier. These identifiers help determine the location and the configuration file that it references. In this example, the remote source

name is Remote and the remote object identifier is Object: VIRTUAL TABLE DUMMY AT "REMOTE" . " <NULL> " . " <NULL> " . " OBJECT "

4. Enter a file name pattern. This action associates all files with this pattern to the file format definition. For example, `%.txt` applies to all files with a TXT extension. `123%.txt` applies to all TXT files that begin with the value "123".
5. Choose the file format type.

| Option | Description                            |
|--------|--|
| CSV    | Uses the comma-separated value format. |
| Fixed  | Uses the fixed-width format.           |

6. Set the required options based on the file format type selected in the previous step.
  - If you chose the *CSV* format, set the column delimiter that is used to separate the values in your file. Frequently, this delimiter is a comma (,), but you can also use other values such as a semicolon (;), colon (:), pipe (|), and so on.
  - If you chose the *Fixed* format, enter the row length and the column start and end numbers. The row length should be the value of the entire row, including spaces and delimiters. The column start and end numbers are the length of each column. You can enter the span of the column, or only the starting number of the column. For example, 0-3;4-14;15-27 and 0;4;15 each return three columns with a total row length of 28.
7. In the *Virtual Table Columns* section, add one or more columns of your virtual table or enter column heading names by clicking the + icon and setting the name, description, and type of each new column. Depending on the type you selected, you may also need to enter length, precision, and scale options. If you choose to test your settings, you can see the columns you have added in the Simulation pane.

You can run the simulation on your file and copy the detected header information as columns in the *Virtual Table Columns* section.

8. To test your settings, copy several lines from your data file and paste them into the top-right pane. Click the *Run Simulation* icon above this pane to see the simulated results in the bottom-right pane.
9. When you have completed the settings, click *Save*.  
You can either create a configuration file that serves as the file format definition, or you can use the virtual table as the file format definition. The advantage of a virtual table is that you can use the table as an object in your flowgraph. For example, you can reference it as a HANA Object in the Data Source and Data Target, and in any nodes where you can call a procedure in the flowgraph. If you created a virtual table, the configuration file is automatically created and placed in the file adapter with the name `<remote_object_identifier>.cfg`. If you are creating a configuration file, continue with the following steps.
10. (Optional) If you want to create a configuration file:
  1. Right-click the `.hdbvirtualtable` file and choose *Configuration (.cfg.txt)*.
  2. Export the configuration file by right-clicking the `.cfg.txt` file, and choose *Export* to place the file in your file adapter.
  3. On the file adapter, right-click the `.cfg.txt` file, choose *Rename*, then delete the `.txt` extension from the filename so that it ends in `.cfg`. For example, you would rename the file `northwest_sales.cfg.txt` to `northwest_sales.cfg`.

## Related Information

[Create an HDB Module \(SAP HANA Developer Guide for SAP HANA XS Advanced Model\)](#)

### 6.2.10.3.3.1 File Format Options

Lists the options available for generating the file format definition in SAP Web IDE.

#### Remote Source

| Option                   | Description  |
|--------------------------|--|
| Remote Source Name       | Enter the name of the remote source, which helps locate the remote source.   |
| Remote Object Identifier | Enter the ID of the object on the remote source, which helps identify the configuration file that it references. If the configuration file does not exist under that identifier, a configuration file is created when the virtual table is deployed. |
| Description              | Enter an optional description of the remote source.  |

#### File Location

| Option           | Description   |
|------------------|---|
| Filename Pattern | Enter a file name pattern that indicates the files that are used automatically with this file format definition. For example, if you enter 123%, all files that begin with 123 automatically use this file format definition. |

| Option               | Description   |
|----------------------|---|
| Directory Pattern    | <p>Enter a directory pattern that indicates the location of the files used with this file format definition. You can use the directory pattern alone, or with the filename pattern setting, to narrow the virtual tables that use this file format definition. You might want to execute a simple <code>select * from &lt;virtualtable&gt;</code> without a WHERE clause on a directory and name of the file. In that case, every single file in the root directory and subdirectories is read and parsed according to this virtual table format definition. Processing might take a while and produce many errors. However, if the virtual table maps to files in a particular directory, directory tree, or to particular file names only, you can specify this information in the virtual table directly. For example:</p> <ul style="list-style-type: none"> <li>Read all files in one directory only:<br/> <pre>Directory Pattern=/usr/sap/FileAdapter/FileServer/plandata</pre> </li> <li>Read all files in the directory and subdirectories:<br/> <pre>Directory Pattern=/usr/sap/FileAdapter/FileServer/plandata/%</pre> </li> <li>Read all files in directories that start with "plan"<br/> <pre>Directory Pattern=/usr/sap/FileAdapter/FileServer/plan%:</pre> </li> <li>Read files like <code>plan20120101.txt</code><br/> <pre>Filename Pattern=plan%.txt</pre> </li> <li>Read files inside the directory and match the provided name pattern<br/> <pre>Directory Pattern=/usr/sap/FileAdapter/FileServer/plandata Filename Pattern=plan%.txt</pre> </li> </ul> |
| Number of Partitions | Enter the number of partitions for parallel processing, which can improve performance. Entering 0 means that the data is run serially.  |

## File Content Specification (general options)

| Option               | Description  |
|----------------------|--|
| Format               | Choose the data source file type, CSV (comma-separated value), or Fixed (fixed-width files). The option you select here displays format-specific options.  |
| Code Page            | Select the character encoding for the file. By default, the operating system default is used. When the file has a Byte Order Mark, this code page is always used. Valid values of the Java installation can be found by creating a virtual table for the code page and querying its contents. If you chose JSON or XML as the format, then set the code page to UTF-8. |
| Locale               | The locale option sets the decimal and date conversion from the strings in the file into native numbers or dates. For example, the month and day "14. Oktober 2017" are valid in German, but is not valid in other languages. Valid values for the locale can be found by querying a virtual table based on the LOCALE table of the adapter.                           |
| Skipped Leader Lines | If the file contains header information such as metadata that is not used in the actual data columns, enter the number of lines to be skipped.   |

| Option        | Description   |
|---------------|---|
| Row Delimiter | <p>Enter the character sequence indicating the end of a row in the file. When the delimiters are nonprintable characters, they can be provided encoded as /d65536 or /xFFFF or as Unicode notation /u+FFFF. Alternatively, the typical \r and \n are supported as well. Examples:</p> <ul style="list-style-type: none"> <li>• \n Unix standard</li> <li>• \r\n Windows standard</li> <li>• \d13\d10 Windows standard, but characters provided as a decimal number</li> <li>• \x0D\x0A Windows standard, but characters provided as a hex number</li> </ul> |

## File Content Specification (CSV only)

| Option                             | Description   |
|------------------------------------|---|
| Column Delimiter                   | <p>Enter the character sequence indicating the next column. If nonprintable characters are used, then encoding \d65536, \xFFFF, or \u+FFFF works.</p> <ul style="list-style-type: none"> <li>• ; The semicolon is the column separator, so a line looks like <code>2000 ; IT Costs ; 435 . 55</code></li> <li>•   Use the pipe character as the delimiter</li> <li>• \d09 Use an ASCII tab character as the delimiter</li> </ul>  |
| Escape Character                   | <p>If you have special characters in your data such as quotation marks or semicolons, enter an escape character to use the character literally. For example, <code>2000 ; IT Costs \ ; software related only ; 435 . 55</code>. In this example, the \ char is an escape char and indicates that the subsequent character, the semicolon (;), is to be taken literally, not as a column delimiter.</p>  |
| Text Quotes Character              | <p>If you have text data enclosed in quotes, you can specify a character to indicate that the quotes are part of the data, and not a delimiter. The line <code>2000 ; IT Costs ; software related only ; 435 . 55</code> would appear as 4 columns because the text contains a semicolon as well. If the file was created with quotes like <code>2000 ; " IT Costs ; software related only " ; 435 . 55</code>, then the semicolon within the quotes is not interpreted as a column delimiter.</p>  |
| Text Quotes Escape Character       | <p>Specify how to make quotes appear inside the text, like in <code>IT Costs ; " software related " only</code>. One option the file creator might have used is to use the global escape character: <code>2000 ; " IT Costs ; \"software related \" only " ; 435 . 55</code>. Another popular method is to have the quotes escaped by another quote like in <code>2000 ; " IT Costs ; ""software related"" only " ; 435 . 55</code>. In that case both the Character for Text Quotes=" and the Text Quotes Escape Character=" are set to the " character.</p> |
| Quoted Text Contains Row Delimiter | <p>When disabled (off), indicates that any quotes or escape characters in text inside a row does not contain the row delimiter character. In this case, processing is faster. When enabled (on), processing is slower because the system looks for quotes or escape characters in the rows.</p>   |

## File Content Specification (Fixed Format only)

| Option                         | Description  |
|--------------------------------|--|
| Row Length                     | <p>In fixed width files, you do not need to set a row delimiter. Often the file has some delimiters, and then they must be stripped away. The following examples show that the last data character is at index 53:</p> <ul style="list-style-type: none"><li>Setting <code>RowLength</code> to 56 and leaving the <code>Row Delimiter</code> setting empty works for a file that has a row delimiter. The payload text ranges from 0 to 53 (therefore is 54 characters long when counting the 0) plus two characters for <code>\r\n</code>. However, the last column does not contain the <code>\r\n</code>, and is told to index at 53.</li><li>Setting <code>RowLength</code> to 54 and <code>Row Delimiter</code> to <code>\r\n</code> is equivalent to the example in the previous bullet. Each row is expected to be 54 characters plus 2 characters long. The main advantage of this notation is that setting the <code>Columns Start and End Position</code> parameter to <code>0;4;12;38</code> works well, because the trailing <code>\r\n</code> is stripped away. In the example in the previous bullet, the last column would start at 38 and end at index 55, because the row length is 56 and contain the <code>\r\n</code> characters in the last column.</li></ul> |
| Columns Start and End Position | <p>Enter the column positions for each column. Example:</p> <ul style="list-style-type: none"><li><code>0-3;4-11;12-37;38-53</code> defines that the first 4 characters are the first column, the next 8 contain the data for the second column, and so on. Columns must be in the proper order.</li><li><code>0;4;12;38</code> is equivalent to the example in the previous bullet. The last column ends with the line end.</li><li><code>0;4;12;38-53</code> can be used as well. In fact, every single column can either specify the start and end position or just the start.</li></ul>  |

## Virtual Table Format Settings

| Option                       | Description  |
|------------------------------|--|
| Exponential Character        | Enter a character that identifies any exponents in the data.   |
| Date Format                  | Choose from the available date and time formats or enter a custom date or time format. Each option can have a different format string. The syntax of the format string is the Java <code>SimpleDateFormat</code> syntax. |
| Seconddate Format            |  |
| Time Format                  |  |
| Timestamp Format             |  |
| Convert Invalid Date or Time | Enable the option to correct automatically invalid date or time values. For example, the 27th hour changes to 3 am.  |

## Virtual Table Columns (Add Columns dialog)

| Option      | Description  |
|-------------|--|
| Name        | Enter the column name.   |
| Description | Enter a description of the column.   |
| Type        | Select the column type based on the data in the column.                              |
| Length      | Enter the number of characters of the longest value in the column.                   |
| Precision   | Enter the total number of digits in the value. Used for Decimal data types.          |
| Scale       | Enter the number of digits to the right of the decimal. Used for Decimal data types. |

### 6.2.10.3.4 Generate the Configuration File With a Command-Line Utility

Use a Data Provisioning utility to create the CFG file.

#### Procedure

1. Navigate to `<DPAgent_root>\agentutils`.
2. Run the following from the command line:  
For Windows:

```
createfileformat.bat -file <PATH TO DATA FILE> -cfgdir <DIRECTORY TO STORE  
GENERATED CFG FILES> <OPTION> <VALUE>.....
```

For UNIX:

```
createfileformat.sh -file <PATH TO DATA FILE> -cfgdir <DIRECTORY TO STORE  
GENERATED CFG FILES> <OPTION> <VALUE>.....
```

Only the `-file`, `-cfgdir`, and `-format` (when using a CSV file) parameters are required.

The value for the `-file` parameter is the path to the directory containing one or more data files or the path to a single file name for which the configuration files must be generated. The value for `-cfgdir` is the path to the output directory where the generated configuration files are stored.

A number of options and value pairs can be provided as extra parameters. The following are supported:

| Parameter                  | Description          |
|----------------------------|----------------------|
| <code>-colDelimiter</code> | The column delimiter |
| <code>-rowDelimiter</code> | The row delimiter    |



| Parameter             | Description   |
|-----------------------|---|
| -txtDelimiter         | Text quotes   |
| -escChar              | Escape character  |
| -txtEscChar           | Quote escape character  |
| -dateFormat           | Default date format   |
| -timeformat           | Default time format   |
| -secondDateFormat     | Default second date format  |
| -format               | The format of the file  |
| -firstRowAsColumnName | <p>Specifies whether to use the first row in a data file as the column names when generating a CFG file with the <code>createfileformat .sh/bat</code> tool.</p> <p>If set to TRUE, <code>createfileformat .sh/bat</code> uses the row above the real data as the column name. Otherwise, <code>createfileformat .sh/bat</code> sets the row names as COL1, COL2, ... by default. The default value is FALSE.</p> <p>/17</p> <div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p><b>Note</b></p> <p>To use this parameter together with <code>-skipHeaderLine</code>, the row containing the column names should be included in the <code>-skipHeaderLine</code> count. If you set <code>-firstRowAsColumnName</code> to true and did not configure <code>-skipHeaderLine</code>, <code>-skipHeaderLine</code> is set automatically to 1.</p> </div> <div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>• FIXED format files do not support <code>-firstRowAsColumnName</code>.</li> <li>• The count of column name in the column name line must be correct.</li> <li>• If there are two-column names, but there are 3 columns in the file data, the last column is ignored.</li> <li>• The column delimiter also applies to the column name line.</li> </ul> </div> |
| -skipHeaderLine       | Skips header lines  |

| Parameter                      | Description  |
|--------------------------------|--|
| -columnStartEndPosition        | <p>FIXED file column start end position. For example, -columnStartEndPosition 0-10:11-20.</p> <p>Handle this parameter differently for Windows and Linux systems. The following is an example for Windows:</p> <pre>./createfileformat.sh -file /dpagent/text/test.txt -cfgdir /dpagent/cfg -rowLength 16 -columnStartEndPosition 0-14;14-15 -format "FIXED"</pre> <p>For Linux, you must enclose the semicolon in double quotes:</p> <pre>./createfileformat.sh -file /dpagent/text/test.txt -cfgdir /dpagent/cfg -rowLength 16 -columnStartEndPosition 0-14;"14-15 -format "FIXED"</pre> |
| -rowLength                     | FIXED file row length  |
| -quotedTxtContainsRowDelimiter | Quoted text contains the row delimiter (TRUE or FALSE)   |
| -locale                        | Default locale   |
| -codePage                      | Default code page  |

If no options are provided as parameters, the default delimiters are:

| Delimiter              | Character                   |
|------------------------|-----------------------------|
| Column delimiter       | ,                           |
| Row delimiter          | \n (UNIX)<br>\r\n (Windows) |
| Escape character       | \                           |
| Quote escape character | "                           |
| Default text quotes    | "                           |

### Note

Only one format of each type (date, time, second date) is allowed per file. If you have two columns containing different formatted dates in it, only the first one is recognized. The second is Varchar.

## Example

Run this tool to generate a configuration file named `call_center.dat` that has ';' as a column delimiter and '\n' as a row delimiter:

```
createfileformat.sh -file
C:\usr\sap\dataprovagent\sasi\FileServer\call_center.dat
-cfgdir C:\usr\sap\dataprovagent\sasi\FileDefinitions -colDelimiter ;
-rowDelimiter \n
```

### 6.2.10.3.5 Generate the Configuration File When Creating a Virtual Table

You can generate a CFG file when you create a virtual table using SQL.

A convenient way to generate the necessary configuration file is to do so when creating a virtual table using SQL. By including the appropriate parameters in the SQL, a CFG file is generated and inserted into the appropriate directory that you specified when creating the File adapter remote source.

For example, the following sample code generates a file named `v_plan_2.cfg` that is created in the file format directory.

```
create virtual table v_plan2 at "fileAdapter"."<NULL>". "<NULL>". "v_plan_2"
REMOTE PROPERTY 'dataprovisioning_parameters'=
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Parameters>
<Parameter name="COMMENT">First line must be a comment</Parameter>
<Parameter name="FORCE_FILENAME_PATTERN">fixed%.txt</Parameter>
<Parameter name="FORCE_DIRECTORY_PATTERN"></Parameter>
<Parameter name="FORMAT">FIXED</Parameter>
<Parameter name="CODEPAGE">UTF-8</Parameter>
<Parameter name="ROW_DELIMITER">\n</Parameter>
<Parameter name="SKIP_HEADER_LINES">1</Parameter>
<Parameter name="COLUMNSSTARTENDPOSITION">0-1;2-7;8-15</Parameter>
<Parameter name="ROWLENGTH">16</Parameter>
<Parameter name="COLUMN">COL1;VARCHAR(2)</Parameter>
<Parameter name="COLUMN">COL2;VARCHAR(6)</Parameter>
<Parameter name="COLUMN">COL3;VARCHAR(8)</Parameter>
</Parameters>';
```

## Related Information

[File Adapter Remote Source Configuration \[page 236\]](#)

[Format Parameters \[page 247\]](#)

## 6.2.10.4 Remote Source Tables

The remote source provides tables that reflect the content of the CFG files, and they can be imported as virtual tables.

After a remote source is created, you can browse the remote source. Each of the configured CFG files is shown as a remote table under the remote source and can be imported as a virtual table. The following tables are always included:

| Table               | Description   |
|---------------------|---|
| CODEPAGES           | Use this table to retrieve all supported code pages of the Java installation and optionally specify one in the various file format configuration files. The code page controls the character encodings of the source files.   |
| FILECONTENT         | This virtual table has one row per file and the entire file content is inside a BLOB column. Use this table for unstructured data files.  |
| FILECONTENTROWS     | Similar to FILECONTENT, this table returns the data as is, without any conversion, but splits the file into rows at every <code>&lt;newline&gt;</code> character.   |
| FILECONTENTROWSTEXT | Similar to FILECONTENTROWS, this table also uses a character buffer for improved performance when handling lines with a length less than or equal to MAX_CLOB_INLINE_LOB_LENGTH(43690).<br><br>For lines with a greater length, this table behaves the same as FILECONTENTROWS.   |
| FILECONTENTTEXT     | This virtual table has one row per file, and the entire file content is inside an NCLOB column. Use this table for unstructured data files. In case the file has no ByteOrderMark (BoM) header to identify the code page, or the operating system default code page is not the proper one, you can supply the reader option CODEPAGE. |
| FILEDIRECTORY       | Returns a list of all files in the remote source configured root directory and its subdirectories.  |
| LOCALES             | This table returns all supported Java locales, and the values can be used to control the locale of the file read, which impacts the decimal format, the month names of a date format, and so on.  |
| STATISTICS_CHAR     | Calculates the number of occurrences of each character in the files. Characters that occur often usually are column delimiters, optional text quotes, and row delimiter characters.   |

## 6.2.10.5 Connect to a SharePoint Remote Source

Information about retrieving source data from a SharePoint server.

### Procedure

1. Configure the remote source, making sure that you set the appropriate parameters.

At a minimum, you will need to configure the following remote source parameters, :

| Parameter                                | Comment   |
|--|---|
| Source Options                           |   |
| Target Options                           |   |
| Root Directory                           |   |
| Directory of the file format definitions |   |
| Server URL                               | SharePoint server URL   |
| Local Folder Path                        | The download folder path. This folder will be created under the <DPAgent_root>/ directory automatically. The local folder path is the location on the Data Provisioning Agent machine local drive where you want to place your source data files that the Data Provisioning Agent will download from the SharePoint server. |

See the remote source configuration topic for more information about these parameters.

2. Replicate data from, for example, the following SharePoint server URL: `http://<host name>/sharepoint_site1/SharedDocuments/myCSVfile.txt`.
3. In the local CFG file, add the following:

```
FORCE_FILENAME_PATTERN=myCSVfile.txt
FORCE_DIRECTORY_PATTERN=<root directory>\download\sharepoint\SharedDocuments
```

## Results

Data Provisioning Agent will download `myCSVfile.txt` from the SharePoint Server URL `SharedDocuments` folder and store the file locally in `<root directory>\download\sharepoint\SharedDocuments`.

### Note

When you execute a query, the Data Provisioning Agent downloads the file and places it in the download folder. If you execute the same query to obtain the same file, the system downloads the file again and replaces the existing file in the download folder.

## Related Information

[File Adapter Remote Source Configuration \[page 236\]](#)

## 6.2.10.6 Access SharePoint Using HTTPS/SSL

Information about how to access SharePoint using HTTPS/SSL.

### Context

You can access the SharePoint server using HTTPS or SSL. You first must download the SharePoint certificate (CER) and configure your system.

### Procedure

1. Navigate to `<DPAgent_root>/ssl` folder.
2. Run the command to change the default keystore password `changeit`.

```
c:\<user>\dpagent\ssl>keytool -storepasswd -keystore cacerts
Enter keystore password:changeit
New keystore password:
Re-enter new keystore password:
```

#### Note

Keytool is in the `jre/bin` folder. Add it to the `$PATH` environment. For example, `C:\Program Files\Java\jre7\bin\keytool.exe`

3. Import the certificate that you exported.

```
c:\<user>\dpagent\ssl>keytool.exe -importcert -keystore
c:\user\dpagent\ssl\cacerts
-storepass <New Key Store Password> -file
C:\<user>\dpagent\ssl\SharePointSSL.cer
Owner: CN=RQA16CWIN2.sjc.sap.corp
Issuer: CN=RQA16CWIN2.sjc.sap.corp
Serial number: 34973632d6cb31934fdfbe04352cc5dc
Valid from: Thu Jan 05 01:29:45 PST 2017 until: Thu Jan 04 16:00:00 PST 2018
Certificate fingerprints:
    MD5: 0C:7E:CA:38:1B:1E:2A:2A:47:21:78:86:50:1C:85:CE
    SHA1: 25:CE:CF:F8:9A:2C:70:0A:66:CD:39:D5:C5:EC:10:4D:57:42:28:0B
    SHA256:
40:80:A0:E1:56:1A:9A:F4:9F:63:20:37:F3:41:B0:27:B6:1F:9C:33:3C:
0A:E8:79:0B:91:7E:E6:6B:E8:08:3A
    Signature algorithm name: SHA1withRSA
    Version: 3
Extensions:
#1: ObjectId: 2.5.29.37 Criticality=false
ExtendedKeyUsages [
    serverAuth
]
#2: ObjectId: 2.5.29.15 Criticality=false
KeyUsage [
    Key_Encipherment
    Data_Encipherment
]
Trust this certificate? [no]: yes
```

```
Certificate was added to keystore
```

4. Use the agent configuration tool to enter the agent keystore file path and password that you used in the previous step.
5. If you are not using the TCP SSL connection between SAP HANA and the DP Agent, clear the *Use SSL to communicate with HANA on Cloud* and *Enable SSL for Agent to HANA communication on TCP* parameters.
6. Open `<DPAgent_root>/dpagent.ini`, and add the following configuration:

```
-Djavax.net.ssl.trustStore=<keystore file path>
```

For example: `-Djavax.net.ssl.trustStore=C:\<user>\dpagent\ssl\cacerts`

7. Restart the Data Provisioning Agent.

## Related Information

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

[Manage the Agent Service \[page 63\]](#)

## 6.2.10.7 Accessing Files On a Shared Network

Information about how to use a shared network directory for data files with the File adapter.

You can access data and format files in a shared directory if you follow these guidelines:

### Windows

When using Windows, make sure that you manually access the network folder first using a user name and password before you try to connect by creating a remote source.

### Linux

To access a Linux network folder, mount the folder under the Data Provisioning Agent root installation directory.

## File Adapter Remote Source Parameters

Observe the instructions for the *Root Directory* and *Directory of the file format definitions* parameters when creating your File remote source.

## Related Information

[File Adapter Remote Source Configuration \[page 236\]](#)

### 6.2.10.8 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

#### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. In the *Agent Preferences* menu, choose *Set Agent Preferences*.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter , OracleLogReaderAdapter , HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

#### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```



## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Agent Configuration Parameters \[page 112\]](#)

### 6.2.10.9 Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365

You must register an application on Microsoft Azure Portal as a precondition for using the Microsoft Graph API, which is what allows you to access SharePoint on Office365 using the File or Microsoft Excel adapters.

#### Procedure

1. Go to <https://portal.azure.com> and sign in with your Microsoft account.
2. Navigate to *Azure Active Directory*, and click *App registrations*.
3. Click *New registration*.
4. Choose a name for your Data Provisioning Agent--for example, *sdi-dpagent*--to use as the name for your application.
5. Choose the proper *Supported account types*: either *Account in this organizational directory only* or *Accounts in any organizational directory*.
6. Leave *Redirect URL* empty, and click *Register*.

#### Next Steps

After registration, note the application (client) ID and Directory (tenant) ID, which you use during remote source configuration.

## Related Information

[File Adapter Remote Source Configuration \[page 236\]](#)

[Configure Your Microsoft Azure Application \[page 274\]](#)

## 6.2.10.10 Configure Your Microsoft Azure Application

Configure your Azure application to set up your credentials and Microsoft Graph API.

### Context

Further configuration of your Azure application is necessary to create credentials for when you create a remote source. You must also grant permissions for using the Microsoft Graph API.

### Procedure

1. Click [Authentication](#) to configure the client type.

If you want to authenticate using the username and password mode, set the *Default client type* to *Yes*.

If you want to authenticate the Client Credential mode, set the *Default client type* to *No*.

- a. If you chose to authenticate using Client Credential mode, create a credential by clicking [Certificates & secrets](#). If you chose to authenticate using the username and password mode, skip to step 2.
  - b. Click [New client secret](#), give it a name and an expiration time, and click [Add](#).
  - c. Note the secret password for use during remote source creation.
2. Add permissions by clicking [API permissions](#) on the application page, and then clicking [Add a permission](#).
  3. Click [Microsoft Graph](#).
  4. If you use the Client Credential mode, click [Application Permission](#). If you use the Username and password mode, click [Delegated permission](#).
  5. Add the following permissions:
    - Directory.Read.All
    - Files.Read.All
    - Group.Read.All
    - Sites.Read.All
    - User.Read.All
  6. Grant consent for these permissions.

If you have an administrator role, click [Grant consent](#).

If you do not have an administrator role, ask your administrator to grant permission for you.

#### Note

If permissions are not granted, you will not be able to access SharePoint Office365.

Every time a permission is changed, you should redo the grant operations.

## Next Steps

You can now create your remote source, using the information created while setting up your Microsoft Azure Portal application.

## Related Information

[File Adapter Remote Source Configuration \[page 236\]](#)

[Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365 \[page 273\]](#)

## 6.2.11 File Datastore Adapters

Use the File Datastore adapters to read text files.

File Datastore adapters leverage the SAP Data Services engine as the underlying technology to read from a wide variety of file sources. SAP Data Services uses the concept of datastore as a connection to a source.

These adapters provide features including:

- Auto-detect file formats
- Route rows that failed to be read to another file
- Read CFG files from SFTP sources
- Automatic CFG file generation via virtual procedure or data file importation

The file datastore adapters include:

- FileAdapterDatastore
- SFTPAdapterDatastore

## Adapter Functionality

Datastore adapters support the following functionality:

- Virtual table as a source
- SELECT, WHERE, TOP, or LIMIT

## Related Information

[File \[page 234\]](#)

## 6.2.11.1 Authorizations

Authorization requirements for accessing remote sources with a File Datastore Adapter.

Keep the following in mind when accessing files:

- Ensure the user account under which the Data Provisioning Agent is running has access to the files on the local host.
- If the files are located on the same host as the Data Provisioning Agent, the files must be located in the same directory or in a subdirectory of the Data Provisioning Agent root directory.

## 6.2.11.2 Configuring Access to Your Data and Configuration Files

How the File Datastore Adapter locates data files and configuration files.

By default, the adapter has access to the `<DPAgent_root>/workspace` directory. To enable browsing your files, you can either put your data and configuration files in the default workspace directory, or you can configure the location of the files in `dpagentconfig.ini`. For example, add the following to the `<DPAgent_root>/dpagentconfig.ini` file:

```
#Number of paths that could be browsed in SAP HANA via this adapter
dsadapter.fileadapter.dirCount=2
dsadapter.fileadapter.dir1=C:\\TEST1\\UAT
dsadapter.fileadapter.dir2=C:\\TEST2\\QA
```

Then, browse to your data file and right-click to add it as virtual table. The adapter creates a corresponding configuration file in the same folder. For example, when you add `employee.csv` to SAP HANA, the adapter creates an `employee.cfg` file in the same folder.

Alternately, you can create your own configuration files through virtual procedures or create them manually:

- To use the Create Configuration File virtual procedure, in the SAP HANA Web Development Workbench: Catalog, navigate to **Provisioning > Remote Sources > <remote\_source> > File Operations > CFG Utilities**. Right-click *Create Configuration File* and *Add as Virtual Procedure*.
- To create the configuration files manually, execute CREATE VIRTUAL PROCEDURE SQL.

You can then use the virtual table in a flowgraph or SQL execution.

## Related Information

[Virtual Procedures \[page 282\]](#)

[Virtual Procedure: Create Configuration File \[page 285\]](#)

## 6.2.11.3 File Format Configuration Files

Create a file format configuration file to work with your data file (File Datastore adapters).

Each configuration file is a text file and must match the following format:

- The first line must contain a comment or a description. This line is ignored during processing.
- A set of key-value pairs to specify the various parsing options
- A set of `COLUMN=<name>;<SAP HANA datatype>;<optional description>;<optional date type format>;<optional column width>`  
The date type format is necessary only if the SAP HANA data type of this column is date-related. Column width is necessary only if the data file is a fixed-format file.

### Example

```
File format to read US census data, see https://www.census.gov/econ/cbp/download/
FORMAT=CSV
FORCE_FILENAME_PATTERN=us_county_census_%.txt
FORCE_DIRECTORY_PATTERN=
CODEPAGE=
LOCALE=
COLUMN_DELIMITER=,
ROW_DELIMITER=\r\n
ESCAPE_CHAR=
TEXT_QUOTES="
TEXT_QUOTES_ESCAPE_CHAR=
SKIP_HEADER_LINES=1
QUOTED_TEXT_CONTAIN_ROW_DELIMITER=false
DATEFORMAT=yyyy.MM.dd HH:mm:ss
COLUMN=FIPSTATE;VARCHAR(2);FIPS State Code
COLUMN=EMP;INTEGER;Total Mid-March Employees with Noise
COLUMN=QP1_NF;VARCHAR(1);Total First Quarter Payroll Noise Flag
COLUMN=CENSTATE;VARCHAR(2);Census State Code
COLUMN=CENCTY;VARCHAR(3);Census County Code
COLUMN=CENTIME;TIMESTAMP;Payroll Time; yyyy.MM.dd HH:mm:ss
COLUMN=PARTITION
COLUMNSTARTENDPOSITION=
```

### Fixed-Format Files

Fixed file formats where `FORMAT=fixed` are supported. You can specify the formatting using the `<optional column width>` parameter. For example, in `COLUMN=COL3;VARCHAR(8);Description;;8`, the last column value of 8 indicates the width.

### Example

```
Fixed file format
```

```

FORMAT=FIXED
FORCE_FILENAME_PATTERN=fixed%.txt
CODEPAGE=UTF-8
LOCALE=
ROW_DELIMITER=\r\n
SKIP_HEADER_LINES=1
COLUMN=COL1;VARCHAR(2);Description;;2
COLUMN=COL2;VARCHAR(6);Description;;6
COLUMN=COL3;VARCHAR(8);Description;;8

```

## 6.2.11.4 Format Parameters for File Datastore Adapters

File format parameter descriptions for File Datastore adapters.

### Global

| Parameter               | Description and Examples   |
|-------------------------|--|
| FORCE_FILENAME_PATTERN  | <p>You might want to execute a simple <code>select * from &lt;virtualtable&gt;</code> without a WHERE clause on a directory. In that case, every file in the root directory and subdirectories is read and parsed according to this virtual table's format definitions. That process could take a long time and produce errors. However, if the virtual table maps to files in a particular directory, directory tree, or to particular file names only, you can specify this information in the virtual table directly. For example:</p> <ul style="list-style-type: none"> <li>To read all files in that directory only: <pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata</pre> </li> <li>To read all files in that directory and subdirectories: <pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata/%</pre> </li> <li>To read all files in directories that start with "plan": <pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plan% :</pre> </li> <li>To read files like <code>plan20120101.txt</code>: <pre>FORCE_FILENAME_PATTERN=plan%.txt</pre> </li> <li>To read files inside the directory and matching the provided name pattern: <pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata FORCE_FILENAME_PATTERN=plan%.txt</pre> </li> </ul> |
| FORCE_DIRECTORY_PATTERN |  |

| Parameter            | Description and Examples  |
|----------------------|---|
| FORMAT               | CSV is required for CSV files.  |
| CODEPAGE             | The character encoding with which to read the file. By default, the operating system default is used. If the file has a Byte Order Mark, this codepage is used. Valid values of the Java installation can be found by creating a virtual table for CODEPAGE and querying its contents.  |
| ROW_DELIMITER        | A character sequence indicating the end of a row in the file. If these sequences are nonprintable characters, they can be provided encoded as /d65536 or /xFFFF or as Unicode notation /u+FFFF. Alternatively, the typical \r and \n are supported as well. Examples: <ul style="list-style-type: none"> <li>\n UNIX standard</li> <li>\r\n Windows standard</li> <li>\d13\d10 Windows standard, but characters are provided as a decimal number</li> <li>\x0D\x0A Windows standard, but characters are provided as a hex number</li> </ul> |
| SKIP_HEADER_LINES    | If the file has a header, enter the number of lines to skip.  |
| ERROR_ON_COLUMNCOUNT | By default, a row with fewer columns than defined is considered acceptable. Setting this parameter to <i>true</i> indicates that all rows of the file have as many columns as defined.  |
| LOCALE               | The decimal and date conversion from the strings in the file into native numbers or dates might be locale-specific. For example, if you have the date "14. Oktober 2000", and you are using a German locale, it works. However, for all other languages, it does not work.<br><br>Valid values for the locale can be found by querying a virtual table based on the LOCALE table of the adapter.  |
| COLUMN               | Multiple entries consist of the <code>columnName ; datatype</code> , where the <code>datatype</code> is any SAP HANA data type.   |
| NULL_INDICATOR       | Specifies a character sequence to indicate to the software that the data is NULL.   |
|                      | <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>The software ignores NULL indicators specified in the file format for blob columns.</p> </div>  |
| IGNORE_ROW_MARKERS   | Specifies a character sequence that appears at the beginning of specific rows. When the software reads the file, or when it automatically creates metadata, and it encounters the row markers, it ignores the row and moves to the next row.  |
| DATEFORMAT           | Specifies the date format for reading and writing date values to and from the file.   |
| TIMEFORMAT           | Specifies the time format for reading and writing time values to and from the file.   |
| SECONDDATEFORMAT     | Specifies the date/time format for reading or writing date/time values to and from the file.  |

| Parameter   | Description and Examples  |
|-------------|---|
| BOF         | Specifies a string that marks the start of data in the file.  |
| EOF         | Specifies the string that marks the end of data in the file.  |
| EXPONENTIAL | <p>Defines the exponential character used for decimal numbers.</p> <p>For example, <i>e</i> for <code>1.05097214923805e-06</code> or <i>E</i> for <code>1.05097214923805E-06</code>.</p> <p>Default: <i>E</i></p>           |
| LENIENT     | <p>Controls automatic date and time format conversion when the value exceeds the range.</p> <p>For example, when this parameter is set to <i>True</i>, the 14th month of 2016 is converted to the second month of 2017.</p> |

## CSV only

| Parameter        | Description and Examples   |
|------------------|--|
| COLUMN_DELIMITER | <p>The character sequence indicating the next column. If nonprintable characters are used, then any of the following encodings works: <code>\d65536</code>, <code>\xFFFF</code>, or <code>\u+FFFF</code>.</p> <ul style="list-style-type: none"> <li><code>;</code> A semicolon is the column separator. For example, <code>2000;IT Costs;435.55</code></li> <li><code> </code> uses the pipe character as a delimiter.</li> <li><code>\d09</code> uses an ASCII tab character as a delimiter.</li> </ul>  |
| TEXT_QUOTES      | <p>Sometimes text data is enclosed in quotes so a column delimiter inside the text does not break the format. The line <code>2000;IT Costs; software related only;435.55</code> would appear as four columns because the text contains a semicolon as well. If the file was created with quotes such as <code>2000;"IT Costs; software related only";435.55</code>, then there is no such issue. However, the file parser must not just search for the next column delimiter, it also must check if the text is inside or outside of the text quote character.</p> |
| ESCAPE_CHAR      | <p>Another way to deal with inline special characters is to escape them. For example, <code>2000;IT Costs\; software related only;435.55</code>. Here the <code>\</code> character is an escape character and indicates that the subsequent character is to be taken literally and not as a column delimiter.</p>  |



| Parameter                         | Description and Examples  |
|-----------------------------------|---|
| TEXT_QUOTES_ESCAPE_CHAR           | You can make quotes appear inside the text. For example, <code>IT Costs ; "software related" only</code> . One option the file creator might have used is to use the global escape character <code>2000 ; "IT Costs ; \"software related\" only" ; 435.55</code> . Another popular method is to have the quotes escaped by another quote; for example, <code>2000 ; "IT Costs ; ""software related" " only" ; 435.55</code> . In that case, both the <code>TEXT_QUOTE="</code> and the <code>TEXT_QUOTE_ESCAPE_CHAR="</code> are set to the <code>"</code> character. |
| QUOTED_TEXT_CONTAIN_ROW_DELIMITER | The default value is <i>false</i> and tells the parser regardless of any quotes or escape characters that the text inside a row never contains the row delimiter character sequence. In this case, the parser can break the file into rows much faster; it must search for the character sequence only, and only the column parsing has to consider the escape and quote characters. If set to <i>true</i> , parsing becomes slower.  |

## Fixed-Width only

| Parameter               | Description and Examples   |
|-------------------------|--|
| COLUMNSSTARTENDPOSITION | In a fixed-width file, the column positions must be specified for each column. Examples: <ul style="list-style-type: none"> <li><code>0-3;4-11;12-37;38-53</code> defines that the first 4 characters are the first column, the next 8 contain the data for the second column, and so on. Columns must be in the proper order.</li> <li><code>0;4;12;38</code> is equivalent to the previous example, but the last column ends with the line end</li> <li><code>0;4;12;38-53</code> can be used as well. In fact, for every column you can either specify the start and end position or just the start.</li> </ul>   |
| ROWLENGTH               | In fixed-width files, there does not need to be a row delimiter. Often the file has some and then they must be stripped away. The following examples assume that the last data character is at index 53 as specified the COLUMNSSTARTENDPOSITION example. <ul style="list-style-type: none"> <li><code>ROWLENGTH=56 ROW_DELIMITER=</code> would work for a file that has a row delimiter. The payload text ranges from <code>0..53</code>; therefore, it is 54 characters long plus two characters for <code>\r\n</code>. The last column does not contain the <code>\r\n</code> because it is instructed to end at index 53.</li> <li><code>ROWLENGTH=54 ROW_DELIMITER=\r\n</code> is equivalent to the previous example. Each row is expected to be 54 characters plus 2 characters long. The main advantage of this notation is that <code>COLUMNSSTARTENDPOSITION=0;4;12;38</code> would work and the trailing <code>\r\n</code> is stripped away. In the previous example, the last column would start at 38 and end at index 55 due to <code>rowlength=56</code> and therefore contain the <code>\r\n</code> characters in the last column.</li> </ul> |

## Related Information

[Configuring Access to Your Data and Configuration Files \[page 276\]](#)

### 6.2.11.5 Virtual Procedures

Use the provided utility virtual procedures to alter, create, delete, or view configuration files.

First use auto-detect to identify the delimiters and metadata, then use these virtual procedures to alter a file source to your requirements.

To create a virtual procedure, in the SAP HANA Web Development Workbench: Catalog, navigate to **► Provisioning ► Remote Sources ► <remote\_source> ► File Operations ► CFG Utilities** **▾**. Right-click the utility and select *Add as Virtual Procedure*.

#### 6.2.11.5.1 Virtual Procedure: Alter Configuration File Property

Use the Alter Configuration File Property virtual procedure to change values in a CFG file property.

You can alter the following values in a CFG file property:

| INOUT | Parameter      | Type     | Description                                |
|-------|----------------|----------|--|
| IN    | ConfigFilePath | NVARCHAR | Full path to the CFG file                  |
| IN    | ParameterName  | NVARCHAR | Name of the CFG file format parameter      |
| IN    | ParameterValue | NVARCHAR | Value of the CFG file format parameter     |
| OUT   | StatusTable    | TABLE    | Table describing the procedure call status |

#### Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."Alter_Configuration_File_Property" (  
  IN ConfigFilePath NVARCHAR(512),  
  IN ParameterName VARCHAR(1024),  
  IN ParameterValue VARCHAR(1024),  
  OUT param_3 TABLE (Status TINYINT,Message VARCHAR(1024))) CONFIGURATION '{  
  "__DP_UNIQUE_NAME__": "FileAdapter.Procedures.ConfigUtil.ALTER_SINGLE_CONFIG",  
  "__DP_HAS_NESTED_PARAMETERS__": false,  
  "__DP_USER_DEFINED_PROPERTIES__": {  
    "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":  
    "ALTER_SINGLE_CONFIG",  
    "isProcCallOnCFGFile": "false"  
  },  
  "__DP_INPUT_PARAMETER_PROPERTIES__": [],
```

```
"__DP_RETURN_PARAMETER_PROPERTIES__": [],
 "__DP_VIRTUAL_PROCEDURE__": true,
 "__DP_HAS_INTERNAL_OUTPUT_PARAMETER__": false,
 "__DP_DEFAULT_OUTPUT_PARAMETER_INDEX__": 0
}' AT "{remote_source_name}";
```

## Example

Suppose that you have a file on `C:\usr\sap\dataprovagent\workspace\sample_data.csv` where the content is in the following format. You want to point the configuration to `prod_data.csv` instead of `sample_data.csv` so you can test with the sample file and load the production file during execution.

```
Item_ID,Item_Price,Item_Description,Date_Added
101,99.99,Item1,2016-10-11
```

The CFG file:

```
#FileFormat created by virtual procedures
COLUMN_DELIMITER=,
ERROR_ON_COLUMNCOUNT=false
FORCE_DIRECTORY_PATTERN=C:\usr\sap\dataprovagent\workspace
FORCE_FILENAME_PATTERN=sample_data.csv
FORMAT=CSV
ROW_DELIMITER=\r\n
SKIP_HEADER_LINES=1
COLUMN=Item_ID;INTEGER;
COLUMN=Item_Price;DOUBLE;
COLUMN=Item_Description;VARCHAR(256);
COLUMN=Date_Added;DATE;SomeDateColumn;yyyy-MM-dd;0
```

Use the procedure to update `FORCE_FILENAME_PATTERN` to use `prod_data.csv`:

```
--Alter second column properties
call
"SYSTEM"."Alter_Configuration_File_Property"('C:\usr\sap\dataprovagent\workspace\
item.cfg','FORCE_FILENAME_PATTERN','prod_data.csv',?);
--Check if updated correctly
call
"SYSTEM"."View_Configuration_File"('C:\usr\sap\dataprovagent\workspace\item.cfg',
?,?);
```

## 6.2.11.5.2 Virtual Procedure: Alter File Field

Alter column metadata using a virtual procedure.

The Alter File Field virtual procedure allows you to change the column metadata for a given file field. You can alter data types, length, format, and so on.

| INOUT | Parameter      | Type     | Description               |
|-------|----------------|----------|---------------------------|
| IN    | ConfigFilePath | NVARCHAR | Full path to the CFG file |

| INOUT | Parameter         | Type     | Description                                |
|-------|-------------------|----------|--|
| IN    | ColumnIndex       | INTEGER  | Index of the column; starts with 0         |
| IN    | ColumnName        | NVARCHAR | Column name                                |
| IN    | DataType          |          | Column data type                           |
| IN    | LengthOrPrecision | INTEGER  | Length or precision                        |
| IN    | Scale             | INTEGER  | Column scale                               |
| IN    | Description       | NVARCHAR | Column description                         |
| IN    | Format            | NVARCHAR | Column date/time format                    |
| IN    | ColumnWidth       | INTEGER  | Column width for fixed-width format        |
| OUT   | StatusTable       | TABLE    | Table describing the procedure call status |

## Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."Alter_File_Field"(
  IN ConfigFilePath NVARCHAR(512),
  IN ColumnIndex INTEGER,
  IN ColumnName VARCHAR(1024),
  IN DataType VARCHAR(32),
  IN LengthOrPrecision INTEGER,
  IN Scale INTEGER,
  IN Description NVARCHAR(1024),
  IN Format VARCHAR(32),
  IN ColumnWidth INTEGER,
  OUT param_9 TABLE (Status TINYINT,Message VARCHAR(1024))) CONFIGURATION '{
  "__DP_UNIQUE_NAME__": "FileAdapter.Procedures.ConfigUtil.ALTER_SINGLE_COLUMN",
  "__DP_HAS_NESTED_PARAMETERS__": false,
  "__DP_USER_DEFINED_PROPERTIES__": {
    "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":
"ALTER_SINGLE_COLUMN",
    "isProcCallOnCFGFile": "false"
  },
  "__DP_INPUT_PARAMETER_PROPERTIES__": [],
  "__DP_RETURN_PARAMETER_PROPERTIES__": [],
  "__DP_VIRTUAL_PROCEDURE__": true,
  "__DP_HAS_INTERNAL_OUTPUT_PARAMETER__": false,
  "__DP_DEFAULT_OUTPUT_PARAMETER_INDEX__": 0
}' AT "{remote_source_name}";
```

## Example

Suppose that you have a file in `C:\usr\sap\dataprovagent\workspace\items.csv` where the content is in the following format and you want to change the data type and column name:

```
Item_ID,Item_Price,Item_Description,Date_Added
```

```
101,99.99,Item1,2016-10-11
```

The CFG file:

```
#FileFormat created by virtual procedures
COLUMN_DELIMITER=,
ERROR_ON_COLUMNCOUNT=false
FORCE_DIRECTORY_PATTERN=C:\usr\sap\dataprovagent\workspace
FORCE_FILENAME_PATTERN=item.csv
FORMAT=CSV
ROW_DELIMITER=\r\n
SKIP_HEADER_LINES=1
COLUMN=Item_ID;INTEGER;
COLUMN=Item_Price;DOUBLE;
COLUMN=Item_Description;VARCHAR(256);
COLUMN=Date_Added;DATE;SomeDateColumn;yyyy-MM-dd;0
```

Use the virtual procedure to update the second column `Item_Price` to be `Price` and `DECIMAL(10,5)`.

```
--Alter second column properties
CALL
"SYSTEM"."Alter_File_Field"('C:\usr\sap\dataprovagent\workspace\item.cfg',1,'Price',
'DECIMAL',10,5,'Price Filed',null,null,?);
--Check if updated correctly
call
"SYSTEM"."View_Configuration_File"('C:\usr\sap\dataprovagent\workspace\item.cfg',
?,?);
```

### 6.2.11.5.3 Virtual Procedure: Create Configuration File

Create Configuration File allows you to create a CFG file under available root folders using SAP HANA tables.

| INOUT | Parameter           | Type     | Description   |
|-------|---------------------|----------|---|
| IN    | ConfigFilePath      | NVARCHAR | Full path to the CFG file                                       |
| IN    | ConfigTable         | TABLE    | Table describing delimiters and other file format configuration |
| IN    | MetadataTable       | TABLE    | Table describing file field in metadata format                  |
| IN    | VerifyConfiguration | VARCHAR  | True or false to verify the CFG content                         |
| OUT   | StatusTable         | TABLE    | Table describing the procedure call status                      |

### Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."Create_Configuration_File"(  
  IN ConfigFilePath NVARCHAR(512),  
  IN ConfigTable TABLE (ParameterName VARCHAR(1024),ParameterValue VARCHAR(1024)),
```

```

IN MetadataTable TABLE (ColumnName NVARCHAR(1024),DataType
VARCHAR(32),LengthOrPrecision INTEGER,Scale INTEGER,Description
NVARCHAR(1024),Format VARCHAR(32),ColumnWidth INTEGER),
IN VerifyConfiguration VARCHAR(4),
OUT StatusTable TABLE (Status TINYINT,Message VARCHAR(1024))) CONFIGURATION '{
  "__DP_UNIQUE_NAME__": "FileAdapter.Procedures.ConfigUtil.CREATE_CONFIG",
  "__DP_USER_DEFINED_PROPERTIES__": {
    "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":
"CREATE_CONFIG",
    "isProcCallOnCFGFile": "false"
  },
  "__DP_VIRTUAL_PROCEDURE__": true,
  "__DP_HAS_INTERNAL_OUTPUT_PARAMETER__": false
}' AT "{remote_source_name}";

```

## Example

Suppose that you have a file on C:\usr\sap\dataprovagent\workspace\items.csv where the content is in the following format:

```

Item_ID,Item_Price,Item_Description,Date_Added
101,99.99,Item1,2016-10-11

```

```

--Sample SQL to create the configuration file
--Create the input table that you will need to provide to the procedure.
drop table SYSTEM.filefields;
create table SYSTEM.filefields (COLUMNNAME NVARCHAR(512), DATATYPE
VARCHAR(32),LENGTHORPRECISION INT, SCALE INT, DESCRIPTION NVARCHAR(512), FORMAT
NVARCHAR(512), COLUMNWIDTH INT);
truncate table SYSTEM.filefields;
insert into SYSTEM.filefields values('Item_ID','INTEGER',0,0,NULL,NULL,0);
insert into SYSTEM.filefields values('Item_Price','DOUBLE',0,0,NULL,NULL,0);
insert into SYSTEM.filefields
values('Item_Description','VARCHAR',256,0,NULL,NULL,0);
insert into SYSTEM.filefields
values('Date_Added','DATE',0,0,'SomeDateColumn','yyyy-MM-dd',0);
select * from SYSTEM.filefields;
drop table SYSTEM.config;
create table SYSTEM.config (parametername varchar(512), parametervalue
varchar(512));
truncate table SYSTEM.config;
insert into SYSTEM.config values('SKIP_HEADER_LINES','1');
insert into SYSTEM.config values('ROW_DELIMITER','\r\n');
insert into SYSTEM.config values('COLUMN_DELIMITER','');
insert into SYSTEM.config
values('FORCE_DIRECTORY_PATTERN','C:\usr\sap\dataprovagent\workspace');
insert into SYSTEM.config values('FORCE_FILENAME_PATTERN','item.csv');
--Call the procedure to create a CFG file based on this configuration.
call
"SYSTEM"."Create_Configuration_File"('C:\usr\sap\dataprovagent\workspace\item.cfg
',SYSTEM.config,SYSTEM.filefields,'true',?);
--Now you can import this cfg and read from the file.

```

## 6.2.11.5.4 Virtual Procedure: Delete Configuration File

Delete a configuration file.

Deletes the given configuration file using the Delete Configuration File virtual procedure.

| INOUT | Parameter      | Type     | Description                                |
|-------|----------------|----------|--|
| IN    | ConfigFilePath | NVARCHAR | Full path to the CFG file                  |
| OUT   | StatusTable    | TABLE    | Table describing the procedure call status |

### Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."Delete_Configuration_File"(  
  IN ConfigFilePath NVARCHAR(512),  
  OUT param_1 TABLE (Status TINYINT,Message VARCHAR(1024))) CONFIGURATION '{  
    "__DP_UNIQUE_NAME__": "FileAdapter.Procedures.ConfigUtil.DELETE_CONFIG",  
    "__DP_HAS_NESTED_PARAMETERS__": false,  
    "__DP_USER_DEFINED_PROPERTIES__": {  
      "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":  
      "DELETE_CONFIG",  
      "isProcCallOnCFGFile": "false"  
    },  
    "__DP_INPUT_PARAMETER_PROPERTIES__": [],  
    "__DP_RETURN_PARAMETER_PROPERTIES__": [],  
    "__DP_VIRTUAL_PROCEDURE__": true,  
    "__DP_HAS_INTERNAL_OUTPUT_PARAMETER__": false,  
    "__DP_DEFAULT_OUTPUT_PARAMETER_INDEX__": 0  
  }' AT "{remote_source_name}";
```

### Usage

Suppose you have a file on C:\usr\sap\dataprovagent\workspace\items.cfg :

```
--Call the procedure to delete this CFG file  
call  
"SYSTEM"."Delete_Configuration_File"('C:\usr\sap\dataprovagent\workspace\item.cfg  
,?);
```

## 6.2.11.5.5 Virtual Procedure: View Configuration File

View an existing CFG file.

The View Configuration File virtual procedure allows you to view an existing CFG file under available root folders.

| INOUT | Parameter      | Type     | Description  |
|-------|----------------|----------|--|
| IN    | ConfigFilePath | NVARCHAR | Full path to the CFG file  |
| OUT   | ConfigTable    | TABLE    | Table describing delimiters and other file format configuration                |
| OUT   | MetadataTable  | TABLE    | Table describing file field in SAP HANA smart data integration metadata format |

## Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."View_Configuration_File"(
  IN ConfigFilePath NVARCHAR(512),
  OUT param_1 TABLE (ParameterName VARCHAR(1024),ParameterValue VARCHAR(1024)),
  OUT param_2 TABLE (ColumnName NVARCHAR(1024),DataType
  VARCHAR(32),LengthOrPrecision
  INTEGER,Scale INTEGER,Description NVARCHAR(1024),Format VARCHAR(32),ColumnWidth
  INTEGER))
CONFIGURATION '{
  "__DP_UNIQUE_NAME__": "FileAdapter.Procedures.ConfigUtil.VIEW_CONFIG",
  "__DP_HAS_NESTED_PARAMETERS__": false,
  "__DP_USER_DEFINED_PROPERTIES__": {
    "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":
    "VIEW_CONFIG",
    "isProcCallOnCFGFile": "false"
  },
  "__DP_INPUT_PARAMETER_PROPERTIES__": [],
  "__DP_RETURN_PARAMETER_PROPERTIES__": [],
  "__DP_VIRTUAL_PROCEDURE__": true,
  "__DP_HAS_INTERNAL_OUTPUT_PARAMETER__": false,
  "__DP_DEFAULT_OUTPUT_PARAMETER_INDEX__": 0
}' AT "{remote_source_name}";
```

## Example

Suppose that you have a CFG file in C:\usr\sap\dataprovagent\workspace\items.cfg:

```
--Call the procedure to get the CFG file
call
"SYSTEM"."View_Configuration_File"('C:\usr\sap\dataprovagent\workspace\item.cfg',
?,?);
```

## 6.2.11.6 FileAdapterDatastore

To access file sources, use the FileAdapterDatastore, one of the File Datastore adapters.



## Related Information

[File \[page 234\]](#)

[SFTPAdapterDatastore \[page 292\]](#)

### 6.2.11.6.1 FileAdapterDatastore Remote Source Configuration

Remote source configuration parameters for the FileAdapterDatastore. Also included is a code sample for creating a remote source using the SQL console.

| Category                  | Option                            | Description  |
|---------------------------|-----------------------------------|--|
| File Format Configuration | Format                            | Specifies that the file has a delimiter character between columns. <i>Flat Files</i> and <i>Fixed Width Files</i> are supported.                       |
|                           | Skip Error Handling               | Specifies whether to skip the error handling during processing. Default value is <i>false</i> .  |
| Error handling            | Log data conversion warnings      | Specifies whether to log data conversion warnings.<br><br>Default value is <i>true</i> .   |
|                           | Maximum warnings to log           | Only available when <i>Skip Error Handling</i> is enabled ( <i>true</i> ). Specifies the maximum number of warnings in log files.                      |
|                           | Capture data conversion errors    | Specifies whether to capture data conversion errors in the logs.<br><br>Default value is <i>false</i> .  |
|                           | Capture row format errors         | Specifies whether to capture row format errors in the logs.<br><br>Default value is <i>true</i> .  |
|                           | Capture string truncation errors  | Specifies whether to capture string truncation errors in the logs.<br><br>Default value is <i>false</i> .  |
|                           | Maximum errors to stop processing | Only available when <i>Skip Error Handling</i> is enabled ( <i>true</i> ). Specifies the maximum number of errors allowed before stopping the process. |

| Category                 | Option                          | Description   |
|--------------------------|---------------------------------|---|
|                          | Write error rows to file        | Specifies whether to write error rows to an external error file in the <i>Error file root directory</i> .<br><br>Default value is <i>false</i> .  |
|                          | Error file root directory       | Only available when <i>Write error rows to file</i> is enabled ( <i>true</i> ). Full path to the directory in which to store the error file.  |
|                          | Error file name                 | Only available when <i>Write error rows to file</i> is enabled ( <i>true</i> ). Name of the error file.   |
| Additional Configuration | Auto-Detect Columns             | Specifies whether to detect delimiters and data types automatically.<br><br><div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 10px;"> <p><b>Note</b></p> <p>Auto-detect might not match your data types and delimiters exactly. If this is the case, you can use the CFG file utility virtual procedures to modify the files to your specifications.</p> </div><br>Default value is <i>true</i> .  |
|                          | Data type mapping match percent | Used for auto-detection. Given a file with data: <ol style="list-style-type: none"> <li>1. The software analyzes the probability of possible data types for each column.</li> <li>2. The software selects the data type with the highest probability, provided that the probability is greater than or equal to the specified <i>Data type mapping match percent</i>.</li> <li>3. If the calculated probability for the data type is less than the specified <i>Data type mapping match percent</i>, the software sets the data type as VARCHAR(256).</li> </ol><br>Default value is 90.<br>Range is 50 to 100. |

| Category    | Option                                    | Description  |
|-------------|---|--|
|             | Allow CFG file to overwrite configuration | Whether changes made to settings in the configuration file overwrite the configuration.<br><br>Default value is <i>true</i> .  |
| Credentials | Credentials Mode                          | Only <i>Technical User</i> is supported.   |
|             | AccessToken                               | A password. An access token protects the files from access from different agents. Use this same password when creating a remote source. You can browse and manipulate the configuration and data files only if the AccessToken provided in the remote source configuration matches that set in Data Provisioning Agent Configuration Tool. |

The following code sample illustrates how to create a remote source using the SQL console:

## Example

### Sample Code

```
CREATE REMOTE SOURCE "FileAdapterDSTest" ADAPTER "FileAdapterDatastore" AT
LOCATION agent "MyAgent"
CONFIGURATION '<?xml version="1.0" encoding="UTF-8"?>
<ConnectionProperties name="configuration">
  <PropertyGroup name="fileformatconfiguration">
    <PropertyEntry name="format">flatfiles</PropertyEntry>
    <PropertyEntry name="errorHandling">>false</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="errorHandlingConfiguration">
    <PropertyEntry name="logDataConversionWarnings">>true</PropertyEntry>
    <PropertyEntry name="maximumWarningsToLog"></PropertyEntry>
    <PropertyEntry name="captureDataConversionErrors">>false</
PropertyEntry>
  <PropertyEntry name="captureRowFormatErrors">>true</PropertyEntry>
  <PropertyEntry name="captureStringTruncationErrors">>false</
PropertyEntry>
  <PropertyEntry name="maximumErrorsToStopJob"></PropertyEntry>
  <PropertyEntry name="writeErrorRowsToFile">>false</PropertyEntry>
  <PropertyEntry name="errorFileRootDirectory"></PropertyEntry>
  <PropertyEntry name="errorFileName"></PropertyEntry>
</PropertyGroup>
  <PropertyGroup name="additionalConfiguration">
    <PropertyEntry name="autodetect">>true</PropertyEntry>
    <PropertyEntry name="overwriteConfigByCFG">>true</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AccessTokenEntry">
  <password><yourAccessToken></password>
```

```
</CredentialEntry>' ;
```

## Related Information

[Virtual Procedures \[page 282\]](#)

[Configure Adapter Preferences \[page 587\]](#)

## 6.2.11.7 SFTPAdapterDatastore

To access SFTP CFG file sources, use the SFTPAdapterDatastore, one of the File Datastore adapters.

## Related Information

[File \[page 234\]](#)

[FileAdapterDatastore \[page 288\]](#)

### 6.2.11.7.1 SFTPAdapterDatastore Remote Source Configuration

Remote source configuration parameters for the SFTPAdapterDatastore. Also included is a code sample for creating a remote source using the SQL console.

| Category                  | Option                       | Description  |
|---------------------------|------------------------------|--|
| File Format Configuration | Format                       | Specifies that the file has a delimiter character between columns. <i>Flat Files</i> and <i>Fixed Width Files</i> are supported. |
|                           | Skip Error Handling          | Specifies whether to skip the error handling during processing.<br><br>The default value is <i>false</i> .                       |
| Error handling            | Log data conversion warnings | Specifies whether to log data conversion warnings.<br><br>The default value is <i>true</i> .                                     |
|                           | Maximum warning to log       | Specifies the maximum number of warnings in log files.   |

| Category           | Option                            | Description  |
|--------------------|-----------------------------------|--|
|                    |                                   | Only available when <i>Skip Error Handling</i> is enabled ( <i>true</i> ).   |
|                    | Capture data conversion errors    | Specifies whether to capture data conversion errors in the logs.<br><br>The default value is <i>false</i> .  |
|                    | Capture row format errors         | Specifies whether to capture row format errors in the logs.<br><br>The default value is <i>true</i> .  |
|                    | Capture string truncation errors  | Specifies whether to capture string truncation errors in the logs.<br><br>The default value is <i>false</i> .  |
|                    | Maximum errors to stop processing | Specifies the maximum number of errors allowed before stopping the process.<br><br>Only available when <i>Skip Error Handling</i> is enabled ( <i>true</i> ).                        |
|                    | Write error rows to file          | Specifies whether to write error rows to an external error file in the <i>Error file root directory</i> .<br><br>The default value is <i>false</i> .                                 |
|                    | Error file root directory         | Full path to the directory in which to store the error file, local to the agent installation.<br><br>Only available when <i>Write error rows to file</i> is enabled ( <i>true</i> ). |
|                    | Error file name                   | Name of the error file.<br><br>Only available when <i>Write error rows to file</i> is enabled ( <i>true</i> ).   |
| SFTP Configuration | Host                              | The host name of the SFTP server   |
|                    | Port                              | The port number enabled for the SFTP connection  |
|                    | Hostkey Fingerprint               | Specifies the code for the host computer, expressed in hexadecimal string values. Used to secure the SFTP connection.  |

| Category    | Option                       | Description   |
|-------------|------------------------------|---|
|             |                              | <p>You can retrieve the ECDSA hostkey fingerprint for a public key using <code>ssh-keygen</code>:</p> <pre>ssh-keygen -E md5 -lf /path/to/key.pub</pre>   |
|             | Authentication Type          | Only <i>Password</i> is supported.  |
|             | Connection Retry Count       | The maximum number of times to retry the connection   |
|             | Connection Retry Interval    | The time interval for each connection retry   |
|             | Remote File Format Directory | The directory of the folder on the SFTP server to browse  |
|             | Enable Additional Logging    | <p>Set to <i>True</i> to allow JSch to write its own logging to <code>framework.trc</code></p> <p>Set to <i>False</i> to not print JSch specific logs to <code>framework.trc</code></p> <p>The default value is <i>False</i>.</p>   |
| Credentials | Credentials Mode             | Only <i>Technical User</i> is supported.  |
|             | AccessToken                  | <p>A password. An access token protects the files from access from different agents. Use this same password when creating a remote source. You can browse and manipulate the configuration and data files only if the AccessToken provided in the remote source configuration matches that set in the agent configuration tool.</p> |
|             | User                         | The user name for the SFTP connection   |
|             | Password                     | The password for the corresponding SFTP user  |

The following code sample illustrates how to create a remote source using the SQL console.

## Example

### Sample Code

```
CREATE REMOTE SOURCE "SFTPAdapterDSTest" ADAPTER "SFTPAdapterDatastore" AT
LOCATION agent "MyAgent"
CONFIGURATION '<?xml version="1.0" encoding="UTF-8"?>
<ConnectionProperties name="configuration">
  <PropertyGroup name="fileformatconfiguration">
    <PropertyEntry name="format">flatfiles</PropertyEntry>
    <PropertyEntry name="errorHandling">>false</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="errorHandlingConfiguration">
    <PropertyEntry name="logDataConversionWarnings">>true</PropertyEntry>
    <PropertyEntry name="maximumWarningsToLog"></PropertyEntry>
    <PropertyEntry name="captureDataConversionErrors">>false</
PropertyEntry>
    <PropertyEntry name="captureRowFormatErrors">>true</PropertyEntry>
    <PropertyEntry name="captureStringTruncationErrors">>false</
PropertyEntry>
    <PropertyEntry name="maximumErrorsToStopJob"></PropertyEntry>
    <PropertyEntry name="writeErrorRowsToFile">>false</PropertyEntry>
    <PropertyEntry name="errorFileRootDirectory"></PropertyEntry>
    <PropertyEntry name="errorFileName"></PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="sftp_location">
    <PropertyEntry name="host">mo-1a6803cc5.mo.sap.corp</PropertyEntry>
    <PropertyEntry name="port">22</PropertyEntry>
    <PropertyEntry
name="hostKeyFingerprint">ba:84:07:e8:1d:23:a0:89:0e:13:83:e0:d2:e5:77:3e</
PropertyEntry>
    <PropertyEntry name="authType">password</PropertyEntry>
    <PropertyEntry name="connectionRetryCount">10</PropertyEntry>
    <PropertyEntry name="connectionRetryInterval">10</PropertyEntry>
    <PropertyEntry name="sftp_remote_directory">/usr/sap/KS1/HDB01</
PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="AccessTokenEntry">
    <password><SFTPAdapterDatastore_Access_Token></password>
  </CredentialEntry>'
  '<CredentialEntry name="SFTP_CREDENTIAL">
    <user><SFTP_User></user>
    <password><SFTP_Password></password>
  </CredentialEntry>';
```

## Related Information

[Configure Adapter Preferences \[page 587\]](#)

### 6.2.12 Hive

The Hive adapter supports Hadoop via Hive.

Hive is the data warehouse that sits on top of Hadoop and includes a SQL interface. While Hive SQL does not fully support all SQL operations, most SELECT features are available. The Hive adapter service provider is

created as a remote source, and requires the support of artifacts like virtual table and remote subscription for each source table to perform replication.

### Note

Before registering the adapter with the SAP HANA system, ensure that you have downloaded and installed the correct JDBC libraries. See the SAP HANA smart data integration Product Availability Matrix (PAM) for details. Place the files in the `<DPAgent_root>/lib/hive` folder.

## Adapter Functionality

This adapter supports the following functionality:

- SELECT, INSERT, UPDATE, and DELETE
- Virtual table as a source
- Virtual table as a target using a Data Sink node in a flowgraph

### Restriction

Write-back operations including INSERT, UPDATE, and DELETE are supported only with SAP Data Provisioning Agent 2.3.3 and newer, and the source table must support ACID transactions.

When writing to a Hive virtual table, the following data type size limitations apply:

- BLOB: 65,536 bytes
- CLOB: 43,690 bytes

In addition, this adapter supports the following capabilities:

Table 45: Global Settings

| Functionality                                | Supported? |
|--|------------|
| SELECT from a virtual table                  | Yes        |
| INSERT into a virtual table                  | Yes        |
| Execute UPDATE statements on a virtual table | Yes        |
| Execute DELETE statements on a virtual table | Yes        |
| Different capabilities per table             | No         |
| Different capabilities per table column      | No         |
| Real-time                                    | No         |



Table 46: Select Options

| Functionality                               | Supported? |
|---|------------|
| Select individual columns                   | Yes        |
| Add a WHERE clause                          | Yes        |
| JOIN multiple tables                        | Yes        |
| Aggregate data via a GROUP BY clause        | Yes        |
| Support a DISTINCT clause in the select     | Yes        |
| Support a TOP or LIMIT clause in the select | Yes        |
| ORDER BY                                    | Yes        |
| GROUP BY                                    | Yes        |

## Related Information

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

[Understanding Hive Versions, Features, and JAR Files \[page 297\]](#)

### 6.2.12.1 Understanding Hive Versions, Features, and JAR Files

Find out which Hive, Hadoop, and other product JAR files are compatible with which versions of SAP HANA smart data integration

Depending on the version of SAP HANA smart data integration and Hive you are using, there are steps you need to take to ensure you have the proper JAR files loaded.

#### Upgrading to SDI 2.2.2 or Higher

Beginning with SAP HANA smart data integration 2.2.2, we no longer bundle the `hadoop-core-0.20.2.jar` file. When you upgrade from a previous version, you must manually download this file and place it in the `<DPAgent_root>/lib/hive` folder. After you restart the Data Provisioning Agent and refresh the Hive adapter in SAP HANA, your remote source will work.

## Avoiding JAR File Conflicts

There are two ways that conflicts may occur when installing JAR files in the `<DPAgent>/lib/hive` directory:

- The directory cannot contain multiple versions of Hive JAR files, which avoids class name conflicts.
- The directory cannot contain both a `hadoop-core-0.20.2.jar` and `hadoop-common-<version>.jar` file at the same time, which also avoids class name conflicts.

## JAR Files for Normal Operation

If you are not using more advanced features, the following JAR files are sufficient:

Table 47: Hive 1.2.2/Hadoop 2.7.3

| Hive JAR Files  | Hadoop JAR Files  |
|---|---|
| Found in <code>\$HIVE_HOME/lib/</code>  | Found in the Maven repository   |
| <ul style="list-style-type: none"><li>• <code>hive-jdbc-1.2.2-standalone.jar</code></li></ul> | <ul style="list-style-type: none"><li>• <code>hadoop-core-0.20.2.jar</code></li></ul> |

Table 48: Hive 3.1.2 (SDI 2.5.2 and above)

| Hive JAR Files  |
|---|
| Found in <code>\$HIVE_HOME/lib/</code>  |
| <ul style="list-style-type: none"><li>• <code>hive-jdbc-3.1.2-standalone.jar</code></li></ul> |

Table 49: Hive 3.1.2/Hadoop 3.1.3 (SDI 2.5.2 and above)

| Hive JAR Files  | Hadoop JAR Files  |
|---|---|
| Found in <code>\$HIVE_HOME/lib/</code>  | Found in the Maven repository   |
| <ul style="list-style-type: none"><li>• <code>hive-jdbc-3.1.2-standalone.jar</code></li></ul> | <ul style="list-style-type: none"><li>• <code>hadoop-core-0.20.2.jar</code></li></ul> |

Alternatively, you can use the JAR files associated with advanced Hive features listed below.

## JAR Files for Advanced Features

If you are using some advanced Hive features, for example, Zookeeper and HTTP Transport Mode, a standalone Hive JAR (`hive-jdbc-<version>-standalone.jar`) is not sufficient. If you are using any of the following

features, you need to be sure that the following files are manually installed in the `<DPAgent_root>/lib/hive` folder:

Table 50: Hive 1.2.2/Hadoop 2.7.3

| Hive JAR Files  | Hadoop JAR Files   |
|---|--|
| Found in <code>\$HIVE_HOME/lib/</code>  | Found in <code>\$HADOOP_HOME/share/hadoop/</code>  |
| <ul style="list-style-type: none"> <li>hive-jdbc-1.2.2-standalone.jar</li> <li>commons-codec-1.4.jar</li> <li>httpclient-4.4.jar</li> </ul> | <ul style="list-style-type: none"> <li>common/hadoop-common-2.7.3.jar</li> <li>common/lib/commons-configuration-1.6.jar</li> <li>common/lib/hadoop-auth-2.7.3.jar</li> <li>common/lib/jaxb-impl-2.2.3.jar</li> <li>common/lib/slf4j-log4j12-1.7.10.jar</li> <li>hdfs/lib/xercesImpl-2.9.1.jar</li> </ul> |

Table 51: Hive 2.3.0/Hadoop 2.8.1 (SDI 2.3.0 and above)

| Hive JAR Files   | Hadoop JAR Files   |
|--|--|
| <code>\$HIVE_HOME/lib/</code>  | <code>\$HADOOP_HOME/share/hadoop/</code>   |
| <ul style="list-style-type: none"> <li>commons-codec-1.4.jar</li> <li>curator-client-2.7.1.jar</li> <li>curator-framework-2.7.1.jar</li> <li>guava-14.0.1.jar</li> <li>hive-common-2.3.0.jar</li> <li>hive-jdbc-2.3.0.jar</li> <li>hive-serde-2.3.0.jar</li> <li>hive-service-2.3.0.jar</li> <li>hive-service-rpc-2.3.0.jar</li> <li>hive-shims-0.23-2.3.0.jar</li> <li>hive-shims-2.3.0.jar</li> <li>hive-shims-common-2.3.0.jar</li> <li>httpclient-4.4.jar</li> <li>libthrift-0.9.3.jar</li> <li>zookeeper-3.4.6.jar</li> </ul> | <ul style="list-style-type: none"> <li>common/hadoop-common-2.8.1.jar</li> <li>common/lib/commons-collections-3.2.2.jar</li> <li>common/lib/commons-configuration-1.6.jar</li> <li>common/lib/commons-lang-2.6.jar</li> <li>common/lib/hadoop-auth-2.8.1.jar</li> <li>common/lib/httpcore-4.4.4.jar</li> <li>common/lib/jaxb-impl-2.2.3-1.jar</li> <li>common/lib/slf4j-log4j12-1.7.10.jar</li> <li>hdfs/lib/xercesImpl-2.9.1.jar</li> </ul> |

Table 52: Hive 3.1.2/Hadoop 3.1.3 (SDI 2.5.2 and above)

| Hive JAR Files  | Hadoop JAR Files  |
|---|---|
| <p>Found in \$HIVE_HOME/lib/</p> <ul style="list-style-type: none"> <li>hive-jdbc-3.1.2-standalone.jar</li> </ul> | <p>Found in \$HADOOP_HOME/share/hadoop</p> <ul style="list-style-type: none"> <li>common/hadoop-common-3.1.3.jar</li> <li>common/lib/commons-configuration2-2.1.1.jar</li> <li>common/lib/commons-collections-3.2.2.jar</li> <li>common/lib/hadoop-auth-3.1.3.jar</li> <li>common/lib/jaxb-impl-2.2.3-1.jar</li> <li>common/lib/slf4j-log4j12-1.7.25.jar</li> <li>common/lib/guava-27.0-jre.jar</li> <li>common/lib/commons-lang-2.6.jar</li> </ul> |

## Related Information

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

[Hive Remote Source Configuration \[page 300\]](#)

### 6.2.12.2 Hive Remote Source Configuration

Configure the following options in smart data access to set up your connection to a Hive remote source. Also included is sample code for creating a remote source using the SQL console.

#### Note

If you change the remote source parameters after you have made a connection with Hive, you need to restart the Data Provisioning Agent.

| Category   | Option             | Description  |
|------------|--------------------|--|
| Connection | Use Connection URL | Specify whether to use a connection URL.<br><br>If you set this value to <i>True</i> , you need to provide the URL in the <i>Connection URL</i> parameter. |
|            | Connection URL     | The URL used to create the connection.   |

| Category          | Option             | Description   |
|-------------------|--------------------|---|
|                   |                    | The format for the connection URL is documented on the Apache website.  |
|                   | Hive Version       | The version of Hive. For Hive 0.12.0, set its value to 0.12.0. For Hive 0.13.0 and 0.13.1, set its value to 0.13.1, and so on.  |
|                   | Host               | <p>The host of Hive.</p> <p>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i>.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, the host should be specified in the URL directly.</p>  |
|                   | Port               | <p>The port number of Hive.</p> <p>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i>.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, the port should be specified in the URL directly.</p>   |
|                   | Database Name      | <p>The Hive database name.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, this parameter has no effect.</p> <p>If <i>Use Connection URL</i> is set to <i>False</i> and the database name is specified here, you will see only the specified database in the remote source catalog. If you leave this parameter empty, you will see all Hive databases in the remote source catalog.</p> |
| Data Type Mapping | Map Hive STRING to | If the length of a string in Hive is greater than 5000 characters, set this parameter to <i>CLOB</i> . The default value is VARCHAR(5000).  |
|                   | Map Hive BINARY to | If the length of a BINARY in Hive is greater than 5000 characters, set this parameter to <i>BLOB</i> . The default value is VARBINARY(5000).  |
| Security          | Use SSL            | <p>Specifies whether to use SSL.</p> <p>The default value is <i>False</i>.</p>  |

| Category | Option                      | Description  |
|----------|-----------------------------|--|
|          |                             | <p>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i>.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, the connection URL should be specified in the URL directly.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin: 10px 0;"> <p><b>Note</b></p> <p>The CA certificate for the remote source must be imported into the adapter truststore on the Data Provisioning Agent host.</p> </div> <p>You will also need to set up the truststore and password in the Data Provisioning Agent Configuration Tool.</p> |
|          | Logon Mechanism             | <p>Controls the authentication (+authorization) method used, and which username and password values to enter in the credentials field.</p> <ul style="list-style-type: none"> <li>• Default</li> <li>• Kerberos: If set to <i>Kerberos</i>, the <i>Realm</i>, <i>KDC</i>, and <i>Hive Service Principal</i> settings are used when making the Hive connection.</li> </ul>  |
|          | Use Agent Stored Credential | Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.  |
| Kerberos | Realm                       | <p>(Optional when using Kerberos) Authenticate using a principal from this realm instead of the systems default realm. Specify the realm for the technical user.</p> <p>The <i>Realm</i> option must be used together with <i>KDC</i>.</p>   |
|          | KDC                         | (Optional when using Kerberos) The address of the technical user's KDC (Key Distribution Center) to be used with the specified realm. This must be used together with the <i>Realm</i> option.   |
|          | Hive Service Principal      | The Hive Service principal name.   |

| Category | Option           | Description   |
|----------|------------------|---|
|          |                  | <p><b>Note</b></p> <p>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i>.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, the Hive service principal should be specified in the URL directly.</p>  |
|          | Use Ticket Cache | <p>Set this to true if you want the ticket-granting ticket (TGT) to be obtained from the ticket cache. Set this option to <i>False</i> if you do not want this module to use the ticket cache. The default value is <i>False</i>.</p> <p>This module searches for the ticket cache in the following locations:</p> <ul style="list-style-type: none"> <li>On Solaris and Linux, in <code>/tmp/krb5cc_&lt;uid&gt;</code>, where the uid is a numeric user identifier.</li> <li>If the ticket cache is not available in <code>/tmp/krb5cc_&lt;uid&gt;</code>, or if you are on a Windows platform, the module looks for the cache as <code>&lt;user.home&gt;&lt;file.separator&gt;krb5cc_&lt;user.name&gt;</code>. You can override the ticket cache location by using the <i>Ticket Cache</i> parameter.</li> <li>For Windows, if a ticket cannot be retrieved from the file ticket cache, the module uses Local Security Authority (LSA) API to get the TGT.</li> </ul> |
|          | Ticket Cache     | <p>Set this to the name of the ticket cache that contains the user's TGT. If this is set, <i>Use Ticket Cache</i> must also be set to true; otherwise, a configuration error is returned.</p>   |
|          | Use Key Tab      | <p>Set this to <i>True</i> if you want the module to get the technical user's key from the keytab. The default value is <i>False</i>.</p>   |

| Category         | Option                | Description   |
|------------------|-----------------------|---|
|                  |                       | If <i>Key Tab</i> is not set, then the module locates the keytab from the Kerberos configuration file. If it is not specified in the Kerberos configuration file, then the module looks for the file <code>&lt;user.home&gt;&lt;file.separator&gt;krb5.keytab</code> .              |
|                  | Key Tab               | Set this to the file name of the keytab to get the technical user's secret key.   |
|                  | Additional Properties | Additional JDBC settings that are added directly to the JDBC URL. The parameters must be specified in the following format:<br><code>key=value, key=value, . . .</code><br><br>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i> . |
| Credentials      | Credentials Mode      | <i>Technical user</i> or <i>Secondary user</i><br><br>Select one of the choices depending on the purpose of the remote source you want to create.   |
| JDBC Credentials | Username              | The technical user's user name.<br><br>If <i>Logon Mechanism</i> is set to <i>Kerberos</i> , the user should be the client principal.   |
|                  | Password              | The technical user's password.  |

The following code samples illustrate how to create a remote source using the SQL console:

## Basic

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyHiveSource" ADAPTER "HiveAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?'>
<ConnectionProperties name="configurations">
  <PropertyGroup name="connectionInfo" displayName="Database">
```



```

        <PropertyEntry name="HOST" displayName="Host">myhost.sap.corp</
PropertyEntry>
        <PropertyEntry name="PORT" displayName="Port Number">10000</
PropertyEntry>
        <PropertyEntry name="DB_NAME" displayName="Database Name">mydb</
PropertyEntry>
        <PropertyEntry name="VERSION" displayName="Database Version">1.2.1</
PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="security" displayName="Security">
        <PropertyEntry name="USE_SSL">false</PropertyEntry>
        <PropertyEntry name="LOGMECH">default</PropertyEntry>
    </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
' <CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
</CredentialEntry>' ;

```

## Kerberos

### Example

#### Sample Code

```

CREATE REMOTE SOURCE "MyHiveSource" ADAPTER "HiveAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
' <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
<ConnectionProperties name="configurations">
    <PropertyGroup name="connectionInfo" displayName="Database">
        <PropertyEntry name="HOST" displayName="Host">myhost.sap.corp</
PropertyEntry>
        <PropertyEntry name="PORT" displayName="Port Number">10000</
PropertyEntry>
        <PropertyEntry name="DB_NAME" displayName="Database Name">mydb</
PropertyEntry>
        <PropertyEntry name="VERSION" displayName="Database Version">1.2.1</
PropertyEntry>
        <PropertyEntry name="ADDITIONAL"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="security" displayName="Security">
        <PropertyEntry name="USE_SSL">false</PropertyEntry>
        <PropertyEntry name="LOGMECH">Kerberos</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="Kerberos" displayName="Kerberos">
        <PropertyEntry name="KERBEROS_REALM">SAPDS.CORP</PropertyEntry>
        <PropertyEntry name="KERBEROS_KDC">myhost.sap.corp</PropertyEntry>
        <PropertyEntry name="KERBEROS_PRINCIPAL">hive/
myhost.sap.corp@SAPDS.CORP</PropertyEntry>
        <PropertyEntry name="KERBEROS_REFRESH_KRB5_CONFIG">>true</
PropertyEntry>
        <PropertyEntry name="KERBEROS_USE_TICKET_CACHE">false</
PropertyEntry>
        <PropertyEntry name="KERBEROS_USE_KEY_TAB">>true</PropertyEntry>
        <PropertyEntry name="KERBEROS_KEY_TAB">my.keytab</PropertyEntry>
    </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING

```

```
'<CredentialEntry name="credential">
  <user>myuser@SAPDS.CORP</user>
  <password>mypassword</password>
</CredentialEntry>';
```

## Related Information

[Apache Hive Connection URL Format](#) 

[Understanding Hive Versions, Features, and JAR Files](#) [page 297]

[Configure the Adapter Truststore and Keystore](#) [page 607]

[Store Remote Data Source Credentials Securely](#) [page 68]

### 6.2.12.3 Kerberos Debugging

There are steps you need to take to enable Kerberos debugging.

Even though you may have enabled Kerberos debug messages in the remote source configuration by setting *Kerberos Debug* to *True* or by setting `sun.security.krb5.debug=true` in the `dpagentconfig.ini` file, the debug messages will not appear in the Data Provisioning Agent log `framework.trc`.

To make the Kerberos debug messages visible, start the Data Provisioning Agent directly by executing `<DPAgent_root>/dpagent`, or in Windows, `<DPAgent_root>/dpagent.exe`). Then, all logs and Kerberos debug messages are printed in your console. In Linux, you could also save all of the output to a file by redirecting the `stdout` and `stderr`, such as `./dpagent 2>&1 1>output.txt`.

## Related Information

[Hive Remote Source Configuration](#) [page 300]

### 6.2.13 IBM DB2 Log Reader

The IBM DB2 Log Reader adapter provides real-time changed-data capture capability to replicate changed data from a database to SAP HANA in real time. You can also use this adapter for batch loading.

#### Note

If your data source is an SAP ERP Central Component (ECC) system, use the [SAP ECC adapter](#) [page 510] for this database instead of the log reader adapter. The SAP ECC adapters provide extra ECC-specific functionality such as ECC metadata browsing and support for cluster and pooled tables in SAP ECC.

The Log Reader service provider is created as a remote source and requires the support of artifacts like virtual tables and remote subscriptions for each source table to perform replication.

### 📘 Note

Before you register the adapter with the SAP HANA system, ensure that you've downloaded and installed the correct JDBC libraries. Place the files in the `<DPAgent_root>/lib` folder.

For more information about the supported JDBC libraries, see the *Product Availability Matrix (PAM)*.

## Adapter Functionality

This adapter supports the following functionality:

- Connect multiple remote sources in SAP HANA to the same source database

### 📘 Note

Use different DB2 users to set up different replications on the same DB2 database.

- Virtual table as a source
- Real-time changed-data capture (CDC)

### ⚠️ Restriction

DB2 range partitioned tables aren't supported for real-time CDC.

### ⚠️ Restriction

For DB2 BLU, real-time replication is supported only for row-organized tables.

- Virtual table as a target using a Data Sink node in a flowgraph
- Loading options for target tables
- Log-based DDL propagation for the following schema changes:
  - ADD COLUMN
  - DROP COLUMN

### ⚠️ Restriction

Source transactions that contain both DDL (such as ALTER TABLE) and DML (INSERT, UPDATE, DELETE, UPSERT, and so on) within the same transaction aren't supported.

- Trigger-based DDL propagation for the following schema changes:
  - ADD COLUMN
  - DROP COLUMN
  - DROP TABLE

### 📘 Note

ADD COLUMN and DROP COLUMN are supported for primary key columns only when the *Triggers record PK only* remote source configuration parameter is set to *False*.

### ⚠ Caution

The adapter captures DDL changes at an interval defined in the *DDL Scan Interval* remote source configuration parameter.

When DDL changes on the source occur, no DML changes can occur on the subscribed source tables before the DDL changes are replicated to SAP HANA.

### ⚠ Restriction

Source transactions that contain both DDL (such as ALTER TABLE) and DML (INSERT, UPDATE, DELETE, UPSERT, and so on) within the same transaction aren't supported.

- Replication monitoring and statistics
- Search for tables
- LDAP Authentication
- Virtual procedures

In addition, this adapter supports the following capabilities:

Table 53: Global Settings

| Functionality                                | Supported? |
|--|------------|
| SELECT from a virtual table                  | Yes        |
| INSERT into a virtual table                  | Yes        |
| Execute UPDATE statements on a virtual table | Yes        |
| Execute DELETE statements on a virtual table | Yes        |
| Different capabilities per table             | No         |
| Different capabilities per table column      | No         |
| Real-time                                    | Yes        |

Table 54: Select Options

| Functionality                               | Supported? |
|---|------------|
| Select individual columns                   | Yes        |
| Add a WHERE clause                          | Yes        |
| JOIN multiple tables                        | Yes        |
| Aggregate data via a GROUP BY clause        | Yes        |
| Support a DISTINCT clause in the select     | Yes        |
| Support a TOP or LIMIT clause in the select | Yes        |

| Functionality | Supported? |
|---------------|------------|
| ORDER BY      | Yes        |
| GROUP BY      | Yes        |

## Related Information

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

### 6.2.13.1 IBM DB2 Real-time Replication

Information about setting up your source system and adapter for real-time replication.

#### 6.2.13.1.1 Remote Database Setup for DB2 Real-time Replication

The remote database must be set up properly for Log Reader adapters to function correctly when using real-time replication.

This setup process is necessary only when using real time.

Remember the following when setting up for replication:

- If you have a UDB client instance and a UDB server instance on different machines, the client and server must be of the same UDB version.
- On a Windows system, the DB2 connectivity autocommit parameter must be enabled (autocommit=1). The autocommit parameter is specified in the DB2 call level interface (CLI) configuration file for the primary database.  
If the autocommit parameter is not enabled, a deadlock problem can occur. The path to the CLI configuration file is: `<%DB2DIR%> \sql1lib\db2cli.ini` where `<%DB2DIR%>` is the path to the DB2 client installation. Alternatively, to enable autocommit, open the DB2 administrative command-line console and run: `db2set DB2OPTIONS=-c`
- To initialize LogReader without error, the database must have a tablespace created with these characteristics:
  - The tablespace should be a user temporary tablespace. By default, user temporary tablespaces are not created when a database is created.
  - The tablespace must be a system-managed space (SMS).
  - The PAGESIZE parameter must be set to 8192 (8 kilobytes) or greater.

## Upgrading the DB2 Database

Before upgrading your source DB2 database, keep the following in mind:

- Suspend any remote subscriptions before upgrading. Before suspending your subscriptions, ensure that all data has been synced to the SAP HANA target table.
- After suspending your subscriptions, ensure that there is a change to the DB2 source table.
- After your upgrade, resume your subscriptions. If you receive an error such as `code: <-2,657>` after resuming your subscriptions, reset and then resume all of your subscriptions.

## Real-time Replication Limitations

The following limitations exist when performing real-time replication:

- Unsupported table types:
  - Table with all LOB columns
  - Table with computed columns
  - Table with LOB column and no primary key or unique index
  - Table with duplicated rows and no primary key
  - Table with user-defined identifier
  - Nested table

### 6.2.13.1.1.1 Setting DB2 Universal Database Environment Variables

The method for setting DB2 UDB environment variables depends on the operating system.

#### Note

The DB2 UDB environment variables should be set up regardless of whether your Data Provisioning Agent is installed on the same server as the DB2 database or not. Prior to setting up the variables, be sure that you have installed the IBM Data Server Runtime Client.

For Linux, the DB2 UDB installation provides two scripts for setting up the DB2 UDB environment variables: `db2cshrc` for C shell and `db2profile` for Bourne or Korn shell. These scripts set the library path environment variable based on the bit size of the installed server or client.

For Windows, the installation sets all necessary environment variables.

For Linux platforms, the 32-bit and 64-bit versions of the driver and API libraries are located in `<$HOME/sqllib/lib32>/sqllib/lib32` and `<$HOME/sqllib/lib64>/sqllib/lib64`, respectively, where `<$HOME>` is the home directory of the DB2 UDB instance owner.

### 📘 Note

If the Data Provisioning Agent is installed on Linux, the library path environment variable must point to the 64-bit libraries. For Windows, the library path environment variable must point to the 32-bit libraries.

### 📘 Note

We recommend that you add a line to the `<DPAgent_root>/bin/dpagent_env.sh` file to set the `db2profile` environmental variables. This ensures that when you use `dpagent_servicedaemon.sh` to stop and start the DPAGENT service, the DB2 UDB environment variables are sourced automatically. For example, for `dpagent_setenv.sh` (Linux), you could add a line such as `. /home/db2inst1/sqllib/db2profile`.

## 6.2.13.1.1.2 Installing the Data Provisioning Agent and DB2 Server on Different Servers

Additional steps are necessary when installing the Data Provisioning Agent and DB2 Server on different servers.

If the Data Provisioning Agent and the DB2 Server are on different machines, the IBM Data Server Runtime Client must be installed on the Data Provisioning Agent machine.

### 6.2.13.1.1.2.1 DB2 Connectivity

The method for configuring DB2 connectivity varies by operating system.

On a Windows system, you must configure a DB2 Universal Database JDBC data source in the DB2 Administration Client, then use the database name and database alias specified for that DB2 Universal Database JDBC data source when you configure DB2 LogReader Adapter connectivity.

On a Linux system, catalog the node and the primary database in DB2. Set the DB2 LogReader Adapter `pds_datasource_name` parameter to the database alias. Also set the `pds_host_name` and `pds_host_number`.

## 6.2.13.1.1.2.2 Catalog the Remote TCP/IP Node from the DB2 Client

Follow these steps to catalog the remote TCP/IP node from the DB2 client.

### Procedure

1. (For Linux only) Log in as the DB2 instance owner.  
Logging in sets up your DB2 environment variables by executing the environment scripts. You can also execute these scripts manually as follows.  
In Korn shell, source the `db2profile` file: `<$HOME>/sqlllib/db2profile`.  
In C shell, source the `db2cshrc` file: `source <$HOME>/sqlllib/db2cshrc`  
`<$HOME>` is the home directory of the DB2 instance owner.
2. Start the DB2 command-line processor by typing the following DB2 command: `%>db2 db2 =>`
3. Catalog the remote TCP/IP node using this command at the DB2 prompt: `db2 => catalog TCPIP node MYNODE remote MYHOST server XXXX`, where `<MYNODE>` is the node name, `<MYHOST>` is the host name or IP address of the data server, and `<XXXX>` is the data server port number.
4. Verify the catalog entry: `db2 => list node directory`. DB2 should return something similar to: Node 1 entry: Node name = MYNODE Comment = Directory entry type = LOCAL Protocol = TCPIP Hostname = MYHOST Service name = XXXX

## 6.2.13.1.1.2.3 Catalog the Primary Database from the DB2 Client

Follow these steps to catalog the primary database from the DB2 client.

### Procedure

1. Catalog the primary database using this command at the DB2 prompt:

```
db2 => catalog database MYDB as MYDB_ALIAS at node MYNODE
```

| Parameter  | Description                                      |
|------------|--|
| MYDB       | Database name                                    |
| MYDB_ALIAS | Alias for the database                           |
| MYNODE     | Node name used in the catalog TCPIP node command |



2. Verify the catalog entry:

```
db2 => list database directory
```

DB2 should return something similar to:

#### System Database Directory

---

Number of entries in the directory 1

---

|                  |                               |
|------------------|-------------------------------|
| Database 1 entry | Database alias = MYDB_ALIAS   |
|                  | Database name = MYDB          |
|                  | Node name = MYNODE            |
|                  | Database release level = b.00 |
|                  | Comment =                     |
|                  | Directory entry type = Remote |

---

### 6.2.13.1.1.3 Primary DB2 UDB Database Configuration for Replication

Configure your DB2 UDB database to work with the Log Reader adapter and replication.

For successful replication, remember the following:

- If you have a UDB client instance and a UDB server instance on different machines, the client and server must be of the same UDB version.
- On a Windows system, the DB2 connectivity autocommit parameter must be enabled (autocommit=1). The autocommit parameter is specified in the DB2 call level interface (CLI) configuration file for the primary database. If the autocommit parameter is not enabled, a deadlock problem can occur. The path to the CLI configuration file is: `<%DB2DIR%>\sql1lib\db2cli.ini` where `<%DB2DIR%>` is the path to the DB2 client installation. Alternatively, to enable autocommit, open the DB2 administrative command line console and run: `db2set DB2OPTIONS=+c`
- To initialize LogReader without error, the database must have a tablespace created with these characteristics:
  - The tablespace should be a user temporary tablespace. By default, user temporary tablespaces are not created when a database is created.
  - The tablespace must be a system-managed space (SMS).
  - The PAGESIZE parameter must be set to 8192 (8 kilobytes) or greater.

## 6.2.13.1.1.3.1 Add a Temporary Tablespace to the Primary Database

These steps show how to add a temporary tablespace to the primary database.

### Procedure

1. Start the DB2 UDB command-line processor:

```
%>bash
%>source /db2home/db2inst1/sqllib/db2profile
%>db2
```

2. Connect to the primary DB2 UDB database:

```
db2 => connect to pdb user db2_admin_user using db2_admin_password
```

<db2\_admin\_user> and <db2\_admin\_password> are the administrative user ID and password for the primary database.

3. Create a buffer pool:

```
db2 => create bufferpool pdb_buffer_name size 1000 pagesize
same_pagesize_as_pdb
```

<pdb\_buffer\_name> is the buffer name and <same\_pagesize\_as\_pdb> is the page size at the primary database.

4. Create a temporary tablespace:

```
db2=>create user temporary tablespace pdb_temp_space_name
pagesize same_pagesize_as_pdb managed by automatic storage
bufferpool pdb_buffer_name
```

<pdb\_temp\_space\_name> is the tablespace name, <same\_pagesize\_as\_pdb> is the page size at the primary database, and <pdb\_buffer\_name> is the buffer name.

#### Note

Determine the DB2 UDB page size using the LIST TABLESPACES SHOW DETAIL command. For example, to create a temporary tablespace named deep13 with a 16-KB page size and buffer pool named tom\_servo, enter:

```
db2 => create user temporary tablespace deep13 pagesize 16K managed by
automatic storage bufferpool tom_servo
```

## 6.2.13.1.1.3.2 Verify the Current Archive Setting of the Transaction Log

Set the primary DB2 UDB database transaction logging to archive logging instead of circular logging for DB2 LogReader Adapter.

### Procedure

1. Determine the LOGARCHMETH1 setting.
  - a. Connect to the database by entering this command at the CLP prompt:

```
db2 => CONNECT TO dbalias USER db2_user USING db2_user_ps
```

where `<dbalias>` is the cataloged alias of the primary database, `<db2_user>` is the primary database user, and `<db2_user_ps>` is the password.

- b. Determine the LOGARCHMETH1 setting:

```
db2 => GET DB CFG FOR dbalias
```

2. If the results do not show that LOGARCHMETH1 is set to LOGRETAIN or to the path name of the directory to which logs are archived or TSM server, set it:

- To use the default archive location:

```
db2 => UPDATE DATABASE CONFIGURATION USING logarchmeth1 LOGRETAIN
```

- To use a specific archive location:

```
db2 => UPDATE DATABASE CONFIGURATION USING logarchmeth1 DISK:path
```

- To use TSM server:

```
db2 => UPDATE DATABASE CONFIGURATION USING logarchmeth1 TSM
```

where `<path>` is the full path name of the directory where the archive logs are to be stored. If you change the setting of the DB2 UDB `logarchmeth1` parameter, DB2 UDB requires you to back up the database. Use your normal backup procedure or see the IBM documentation for information on the `BACKUP DATABASE` command.

3. Reactivate and backup the DB2 UDB database to make the configuration change take effect:
  - a. Deactivate the database `db2 => DEACTIVATE DATABASE dbalias USER db2_user USING db2_user_ps`, where `<dbalias>` is the cataloged alias of the primary database, `<db2_user>` is the primary database user, and `<db2_user_ps>` is the password.
  - b. Back up the database:

- LOGARCHMETH1=LOGRETAIN

```
db2 => BACKUP DATABASE dbalias USER db2_user USING db2_user_ps
```

- LOGARCHMETH1=DISK: path

```
db2 => BACKUP DATABASE dbalias TO path USER db2_user USING db2_user_ps
```

where `<dbalias>` is the cataloged alias of the primary database, `<path>` is the log archive path you specified, `<db2_user>` is the primary database user, and `<db2_user_ps>` is the password.

- c. Activate the database again `db2 => ACTIVATE DATABASE dbalias USER db2_user USING db2_user_ps`, where `<dbalias>` is the cataloged alias of the primary database, `<db2_user>` is the primary database user, and `<db2_user_ps>` is the password.

4. Verify the configuration change:

- ```
db2=> CONNECT TO dbalias USER db2_user USING db2_user_ps
```

where `<dbalias>` is the cataloged alias of the primary database, `<db2_user>` is the primary database user, and `<db2_user_ps>` is the password.

- ```
db2=> CALL SYSPROC.GET_DB_CONFIG( )
```

- ```
db2=> SELECT DBCONFIG_TYPE, LOGARCHMETH1 FROM SESSION.DB_CONFIG
```

The last SELECT statement returns two rows: one for the on-disk (`DBCONFIG_TYPE=0`) value and another for the in-memory (`DBCONFIG_TYPE=1`) value. Make sure that both of the values are changed to LOGRETAIN or DISK.

### 6.2.13.1.1.3.3 Create a DB2 UDB User and Grant Permissions

These steps show how to create a DB2 UDB user and grant permissions.

#### Context

DB2 LogReader Adapter requires a DB2 UDB login that has permission to access data and create new objects in the primary database. The DB2 UDB login must have SYSADM or DBADM authority to access the primary database transaction log.

#### Procedure

1. Create a new operating system user named `ra_user` using commands appropriate for your operating system. For example, to create a user named `ra_user` on a Linux operating system, use: `%>useradd -gusers -Gmgmt -s/bin/shell -psybase -d/home/ra_user -m ra_user`, where `<psybase>` is the password corresponding to the `ra_user` user name.
2. Start the DB2 UDB command-line processor:

```
%>bash
%>source /db2home/db2inst1/sqlllib/db2profile
%>db2
```

3. Connect to the primary DB2 UDB database: `db2=>connect to pdb user db2_admin_user using db2_admin_password`, where `<db2_admin_user>` and `<db2_admin_password>` are the administrative user ID and password for the primary database.

4. Grant all necessary authorities to ra\_user:

```
GRANT DBADM ON DATABASE TO USER <user>
GRANT CREATETAB ON DATABASE TO USER <user>
GRANT BINDADD ON DATABASE TO USER <user>
GRANT CONNECT ON DATABASE TO USER <user>
GRANT CREATE_NOT_FENCED_ROUTINE ON DATABASE TO USER <user>
GRANT IMPLICIT_SCHEMA ON DATABASE TO USER <user>
GRANT LOAD ON DATABASE TO USER <user>
GRANT CREATE_EXTERNAL_ROUTINE ON DATABASE TO USER <user>
GRANT QUIESCE_CONNECT ON DATABASE TO USER <user>
```

## 6.2.13.1.1.4 Required Libraries for DB2 Log Reader Adapter

The following table contains a list of the required libraries for setting up the DB2 Log Reader Adapter.

| Library                                                                                                           | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|------------------|----------------------------------|------------------------------------|--------------------------------------------|----------------|------------------------------------|---------------------------------------|----------------------------------------------------|
| DB2 UDB JDBC driver                                                                                               | <p>Include the DB2 JDBC driver library in the Data Provisioning Agent CLASSPATH environment variable. Use the corresponding version of the JDBC driver listed in the IBM documentation.</p> <p>For information about required JDBC libraries, see the <i>SAP HANA smart data integration Product Availability Matrix (PAM)</i>. This JAR file (db2jcc4.jar) must be copied to the following directory:</p> <p>&lt;DPAgent_root&gt;/lib</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |
| Log Reader native interface                                                                                       | <p>The DB2 Log Reader Adapter calls a C-based native interface to access the DB2 Log Reader API to read its log record. Include the native interface library in the DPAGENT_PATH (for Windows) or LD_LIBRARY_PATH (for Linux) environment variable or JVM -Djava.library.path variable if you start up the Data Provisioning Agent from Eclipse.</p> <table border="1"> <thead> <tr> <th>Platform</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Windows (64-bit)</td> <td>sybrauni.dll to support DB2 v9.5</td> </tr> <tr> <td>sybrauni97.dll to support DB2 v9.7</td> </tr> <tr> <td>sybrauni98.dll to support DB2 v10.1, v10.5</td> </tr> <tr> <td rowspan="3">Linux (64-bit)</td> <td>libsybrauni.so to support DB2 v9.5</td> </tr> <tr> <td>libsybrauni97.so to support DB2 v9.7)</td> </tr> <tr> <td>libsybrauni98.so to support DB2 v9.8, v10.1, v10.5</td> </tr> </tbody> </table> | Platform | Notes | Windows (64-bit) | sybrauni.dll to support DB2 v9.5 | sybrauni97.dll to support DB2 v9.7 | sybrauni98.dll to support DB2 v10.1, v10.5 | Linux (64-bit) | libsybrauni.so to support DB2 v9.5 | libsybrauni97.so to support DB2 v9.7) | libsybrauni98.so to support DB2 v9.8, v10.1, v10.5 |
| Platform                                                                                                          | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |
| Windows (64-bit)                                                                                                  | sybrauni.dll to support DB2 v9.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |
|                                                                                                                   | sybrauni97.dll to support DB2 v9.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |
|                                                                                                                   | sybrauni98.dll to support DB2 v10.1, v10.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |
| Linux (64-bit)                                                                                                    | libsybrauni.so to support DB2 v9.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |
|                                                                                                                   | libsybrauni97.so to support DB2 v9.7)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |
|                                                                                                                   | libsybrauni98.so to support DB2 v9.8, v10.1, v10.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |
| <p><b>Note</b></p> <p>The native interface libraries are packaged into the Data Provisioning Agent installer.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |       |                  |                                  |                                    |                                            |                |                                    |                                       |                                                    |

| Library                                   | Notes                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DB2 Log Reader Adapter internal libraries | <ul style="list-style-type: none"> <li>• <code>sybrautruncl.jar</code></li> <li>• <code>sybraudb2flsn.jar</code></li> </ul> <p>These libraries are installed into the DB2 database during replication initialization for specific procedure calls. Include them in the Data Provisioning Agent CLASSPATH environment variable. These libraries are packaged into the Data Provisioning Agent installer.</p> |

## Related Information

[IBM driver documentation](#) 

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#) 

### 6.2.13.1.2 Remote Database Clean-up for DB2 Real-time Replication

Run SQL scripts to clean objects manually from the DB2 source database.

Clean-up scripts are used to drop database-level objects. Usually you do not need to execute a clean-up script after an adapter is dropped, because the adapter drops database-level objects automatically. However, in some cases, if any errors occur before or while automatically dropping these objects, the objects may not be dropped. At that point, you may want to execute the clean-up script to drop the objects.

You can find the DB2 clean-up script file at

`<DPAgent_root>\LogReader\scripts\db2_logreader_cleanup.sql`.

### 6.2.13.1.3 Validate the IBM DB2 Log Reader Environment

You can use the Data Provisioning Agent command-line configuration tool to validate the configuration of the IBM DB2 log reader environment before creating remote sources that use the IBM DB2 Log Reader adapter.

## Prerequisites

Before validating the log reader environment, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

Also, before starting these steps, place your files in `<DPAgent_root>/lib`, and manually create the `/lib` folder.

## Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`

3. Choose *DB2 Replication Setup*.

4. Choose *Config DB2 Connection Info* to configure the connection used for other validation tasks.

Specify the following information required to connect the configuration tool to the database:

- The hostname, port number, database name, and database source name for the DB2 database
- Whether to use SSL
- The DB2 username and password for connecting to the database

The configuration tool connects to the database with the specified parameters when performing other validation tasks.

5. Perform validation and configuration tasks for the IBM DB2 log reader environment.

For each task, provide any additional parameters required by the task. To test whether the DB2 environment is ready for replication, choose *DB2 Replication Precheck*.

## Next Steps

After you have validated the configuration of the IBM DB2 log reader environment, you can create remote sources with the IBM DB2 Log Reader adapter. You can manually create remote sources or generate a creation script with the command-line configuration tool.

## Related Information

[Generate a Log Reader Remote Source Creation Script \[page 320\]](#)

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

## 6.2.13.1.4 Generate a Log Reader Remote Source Creation Script

Use the Data Provisioning Agent command-line configuration tool to validate parameters and generate a usable script to create a remote source for log reader adapters.

### Prerequisites

Before generating a remote source creation script for your source, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

Before performing these steps, place your files in `<DPAgent_root>/lib`. Note that you must manually create the `/lib` folder.

### Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose the appropriate replication setup option for your remote source type.
4. Choose the appropriate log reader setup option for your remote source type.
5. Provide the configuration details for your remote source as prompted.

Specify the name of the agent to use and the name of the remote source to create, as well as any connection and configuration information specific to your remote source.

For more information each configuration parameter, refer to the remote source configuration section for your source type.

### Results

The configuration tool validates the configuration details for your remote source and generates a script that can be used to create the remote source. You can view the validation results in the Data Provisioning Agent log.

By default, the configuration tool generates the remote source creation script in the user temporary directory. For example, on Windows: `C:\Users\<username>\AppData\Local\Temp\remoteSource-<remote_source_name>.txt`.



## Related Information

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

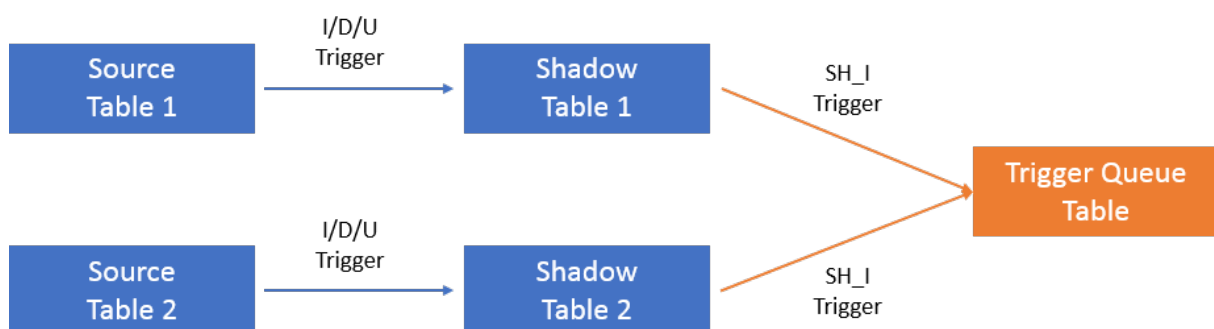
[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

### 6.2.13.1.5 IBM DB2 Trigger-Based Replication

When you use trigger-based replication, the adapter creates triggers to capture changed data and then continuously queries the source database to get the changed data. When you subscribe to a table for replication, the adapter creates three triggers (INSERT, UPDATE, and DELETE) on the table for capturing data.

The adapter also creates a shadow table for the subscribed table. Except for a few extra columns for supporting replication, the shadow table has the same columns as its replicated table. The triggers record changed data in shadow tables. For each adapter instance (remote source), the adapter creates a Trigger Queue table to mimic a queue. Each row in shadow tables has a corresponding element (or placeholder) in the queue. The adapter continuously scans the queue elements and corresponding shadow table rows to get changed data and replicate them to the target SAP HANA database.



#### 6.2.13.1.5.1 Required Permissions for IBM DB2 Trigger-Based Replication

Grant permissions and privileges to use IBM DB2 trigger-based replication.

##### Note

You must create a buffer pool and table space for trigger-based replication on IBM DB2:

```
create bufferpool <bufferpool_name> size 1000 pagesize 8192
create user temporary tablespace <tablespace_name> pagesize 8192 managed by
automatic storage bufferpool <bufferpool_name>
```

Table 55: Required Permissions for Trigger-Based Replication

| Action                                                        | Permission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Execute system procedures, count, and access temporary tables | <pre>GRANT DBADM ON DATABASE TO USER &lt;username&gt;</pre> <p>OR</p> <pre>GRANT EXECUTE ON FUNCTION SYSPROC.MON_GET_UNIT_OF_WORK TO &lt;username&gt; GRANT EXECUTE ON FUNCTION SYSPROC.MON_GET_APPLICATION_HANDLE TO &lt;username&gt; GRANT USE OF TABLESPACE &lt;tablespace_name&gt; TO USER &lt;username&gt;</pre>                                                                                                                                                                                                                                                                     |
| Create before and after triggers                              | <pre>GRANT DBADM ON DATABASE TO USER &lt;username&gt;</pre> <p>OR</p> <pre>GRANT ALTER ON TABLE &lt;table_name&gt; TO &lt;username&gt; GRANT SELECT ON TABLE &lt;table_name&gt; TO &lt;username&gt;</pre> <p>OR</p> <pre>GRANT ALTERIN ON SCHEMA &lt;schema_name&gt; TO USER &lt;username&gt; GRANT SELECTIN ON SCHEMA &lt;schema_name&gt; TO USER &lt;username&gt;</pre> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>GRANT ALTERIN ON SCHEMA and GRANT SELECTIN ON SCHEMA are supported only on IBM DB2 Version 11 and newer.</p> </div> |

## 6.2.13.1.5.2 System Objects Created in IBM DB2

When you create a remote source to use trigger-based replication, a few system objects—such as tables, triggers, or procedures—are created on the IBM DB2 source.

### System Objects for Trigger-Based Replication

The following examples assume that the subscribed table is named `fruit.APPLE2`, the configured prefix is `A1_`, and the credentialed remote source username is `db2trg2`.

Table 56: Created System Objects

| Type  | Function     | Name and Example                                                                                                              |
|-------|--------------|-------------------------------------------------------------------------------------------------------------------------------|
| Table | Shadow table | <pre>&lt;username&gt;.&lt;prefix&gt;_SHADOW_&lt;schema&gt;_&lt;table_name&gt;</pre> <pre>db2trg2.A1_SHADOW_fruit_APPLE2</pre> |

| Type    | Function                             | Name and Example                                                                                                                                                     |
|---------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | Trigger queue table                  | <code>&lt;username&gt;.&lt;prefix&gt;_TRIGGER_QUEUE</code><br><code>db2trg2.A1_TRIGGER_QUEUE</code>                                                                  |
|         | Global temporary tables              | <code>&lt;username&gt;.&lt;prefix&gt;_TXNS</code><br><code>db2trg2.A1_TXNS</code><br><code>&lt;username&gt;.&lt;prefix&gt;_TMP</code><br><code>db2trg2.A1_TMP</code> |
|         | Source table to shadow table mapping | <code>&lt;username&gt;.&lt;prefix&gt;_SRC_TO_ST</code><br><code>db2trg2.A1_SRC_TO_ST</code>                                                                          |
|         | Marker table                         | <code>&lt;username&gt;.&lt;prefix&gt;_MARKERS</code><br><code>db2trg2.A1_MARKERS</code>                                                                              |
|         | Marker shadow table                  | <code>&lt;username&gt;.&lt;prefix&gt;_SHADOW_&lt;username&gt;.&lt;prefix&gt;_MARKERS</code><br><code>db2trg2.A1_SHADOW_db2trg2_A1_MARKERS</code>                     |
|         | Internal marker shadow               | <code>&lt;username&gt;.&lt;prefix&gt;_INTERNAL_MARK</code><br><code>db2trg2.A1_INTERNAL_MARK</code>                                                                  |
|         | Trace marker                         | <code>&lt;username&gt;.&lt;prefix&gt;_TRACE_MARKER</code><br><code>db2trg2.A1_TRACE_MARKER</code>                                                                    |
|         | Column metadata                      | <code>&lt;username&gt;.&lt;prefix&gt;_COLUMNS_METADATA</code><br><code>db2trg2.A1_COLUMNS_METADATA</code>                                                            |
|         | System information                   | <code>&lt;username&gt;.&lt;prefix&gt;_SYS_INFO</code><br><code>db2trg2.A1_SYS_INFO</code>                                                                            |
| Trigger | Marker insert                        | <code>&lt;username&gt;.&lt;username&gt;.&lt;prefix&gt;_MARKERS_I.&lt;prefix&gt;_TRIG</code><br><code>db2trg2.db2trg2_A1_MARKERS_I_A1_TRIG</code>                     |

| Type      | Function               | Name and Example                                                                                                                                                                   |
|-----------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Marker delete          | <code>&lt;username&gt;.&lt;username&gt;_&lt;prefix&gt;_MARKERS_D_&lt;prefix&gt;_TRIG</code><br><code>db2trg2.db2trg2_A1_MARKERS_D_A1_TRIG</code>                                   |
|           | Marker update          | <code>&lt;username&gt;.&lt;username&gt;_&lt;prefix&gt;_MARKERS_U_&lt;prefix&gt;_TRIG</code><br><code>db2trg2.db2trg2_A1_MARKERS_U_A1_TRIG</code>                                   |
|           | Marker queue insert    | <code>&lt;username&gt;.&lt;username&gt;_&lt;prefix&gt;_MARKERS_SH_I_&lt;prefix&gt;_TRIG</code><br><code>db2trg2.db2trg2_A1_MARKERS_SH_I_A1_TRIG</code>                             |
|           | Internal marker insert | <code>&lt;username&gt;.&lt;username&gt;_&lt;prefix&gt;_MARKERS_SH_I_&lt;prefix&gt;_INTERNAL_MARK_TRIG</code><br><code>db2trg2.db2trg2_A1_MARKERS_SH_I_A1_INTERNAL_MARK_TRIG</code> |
|           | Shadow insert          | <code>&lt;schema&gt;.&lt;schema&gt;_&lt;tablename&gt;_I_&lt;prefix&gt;_TRIG</code><br><code>fruit.fruit_APPLE2_I_A1_TRIG</code>                                                    |
|           | Shadow update          | <code>&lt;schema&gt;.&lt;schema&gt;_&lt;tablename&gt;_U_&lt;prefix&gt;_TRIG</code><br><code>fruit.fruit_APPLE2_U_A1_TRIG</code>                                                    |
|           | Shadow delete          | <code>&lt;schema&gt;.&lt;schema&gt;_&lt;tablename&gt;_D_&lt;prefix&gt;_TRIG</code><br><code>fruit.fruit_APPLE2_D_A1_TRIG</code>                                                    |
|           | Shadow queue insert    | <code>&lt;username&gt;.&lt;schema&gt;_&lt;tablename&gt;_I_&lt;prefix&gt;_TRIG</code><br><code>db2trg2.fruit_APPLE2_SH_I_A1_TRIG</code>                                             |
| Procedure | Scan procedure         | <code>&lt;username&gt;.&lt;prefix&gt;_PROC_V2</code><br><code>db2trg2.A1_PROC_V2</code>                                                                                            |
| Sequence  | Trigger sequence       | <code>&lt;username&gt;.&lt;prefix&gt;_TRIGGER_SEQ</code><br><code>db2trg2.A1_TRIGGER_SEQ</code>                                                                                    |

| Type | Function      | Name and Example                                    |
|------|---------------|-----------------------------------------------------|
|      | Scan sequence | <username>.<prefix>_SCAN_SEQ<br>db2trg2.A1_SCAN_SEQ |

## Cleaning up System Objects in the Remote Database

To clean up remote database system objects used for trigger-based replication, use the script provided at `<DPAgent_root>/Trigger/db2_trigger_based_cleanup.sql`.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

### 6.2.13.1.5.3 Set the DB2 Compatibility Vector

Improve compatibility with the LIMIT statement used by the IBM DB2 Log Reader adapter.

## Context

The IBM DB2 Log Reader adapter uses a MySQL-style LIMIT statement to fetch only the first number of rows from the trigger queue table. Because the LIMIT statement isn't supported by DB2, exceptions can occur.

### Note

If you can't set the registry variable on your IBM DB2 database, you can change the `adapter.db2.triggerbased.scanprocedure.version` agent configuration parameter to **3**.

With this value, the adapter avoids the LIMIT statement, but you can't change the *Maximum scan size* remote source configuration parameter after the remote source has queued a table. Instead, you must create a new remote source or reset the tables on the remote source and then change the *Maximum scan size* parameter.

For more information about setting agent configuration parameters, see [Agent Configuration Parameters \[page 112\]](#).

For more information about the `DB2_COMPATIBILITY_VECTOR` registry variable, see the IBM DB2 documentation.

## Procedure

1. Close all connections on the DB2 database.

```
db2 force application all
```

2. Set the compatibility vector to **MYS**.

```
db2set DB2_COMPATIBILITY_VECTOR=MYS
```

3. Restart the DB2 database.

```
db2 db2stop  
db2 db2start
```

## Results

DB2 improves compatibility with MySQL syntax and doesn't generate exceptions because of the LIMIT statement.

## Next Steps

If you want to revert this change, set the compatibility vector to null:

```
db2set DB2_COMPATIBILITY_VECTOR -null
```

## Related Information

[Agent Configuration Parameters \[page 112\]](#)

[IBM Documentation - DB2\\_COMPATIBILITY\\_VECTOR registry variable](#) 

### 6.2.13.2 DB2LogReaderAdapter Preferences

Configuration parameters for the DB2 Log Reader adapter.

#### Note

Log Reader adapter preferences are no longer set in the Data Provisioning Agent Configuration Tool with the exception of *Number of wrapped log files*, *Enable verbose trace*, and *Maximum log file size*. They are now in the remote source configuration options in SAP HANA. If you have upgraded from a previous version, the settings you find in the Agent Configuration Tool are the previous settings and are displayed for your reference.

You can adjust DB2 Log Reader adapter settings in the Data Provisioning Agent configuration tool.

| Parameter                                                  | Description                                                                                                                                                                | Default value |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Maximum operation queue size                               | The maximum number of operations permitted in the log reader operation queue during replication.                                                                           | 1000          |
| Maximum scan queue size                                    | The maximum number of log records permitted in the log reader log scan queue during replication.                                                                           | 1000          |
| Ignore log record processing errors                        | Determines whether to ignore log record processing errors.                                                                                                                 | false         |
| Replicate LOB columns                                      | Determines whether the agent applies each LOB change.                                                                                                                      | true          |
| Database connection pool size                              | Maximum number of connections allowed in the connection pool on a secondary node.                                                                                          | 15            |
| Number of times to retry to connect if a connections fails | Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times. | 5             |
| Timeout in seconds to retry connecting                     | The number of seconds the agent waits between retry attempts to connect to the primary database.                                                                           | 10            |
| Number of wrapped log files                                | The maximum size in 1-K blocks of the LogReader system log file before wrapping.                                                                                           | 3             |
| Enable verbose trace                                       | Enables or disables extra diagnostic information in the agent system log files.                                                                                            | false         |
| Maximum log file size                                      | Limits the size of the message log to conserve disk space.                                                                                                                 | 1000          |
| Turn on asynchronous logging mode                          | Specifies whether or not Log Reader should turn on asynchronous logging mode. (TRUE, FALSE)                                                                                | TRUE          |
| Maximum size of work queue for asynchronous logging        | The Maximum size of the work queue for asynchronous logging file handler to collect the log records. The range is 1 to 2147483647.                                         | 1000          |

| Parameter                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Default value |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Discard policy for asynchronous logging file handler | <p>Specifies the discard policy for the asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>• BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>• DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>• DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried, which can fail again, causing this process to be repeated.</li> </ul> | BLOCKING      |

## Related Information

[Configure Adapter Preferences \[page 587\]](#)

### 6.2.13.3 DB2 Log Reader Remote Source Configuration

Configure your connection to a DB2 remote source.

#### ⓘ Note

When you create a remote source with a name longer than 30 characters, the generated log reader folder name, under `<DPAgent_root>/LogReader/`, is converted to `AGENT<xxxx>`, where `<xxxx>` is an integer representing the hash code of the remote source name string.

The log file is located at `<DPAgent_root>/log/Framework.trc` and reads: `The instance name <original_name> exceeds 30 characters and it is converted to <converted_name>`.

| Category | Option                                | Description                                                                                                                                                                                                                                     |
|----------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Generic  | Always Map Character Types to Unicode | <p>Determines whether a CHAR/CHARACTER/VARCHAR/LONGVARCHAR/CLOB column in the source database is mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII.</p> <p>The default value is <i>False</i>.</p> |



| Category | Option                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                    | <p>Set this parameter to <i>True</i> only when the remote database is multibyte character sets such as UTF-8, GBK, and JA16SJIS.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                               |
|          | Load and Replicate LOB columns     | <p>When this parameter is set to <i>False</i>, the LOB columns are filtered out when doing an initial load and real-time replication.</p> <p>The default value is <i>True</i>.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>This option isn't available for an ECC adapter.</p> </div> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
| Database | Host                               | <p>The host name or IP address on which the DB2 Server is running.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                             |
|          | Port Number                        | <p>The port number of the DB2 Server.</p> <p>See <a href="#">Setting the DB2 Port Number [page 346]</a> for more information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                  |
|          | Database Name                      | The name of the database                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|          | Database Source Name               | Set the Source Name parameter to <code>&lt;MYDB_ALIAS&gt;</code> when creating a remote source, where <code>&lt;MYDB_ALIAS&gt;</code> is the database alias that was used when cataloging the primary database.                                                                                                                                                                                                                                                                                                                                    |
|          | Allowlist Table in Remote Database | Enter the name of the table that contains the allowlist in the remote database.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Category | Option                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|          |                                         | <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|          | <p>Include Table/Columns Remarks</p>    | <ul style="list-style-type: none"> <li><i>True</i>: Returns a description of the table or column. If you have many tables, setting this parameter to <i>True</i> can impede performance.</li> <li><i>False</i>: Turns off the return of descriptions</li> </ul> <p>The default value is <i>False</i>.</p> <p>When this parameter is set to <i>True</i>, the descriptions of tables or views are returned when GET_REMOTE_SOURCE_OBJECTS_LIST is called. The descriptions of tables or views and columns are returned when GET_REMOTE_SOURCE_TABLE_DEFINITIONS is called.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | <p>Additional Connection Properties</p> | <p>Use this parameter to attach additional custom connection properties. For example, you can use this new parameter to set JDBC driver connection properties.</p> <p>Use the following format:</p> <p><b>key1=value1[;key2=value2].</b><br/>..</p> <p>For example,<br/><b>securityMechanism=9;encryptionAlgorithm=2</b></p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                 |

| Category                  | Option                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LDAP Authentication       | Use LDAP Authentication  | <p>Set to <i>True</i> to enable Lightweight Directory Access Protocol (LDAP) authentication for the DB2 database.</p> <p>The default value is <i>False</i>.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The IBM DB2 log reader adapter doesn't support the following LDAP scenarios:</p> <ul style="list-style-type: none"> <li>• LDAP + SSL authentication</li> <li>• LDAP + Kerberos authentication</li> <li>• LDAP failover mode</li> </ul> </div> |
| Schema Alias Replacements | Schema Alias             | <p>Schema name to be replaced with the schema given in <i>Schema Alias Replacement</i>.</p> <p>When you access a table under this schema, you're considered to be accessing a table under the schema specified in <i>Schema Alias Replacement</i>.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                             |
|                           | Schema Alias Replacement | <p>Schema name to be used to replace the schema given in Schema Alias.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                         |
| Security                  | Use SSL                  | <p>Specifies whether you're using SSL.</p> <p>The default value is <i>False</i>.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                               |

| Category       | Option                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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|                | Use Agent Stored Credential     | <p>Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.</p> <p>The default value is <i>False</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>When you use credentials stored in the agent's secure storage, you must still specify the user name in <a href="#">► Credentials ► User Name ◄</a>. Additionally, the <i>Credential Mode</i> must not be <i>none</i> or empty.</p> </div>                                                                                                                                                                         |
| CDC Properties | Capture Mode                    | <ul style="list-style-type: none"> <li>• <i>Trigger</i>: Capture changes by using triggers and querying the source database for the changed data.</li> <li>• <i>LogReader</i>: Capture changes by reading the remote database log.</li> </ul> <p>The default value is <i>LogReader</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                  |
|                | Row handling for update records | <p>Specifies the method to use when handling UPDATE records to minimize applier delay in certain scenarios.</p> <p>When <i>Capture Mode</i> is set to <i>LogReader</i>, the following behavior applies:</p> <ul style="list-style-type: none"> <li>• <i>Update</i>: The adapter sends UPDATE.</li> <li>• <i>Upsert</i>: The adapter sends UPSERT instead of UPDATE. Use this option if there are no changes on primary key columns for the tables in your remote source.</li> <li>• <i>Delete + Upsert</i>: The adapter sends DELETE + UPSERT instead of UPDATE. Use this option if there are changes on primary key columns for the tables in your remote source.</li> </ul> |

| Category | Option                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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|          |                                 | <p>When <i>Capture Mode</i> is set to <i>Trigger</i>, the following behavior applies:</p> <ul style="list-style-type: none"> <li>• <i>Update</i>: The adapter sends UPDATE.</li> <li>• <i>Upsert</i>: The adapter sends UPSERT + COMMIT instead of UPDATE.<br/>If there are changes on primary key columns for the tables in your remote source, additional rows appear in the target table.</li> <li>• <i>Delete + Upsert</i>: The adapter sends DELETE + UPSERT + COMMIT instead of UPDATE.</li> </ul> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Triggers record PK only</i> is set to <i>False</i>.</p> </div> <p>The default value is <i>Update</i>.</p> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Row handling for insert records | <p>Specifies the method to use when handling INSERT records.</p> <p>When <i>Capture Mode</i> is set to <i>LogReader</i>, the following behavior applies:</p> <ul style="list-style-type: none"> <li>• <i>Insert</i>: The adapter sends INSERT.</li> <li>• <i>Upsert</i>: The adapter sends UPSERT instead of INSERT.<br/>When you have interleaved INSERT and UPSERT records, using this option can improve performance.</li> </ul> <p>When <i>Capture Mode</i> is set to <i>Trigger</i>, the following behavior applies:</p> <ul style="list-style-type: none"> <li>• <i>Insert</i>: The adapter sends INSERT.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                               |

| Category | Option                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                     | <ul style="list-style-type: none"> <li><i>Upsert</i>: The adapter sends UPSERT + COMMIT instead of INSERT.</li> </ul> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Triggers record PK only</i> is set to <i>False</i>.</p> </div> <p>The default value is <i>Insert</i>.</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                   |
|          | Ignore log record processing errors | <p>Specifies whether to ignore log record processing errors. If set to <i>True</i>, the replication doesn't stop if log record processing errors occur.</p> <p>The default value is <i>False</i>.</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>LogReader</i>.</p> </div> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Ignore log record decluster errors  | <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>This parameter is available only when you're using the DB2 Log Reader ECC adapter.</p> </div> <p>Specifies whether to ignore log record declustering errors. If set to <i>True</i>, the replication doesn't stop if log record declustering errors occur.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                 |

| Category | Option                        | Description                                                                                                                                                                                                                                                                                                                                                                                              |
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|          |                               | <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                |
|          | Maximum operation queue size  | <p>The maximum number of operations permitted in the log reader operation queue during replication. The value range is 25 to 2147483647.</p> <p>The default value is <i>1000</i>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>LogReader</i>.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Maximum scan queue size       | <p>The maximum number of log records permitted in the log reader log scan queue during replication. The value range is 25 to 2147483647.</p> <p>The default value is <i>1000</i>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>LogReader</i>.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Database connection pool size | <p>Maximum number of connections allowed in the connection pool on a secondary node. The value range is 1 to 64.</p> <p>The default value is <i>15</i>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>LogReader</i>.</p>                                                                                                                                     |

| Category | Option                                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                           | <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                  |
|          | Number of times to retry to connect if a connection fails | <p>Instructs a client library, such as DBLIB, ODBC, and ADO, to try to connect the specified number of times when the server isn't found. The value range is 0 to 2147483647.</p> <p>The default value is <b>5</b>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>LogReader</i>.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Timeout in seconds to retry connecting                    | <p>The number of seconds the agent waits between retry attempts to connect to the primary database. The value range is 0 to 3600.</p> <p>The default value is <b>10</b>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>LogReader</i>.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                            |
|          | LogReader Character Set                                   | <p>Represents the charset of the source DB2 database. There's no default value, which means no character set conversion occurs during the replication from DB2 to SAP HANA. To view the accepted character set name, refer to <a href="http://www.iana.org/assignments/character-sets">http://www.iana.org/assignments/character-sets</a> .</p>                                                                                            |



| Category | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|          |                                          | <div> <p><b>Note</b></p> </div> <div> <p>This option is valid only when <i>Capture Mode</i> is set to <i>LogReader</i>.</p> </div> <div> <p><b>Note</b></p> </div> <div> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | LogReader read buffer size               | <p>Allows you to adjust the size of the DB2 log read. The value range is 1000 to 2147483647. If the size is too small, you can encounter an error: <code>sqlcode -2650 reason 8</code></p> <p>The default value is <code>65536</code>.</p> <div> <p><b>Note</b></p> </div> <div> <p>This option is valid only when <i>Capture Mode</i> is set to <i>LogReader</i>.</p> </div> <div> <p><b>Note</b></p> </div> <div> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                            |
|          | Maintenance user filter (case sensitive) | <p>Optional. Enter one or more source database user names. Source database transactions (INSERT, UPDATE, DELETE) conducted by these users are filtered out (ignored) and not propagated to the SAP HANA target. For example, if you log in to the source database with a maintenance user and delete a row from a source table that is subscribed for replication, this row isn't deleted from the SAP HANA target table.</p> <p>Don't use the same name as the <i>User Name</i> credential.</p> <p>Specify multiple user names by separating them with a backslash (\). For example, use the following string to specify maintenance users named <b>MAINT_USER</b> and <b>APP_USER</b>:</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p>MAINT_USER\APP_USER</p> </div> |

| Category | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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|          |                                          | <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> <p>However, the changed value takes effect only on newly-created remote subscriptions; existing subscriptions continue to use the previous value.</p>                                                                                                                                                                                                              |
|          | Schema to create system objects          | <p>The source database schema in which the adapter creates system objects such as triggers, sequences, shadow tables, and so on.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p>                                                                                                                                                                                                                                  |
|          | DDL Scan Interval in Minutes             | <p>The amount of time the adapter waits to compare metadata between the DB2 catalog and the subscription registry to identify DDL changes, in minutes.</p> <p>The default value is <i>10</i> and a value of <i>0</i> or lower disables DDL replication.</p> <p>Setting this value too low can increase the workload for both the adapter and the source database.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> |
|          | System object prefix                     | <p>The prefix of the names of the system objects the adapter creates in the source database.</p> <p>The default value is <i>SDI_</i>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p>                                                                                                                                                                                                                             |
|          | Enable ABAP manageable trigger namespace | <p>Specifies whether triggers created by the adapter should match the name pattern of the ABAP system so that</p>                                                                                                                                                                                                                                                                                                                                                            |

| Category | Option                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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|          |                                   | <p>system can manage triggers if there is an upgrade, for example.</p> <p>The default value is <i>False</i>.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i> and the source is an ABAP system.</p> </div>                                                                                                                                                              |
|          | ABAP manageable trigger namespace | <p>The name pattern used by the ABAP system.</p> <p>The default value is <i>/IDI/</i>.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i> and <i>Enable ABAP manageable trigger namespace</i> is set to <i>True</i>.</p> </div>                                                                                                                                           |
|          | Sequence cache size               | <p>The cache size the adapter uses to create sequence objects using the statement <code>CREATE SEQUENCE ... CACHE &lt;cache size&gt; ...</code></p> <p>The default value is <i>1000</i>.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> </div>                                                                                                                   |
|          | Connection pool size              | <p>The maximum number of connections allowed in the connection pool.</p> <p>The default value is <i>8</i>.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> </div> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Minimum scan interval in seconds  | <p>The minimum interval in seconds that the adapter scans the trigger queue table to get change data.</p>                                                                                                                                                                                                                                                                                                                                                                                                   |

| Category | Option                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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|          |                                  | <p>If the adapter scans the queue and finds that the queue is empty, it gradually increases the scan interval from the minimum scan interval to the maximum scan interval.</p> <p>The default value is <i>0</i>.</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> </div> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                |
|          | Maximum scan interval in seconds | <p>The maximum interval in seconds that the adapter scans the trigger queue table to get change data.</p> <p>If the adapter scans the queue and finds that the queue is empty, it gradually increases the scan interval from the minimum scan interval to the maximum scan interval.</p> <p>The default value is <i>10</i>.</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> </div> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Maximum batch size               | <p>The maximum number of consecutive change data on the same table that are batched to process and send to Data Provisioning Server together.</p> <p>The default value is <i>128</i>.</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> </div>                                                                                                                                                                                                                                                                                                                                               |

| Category | Option                            | Description                                                                                                                                                                                                                                                                                                                                                                                           |
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|          |                                   | <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                             |
|          | Batch queue size                  | <p>The internal batch queue size. The batch queue size determines the maximum number of batches of change data that are queued in memory.</p> <p>The default value is <b>64</b>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Maximum transaction count in scan | <p>The maximum number of transactions being processed in a scan of the remote source database.</p> <p>The default value is <b>1000</b>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                          |
|          | Maximum scan size                 | <p>The maximum number of rows being fetched from the trigger queue table in one scan and assigned to batch jobs for further processing.</p> <p>The default value is <b>50000</b>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p>                                                                                                          |

| Category | Option                                                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                                      | <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|          | Merge before and after images of update into one row in shadow table | <p>Specifies whether to merge before and after images when processing UPDATE operations from the source database.</p> <ul style="list-style-type: none"> <li><i>True</i>: Generate only a single merged row in the shadow table.</li> <li><i>False</i>: Generate shadow table rows for both the before and after images.</li> </ul> <p>The default value is <i>False</i>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p>                                                                                                                                                                                                                                                                                                       |
|          | Enable statement-level trigger                                       | <p>Specifies whether to use statement-level or row-level triggers.</p> <p>Statement-level triggers can improve performance when inserting, updating, or deleting in bulk, but reduce performance compared to row-level triggers when inserting rows one by one.</p> <ul style="list-style-type: none"> <li><i>True</i>: Inserts only one record into the trigger queue per statement-level sequence.</li> <li><i>False</i>: Inserts a record into the trigger queue for each individual record in a statement sequence.</li> </ul> <p>The default value is <i>False</i>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i> and <i>Merge before and after images of update into one row in shadow table</i> is set to <i>False</i>.</p> |
|          | Triggers record PK only                                              | <p>Specifies whether to have the triggers record only primary keys (PK) of</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Category | Option                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                        | <p>delta data during CDC processing. This action may improve the DML performance in the source database.</p> <div style="background-color: #f0f0f0; padding: 10px;"> <p><b>Note</b></p> <p>If this parameter is set to <b>False</b>, no DML changes on the subscribed tables must occur during the time period between when DDL changes occur on the source database and when they're replicated to the target SAP HANA database. Replicating DDL changes would trigger the adapter to update (drop and then re-create) triggers and shadow tables on the changed source tables. Errors may result if any data is inserted, updated, or deleted on the source tables during this time period.</p> <p>If this parameter is set to <b>True</b>, simple table structure changes (for example, adding a nonkey field) are supported in real time.</p> </div> <p>To support UPDATE primary key values in this mode, set <i>Capture before and after images</i> to <i>True</i>.</p> <p>The default value is <i>False</i>.</p> <div style="background-color: #f0f0f0; padding: 10px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> </div> |
|          | <p>Capture before and after images</p> | <p>Specifies which images to capture for UPDATE operations on the remote table.</p> <ul style="list-style-type: none"> <li>• <i>True</i>: Triggers capture both before and after images of UPDATE operations on the remote table, as well as updates of primary key values.</li> <li>• <i>False</i>: Triggers capture only the after image of UPDATE operations.</li> </ul> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Category    | Option                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             |                               | <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i> and <i>Triggers record PK only</i> is set to <i>True</i>.</p>                                                                                                                                                                                                                                                                                                                                                        |
|             | Transmit data in compact mode | <p>Specifies whether the adapter packs and sends out the data of one table together in one scan round. However, doing so breaks referential integrity among tables.</p> <p>The default value is <i>False</i>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i> and <i>Triggers record PK only</i> is set to <i>False</i>.</p>                                                                                                                                     |
|             | Enable transaction merge      | <p>Specifies whether to group multiple transactions for the same remote table within a scan round.</p> <ul style="list-style-type: none"> <li><i>True</i>: Transactions on the same remote table are grouped together into a single transaction in each scan round and replicated to the target.</li> <li><i>False</i>: Transactions are replicated as-is.</li> </ul> <p>The default value is <i>False</i>.</p> <p><b>Note</b></p> <p>This option is valid only when <i>Capture Mode</i> is set to <i>Trigger</i>.</p> |
| Credentials | Credentials Mode              | <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>                                                                                                                                                                                                                     |
| Credential  | User Name                     | The name of the DB2 database user that the adapter uses to access the database.                                                                                                                                                                                                                                                                                                                                                                                                                                        |



| Category | Option   | Description                                                                                                               |
|----------|----------|---------------------------------------------------------------------------------------------------------------------------|
|          |          | Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials. |
|          | Password | The password of the DB2 database user that the adapter uses to access the database.                                       |

**Note**

The value of this parameter can be changed when the remote source is suspended.

## Example: DB2 Log Reader Remote Source

```
CREATE REMOTE SOURCE "db2rs" ADAPTER "DB2LogReaderAdapter" AT LOCATION AGENT
"MyAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="pds_host_name" displayName="Host "
isRequired="true">mo-xxxxxxx.mo.sap.corp</PropertyEntry>
    <PropertyEntry name="pds_port_number" displayName="Port Number"
isRequired="true">60060</PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database Name "
isRequired="true">testdb</PropertyEntry>
    <PropertyEntry name="pds_datasource_name" displayName="Database
SourceName" isRequired="true">testdb</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="security" displayName="Security">
    <PropertyEntry name="pds_use_agent_stored_credential">false</
PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>xxxx</user>
  <password>xxxxxxxx</password>
</CredentialEntry>
<CredentialEntry name="credential_user_only">
  <password>xxxxxxx</password>
</CredentialEntry>';
```

## Example: DB2 Trigger-Based Remote Source

```
CREATE REMOTE SOURCE "db2rs" ADAPTER "DB2LogReaderAdapter" AT LOCATION AGENT
"myAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
  <PropertyGroup name="database" displayName="Database">
```

```

        <PropertyEntry name="pds_host_name" displayName="Host "
isRequired="true">xxxxx</PropertyEntry>
        <PropertyEntry name="pds_port_number" displayName="Port Number "
isRequired="true">xxxxx</PropertyEntry>
        <PropertyEntry name="pds_database_name" displayName="Database Name "
isRequired="true">mydb</PropertyEntry>
        <PropertyEntry name="pds_datasource_name" displayName="Database
SourceName" isRequired="true">mydb</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="cdc" displayName="CDC Properties">
        <PropertyEntry name="logreader" displayName="LogReader">
            <PropertyEntry name="capture_mode" displayName="Capture">trigger</
PropertyEntry>
        </PropertyGroup>
    </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
    <user>DB2ADM</user>
    <password>xxxx</password>
</CredentialEntry>' ;

```

## Related Information

[Creating Secondary User Credentials](#)

[Using a Schema Alias \[page 347\]](#)

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

[Security Aspects of SAP HANA Smart Data Access \(SAP HANA Security Guide\)](#)

[Creating an Allowlist to Limit Access to a Source Database \[page 350\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 91\]](#)

[Store Remote Data Source Credentials Securely \[page 68\]](#)

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Setting the DB2 Port Number \[page 346\]](#)

[Using a Schema Alias \[page 347\]](#)

### 6.2.13.3.1 Setting the DB2 Port Number

Make sure that the DB2 port number is within a valid range.

If the DB2 port number is set to 0 or larger than 65535, DB2 converts it to a port number that is less than 65535. The following translation rules apply:

- If the port number is 0 or 65536, DB2 will set a random port number after you restart DB2, each time.
- If the port number is larger than 65536, the real port number that DB2 set is the port number, minus 65536. For example, 70000–65536=4464. In this case, 4464 is the real port number that DB2 sets.

To identify the real port number:

- On Windows, open Task Manager. Find the PID of DB2\_XX service, then open a cmd prompt and type **netstat -aon | findstr PID**.

- On Linux, use the `ps -aux |grep db2sysc` command.

## 6.2.13.4 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database (for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

[SAP HANA Remote Source Configuration \[page 529\]](#)

[SAP ASE LTL Remote Source Configuration \[page 505\]](#)

## 6.2.13.5 Log Reader Adapter Log Files

You can review processing information in the Log Reader log files.

The following files are available:

| Log file name and location                                   | Description                   |
|--------------------------------------------------------------|-------------------------------|
| <DPAgent_root>/LogReader/admin_logs/admin<instance_name>.log | Log Reader administration log |
| <DPAgent_root>/log/<instance_name>.log                       | Log Reader instance log       |

### Note

By default, the adapter instance name is the same as the remote source name when the remote source is created from the SAP HANA Web-based Development Workbench.

## 6.2.13.6 Configure SSL for the DB2 Log Reader Adapter

Set up secure SSL communication between DB2 and the Data Provisioning Agent.

### Context

If you want to use SSL communication between your DB2 source and the Data Provisioning Agent, you must prepare and import certificates and configure the source database.

### Procedure

1. Prepare the DB2 database server for SSL connections.
  - a. Create an SSL directory and use the gskit tool to generate the SSL key file.

For example, on Windows:

```
cd C:\SSL
"C:\Program Files\ibm\gsk8\bin\gsk8capicmd_64.exe" -keydb -create -db
"key.kdb" -pw "ibm123456" -stash
"C:\Program Files\ibm\gsk8\bin\gsk8capicmd_64.exe" -cert -create
-db "key.kdb" -pw "ibm123456" -label "SSLLabel" -dn
"CN=XXXX.XX.XX.XXXX,O=IBM,OU=IDL,L=Bangalore,ST=KA,C=INDIA"
"C:\Program Files\ibm\gsk8\bin\gsk8capicmd_64.exe" -cert -extract -db
"key.kdb" -pw "ibm123456" -label "SSLLabel" -target "key.arm" -format
ascii -fips
```

On Linux:

```
cd /home/db2inst1/SSL
/home/db2inst1/sqlllib/gskit/bin/gsk8capicmd_64 -keydb -create -db
"key.kdb" -pw "ibm123456" -stash
/home/db2inst1/sqlllib/gskit/bin/gsk8capicmd_64 -cert -create -db
"key.kdb" -pw "ibm123456" -label "SSLLabel" -dn
"CN=XXXX.XX.XX.XXXX,O=IBM,OU=IDL,L=Bangalore,ST=KA,C=INDIA"
```

```
/home/db2inst1/sqllib/gskit/bin/gsk8capicmd_64 -cert -extract -db
"key.kdb" -pw "ibm123456" -label "SSLLabel" -target "key.arm" -format
ascii -fips
```

- b. Connect to the DB2 database using the instance user, and use the command-line interface to update SSL-relevant configuration parameters.

Specify the server SSL key location, label, and port, and set the communication protocol to include SSL.

For example, to use a key stored in `H:\cert\SSL` with the label "SSLLabel" and port 56110:

```
db2 update dbm cfg using SSL_SVR_KEYDB H:\cert\SSL\key.kdb
db2 update dbm cfg using SSL_SVR_STASH H:\cert\SSL\key.sth
db2 update dbm cfg using SSL_SVR_LABEL SSLLabel
db2 update dbm cfg using SSL_SVCENAME 56110
db2set DB2COMM=SSL,TCPIP
db2 update dbm cfg using DIAGLEVEL 4
db2 force application all
db2 stop
db2 restart
```

- c. Verify the SSL configuration.

In the DB2 diagnostic log `db2diag.log`, check for the following message:

```
MESSAGE : DIA3000I "SSL" protocol support was successfully started.
```

Additionally, verify that the `/etc/services` file contains the specified SSL port.

2. Prepare the DB2 client for SSL connections.

- a. Copy the SSL key from the DB2 database server to the DB2 client location.

Create an SSL directory on the DB2 client, and copy `key.arm` from the DB2 server into this directory.

- b. Add the DB2 server SSL key to the DB2 client.

From the SSL directory on the DB2 client, use the `gskit` tool to import the server SSL key.

For example:

```
/build/db2/gskit/bin/gsk8capicmd_64 -keydb -create -db "keyclient.kdb" -pw
"ibm123456" -stash
/build/db2/gskit/bin/gsk8capicmd_64 -cert -add -db "keyclient.kdb" -pw
"ibm123456" -label "SSLLabelClnt" -file key.arm -format ascii -fips
```

- c. Update the DB2 client configuration.

Specify the SSL keydb and stash, and restart the instance.

For example:

```
db2 update dbm cfg using SSL_CLNT_KEYDB /build/home/db2inst2/SSL/
keyclient.kdb
db2 update dbm cfg using SSL_CLNT_STASH /build/home/db2inst2/SSL/
keyclient.sth
db2 force application all
db2stop
db2start
```

- d. Catalog the DB2 database with the SSL protocol.

For example:

```
db2 catalog tcpip node SSLNODE remote <hostname> server 56110 security ssl
```

```
db2 catalog database mydb as sslmydb at node SSLNODE
```

- e. Verify the SSL connection to the DB2 server.

For example:

```
db2 connect to sslmydb user db2inst1 using db2inst1
```

3. Prepare the Data Provisioning Agent for SSL connections.
  - a. Copy the SSL key from the DB2 database server to the Data Provisioning Agent installation.

Copy `key.arm` from the DB2 server into `<DPAgent_root>/ssl/`.

- b. Import the DB2 server SSL key to the agent cacerts file.

Use the Java keytool to import the SSL key. By default, `keytool` is located in `$JAVA_HOME/bin`.

For example:

```
keytool -import -keystore <DPAgent_root>/ssl/cacerts -storepass changeit  
-file <DPAgent_root>/ssl/key.arm -noprompt -alias <alias_name>
```

- c. Configure the SSL password with the Data Provisioning Agent configuration tool.

Specify the same password used when importing the SSL key, and then restart the Data Provisioning Agent.

## Next Steps

When you create a DB2 remote source, ensure that the following parameters are set appropriately:

- *Use SSL: True*
- *Port Number*: SSL port for the DB2 database. For example, 56110.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

### 6.2.13.7 Creating an Allowlist to Limit Access to a Source Database

There are times when you might want to limit access to all of the tables in a source database. For data provisioning log reader adapters as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create an allowlist.

Restricting access to only those tables that are to be replicated is done by creating an allowlist of source database objects in a separate table.

### Note

The allowlist impacts only the virtual table created and the replications created after the allowlist was created.

You can use SQL to create the allowlist table.

### Note

- The allowlist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and ALLOWLIST.
- The allowlist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of an allowlist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of allowlisted tables for a single remote source.

## Microsoft SQL Server Example

```
create table allowlist(REMOTE_SOURCE_NAME varchar(128), ALLOWLIST varchar(4000));
```

To add an allowlist for the remote source called "localmssqldb", insert a row into the allowlist table:

```
insert into allowlist values('localmssqldb', 'object.A, object.B*');  
insert into allowlist values('localmssqldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source "localmssqldb".

## SAP HANA Example

```
create schema SAP_RESTRICTIONS;  
create table ALLOW_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, ALLOWLIST  
varchar(4000));
```

To add an allowlist for the remote source called "localhadp", insert a row into the allowlist table:

```
insert into ALLOW_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT,APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source localhadp.

## 6.2.13.8 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

### Procedure

1. Start the Data Provisioning Agent configuration tool.
2. In the *Agent Preferences* menu, choose *Set Agent Preferences*.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter , OracleLogReaderAdapter , HanaAdapter
```

### Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

### Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Agent Configuration Parameters \[page 112\]](#)



## 6.2.14 IBM DB2 Mainframe

The DB2 Mainframe adapter supports IBM DB2 for z/OS and IBM DB2 iSeries, which is formerly known as AS/400.

The DB2 Mainframe adapter is a data provisioning adapter that provides DB2 client access to the database deployed on IBM DB2 for z/OS and iSeries systems. DB2 database resources are exposed as remote objects of the remote source. These remote objects can be added as data provisioning virtual tables. The collection of DB2 data entries are represented as rows of the virtual table.

### Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source for both z/OS and iSeries
- SELECT, WHERE, JOIN, GROUP BY, ORDER BY, TOP, LIMIT, DISTINCT

### 6.2.14.1 Setting DB2 Universal Database Environment Variables

The method for setting DB2 UDB environment variables depends on the operating system.

#### Note

The DB2 UDB environment variables should be set up regardless of whether your Data Provisioning Agent is installed on the same server as the DB2 database or not. Prior to setting up the variables, be sure that you have installed the IBM Data Server Runtime Client.

For Linux, the DB2 UDB installation provides two scripts for setting up the DB2 UDB environment variables: `db2cshrc` for C shell and `db2profile` for Bourne or Korn shell. These scripts set the library path environment variable based on the bit size of the installed server or client.

For Windows, the installation sets all necessary environment variables.

For Linux platforms, the 32-bit and 64-bit versions of the driver and API libraries are located in `<$HOME/sql1lib/lib32>/sql1lib/lib32` and `<$HOME/sql1lib/lib64>/sql1lib/lib64`, respectively, where `<$HOME>` is the home directory of the DB2 UDB instance owner.

#### Note

If the Data Provisioning Agent is installed on Linux, the library path environment variable must point to the 64-bit libraries. For Windows, the library path environment variable must point to the 32-bit libraries.

#### Note

We recommend that you add a line to the `<DPAgent_root>/bin/dpagent_env.sh` file to set the `db2profile` environmental variables. This ensures that when you use `dpagent_servicedaemon.sh` to

stop and start the DPAgent service, the DB2 UDB environment variables are sourced automatically. For example, for `dpagent_setenv.sh` (Linux), you could add a line such as `. /home/db2inst1/sql1lib/db2profile.`

## 6.2.14.2 IBM DB2 Mainframe Permissions

DB2 mainframe database users must have certain permissions granted to them.

The IBM DB2 Mainframe adapter requires a user with read privileges to the SYSIBM.SYSCOLUMNS system table.

## 6.2.14.3 Bind the DB2 SYSHL Package

Instructions for binding the DB2 SYSHL package.

### Context

If you receive the following error from the adapter, follow these steps to bind the DB2 SYSHL package:

```
DB2 SQL Error: SQLCODE=-805, SQLSTATE=51002, SQLERRMC=DB1SLOC.NULLID.SYSLH
```

### Procedure

1. Install and open the IBM DB2 Configuration Assistant.
2. In the source window, connect to the DB2 database deployed on the mainframe system.
3. Test the connection.
4. Bind the DB2 SYSHL package through the Configuration Assistant.
5. Select `ddcsmvs.lst` as the bind file location, enter the connection username and password, and then click *Bind*.

## 6.2.14.4 Preparing JDBC JAR Files

Prepare the IBM DB2 JDBC JAR files to use one of the DB2 Mainframe adapters.

To use one of the DB2 Mainframe adapters, you are required to copy the following IBM DB2 JDBC JAR files to the `/lib` folder of the Data Provisioning Agent installation directory (`<DPAgent_root>\lib`).

- `db2jcc4.jar` (Required)

You can download this file here: <http://www-01.ibm.com/support/docview.wss?uid=swg21363866> .  
 Download the JDBC JAR file according to your DB2 database version.

- `db2jcc_license_cisuz.jar` (Required)  
 You can find information about this file here: <http://www-01.ibm.com/support/docview.wss?uid=swg21191319>

You can find these JAR files in the following ways:

- These JAR files are available in the installation directory after you installed the IBM DB2 client. For example, on a Windows system, the JAR files are located in `C:\Program Files\IBM\SQLLIB\java`.
- Download them from the IBM Support and Download Center.

### Note

If the source z/OS DB2 system contains a non-English CCSID table space, you are required to update the JVM to an internationalized version. At a minimum, the `charsets.jar` file within the current JVM should contain the required `CharToByteCP<XXX>.class`, where `<XXX>` corresponds to the source system's language locale.

## 6.2.14.5 IBM DB2 Mainframe Remote Source Configuration

Options for connecting to the remote mainframe data server. Also included is sample code for creating a remote source using the SQL console.

| Category | Option                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Generic  | Always Map Character types to Unicode | <p>Determines whether a CHAR/CHARACTER/VAR-CHAR/LONGVARCHAR/CLOB column in the source database is mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII. The default value is <code>False</code>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p> <p>Set this parameter to <code>True</code> only when the remote database is multibyte character sets such as UTF-8, GBK, JA16SJIS, and soon.</p> |
| Database | Host                                  | Host name or IP address on which the remote DB2 data server is running.                                                                                                                                                                                                                                                                                                                                                                                                                 |
|          | Port Number                           | The DB2 data server port number.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | Database Name                         | The DB2 database name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|          | Database Source Name                  | The DB2 instance name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Category                 | Option                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          | Additional Connection Properties | <p>Use this parameter to attach additional custom connection properties. For example, you can use this new parameter to set JDBC driver connection properties.</p> <p>Use the following format:</p> <p><b>key1=value1[;key2=value2]...</b></p> <p>For example,</p> <p><b>securityMechanism=9;encryptionAlgorithm=2</b></p>                                                                                                                                                                                                                                                                                                                                                                  |
| Security                 | Use SSL                          | <p>Specifies whether you are using SSL.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                          | Use Agent Stored Credential      | <p>Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| z/OS DB2 Additional Info | Bind Packages                    | <p>When this option is set to <i>Yes</i>, the DB2 mainframe adapter automatically checks and binds all of the required missing JAR files.</p> <p>We recommend that you set this option to <i>Yes</i> the first time you attempt to establish a connection, then set this option to <i>No</i> for subsequent attempts.</p> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>If any necessary packages are missing, an error occurs.</p> </div> <p>Setting this option for subsequent attempts helps improve performance by eliminating the need for redundant checks for the necessary JDBC packages.</p> |
|                          | Source System is AS/400 (IBM I)  | <p>Set this parameter to <i>Yes</i> if your source system is AS/400.</p> <p>The default value is <i>No</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Credential Properties    | Credentials Mode                 | <p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><b>Technical User:</b> A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><b>Secondary User:</b> A unique access credential on the remote source assigned to a specific user.</li> </ul>                                                                                                                                                                                                                                                         |
|                          | User Name                        | <p>The DB2 user with access to the tables that are added as virtual tables in SAP HANA.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Category | Option   | Description                 |
|----------|----------|-----------------------------|
|          | Password | DB2 database user password. |

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyDB2MainframeSource" ADAPTER "DB2MainframeAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
  <PropertyEntry name="pds_host_name" displayName="Host">myhost.sap.corp</
PropertyEntry>
  <PropertyEntry name="pds_port_number" displayName="Port Number">5950</
PropertyEntry>
  <PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
  <PropertyEntry name="pds_datasource_name" displayName="Database
SourceName">mydb</PropertyEntry>
  <PropertyEntry name="bind_packages" displayName="Bind Packages">No</
PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>';
```

## Related Information

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 91\]](#)

[Store Remote Data Source Credentials Securely \[page 68\]](#)

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

### 6.2.14.5.1 Setting the JDBC Isolation Level

Set the isolation level for the JDBC connection with the *Additional Connection Properties* configuration option on your remote source.

To set the JDBC isolation level, specify the key and value as `defaultIsolationLevel=<value>`.

Table 57: Supported Isolation Levels

| Value | Description                       |
|-------|-----------------------------------|
| 1     | TRANSACTION_READ_UNCOMMITTED (UR) |
| 2     | TRANSACTION_READ_COMMITTED (CS)   |
| 4     | TRANSACTION_REPEATABLE_READ (RS)  |
| 8     | TRANSACTION_SERIALIZABLE (RR)     |

For example, `defaultIsolationLevel=1` implies a JDBC isolation level of `TRANSACTION_READ_UNCOMMITTED`.

#### Note

Specifying an isolation level is optional. If this additional connection property is not specified, the default isolation level used by the DB2 JDBC driver is 2 (`TRANSACTION_READ_COMMITTED`).

## Related Information

[IBM DB2 Mainframe Remote Source Configuration \[page 355\]](#)

## 6.2.15 Microsoft Excel

This adapter lets SAP HANA users access Microsoft Excel files.

### Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Search for tables
- SharePoint as a source
- SharePoint on Office365
- SELECT from a virtual table

### 6.2.15.1 Microsoft Excel Authorizations

Authorization requirements for Microsoft Excel file remote sources.

Keep the following in mind when accessing files:

- Password-protected Microsoft Excel files are not supported.
- Ensure the user account under which the Data Provisioning Agent is running has access to the Microsoft Excel files on the local computer, a shared directory, or a SharePoint site.
- If the Microsoft Excel files are located on the same computer as the Data Provisioning Agent, the files must be located in the same directory or a subdirectory of the Data Provisioning Agent root directory.

## 6.2.15.2 Microsoft Excel Adapter Preferences

Options for controlling the Microsoft Excel adapter.

| Option       | Description                                                                                                                                                              |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Access Token | A password. An access token protects the Microsoft Excel files from being accessed from a different remote source. Use this same password when creating a remote source. |

## 6.2.15.3 Microsoft Excel Remote Source Configuration

Options for connecting to the remote Microsoft Excel data. Also included is sample code for creating a remote source using the SQL console.

### Note

If you want to use a Data Provisioning Agent installed on Linux to connect to the SharePoint site, enable Basic Authentication on the SharePoint server.

| Category    | Parameter        | Description                                                                                                                                                                                                                                                                                                                                                               |
|-------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| File Source | File Source Type | <ul style="list-style-type: none"> <li>• <i>File System</i>: Specifies that the Microsoft Excel source is located in a file system.</li> <li>• <i>SharePoint</i>: Specifies that the Microsoft Excel source is located on a SharePoint server.</li> <li>• <i>SharePoint on Office365</i>: Specifies that the Microsoft Excel source is on an Office365 server.</li> </ul> |

| Category    | Parameter         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| File System | Folder            | <p>The directory of Microsoft Excel files. Use a relative path.</p> <p>If you leave this parameter blank, it is set to <code>&lt;DPAgent_root&gt;/excel</code>.</p> <p>If you set the value to a relative folder name, it becomes a subfolder of <code>&lt;DPAgent_root&gt;/excel</code>.</p> <p>For example, if you set the <i>Folder</i> parameter to <code>download/test</code>, the Microsoft Excel file's folder is <code>&lt;DPAgent_root&gt;/excel/download/test</code>.</p> <p>If you are using a shared network directory, enter the path as follows:</p> <pre>\\&lt;host_name&gt;\&lt;directory&gt;</pre> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>Password-protected Microsoft Excel files are not supported.</p> </div> |
| HANA        | HANA Server       | The SAP HANA server name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|             | HANA Port         | The port used to connect to the SAP HANA server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|             | HANA Schema       | The SAP HANA schema                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| SharePoint  | Server URL        | <p>Enter the URL for the server where the SharePoint source is located.</p> <p>If you create a SharePoint site on the server, be sure to include the name of the site at the end of the URL. For example, if your server name is <code>http://&lt;server_name&gt;/</code> and your new site name is <code>site1</code>, your URL would be <code>http://&lt;server_name&gt;/site1</code>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                      |
|             | Local Folder Path | The path to the folder that you want to access on the local file system where the Data Provisioning Agent is deployed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



| Category | Parameter                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Table    | First Row as Header         | <p>Determines whether the first row of the sheet is considered the header. If set to <i>True</i>, each column's content is used as the column name of the virtual table in SAP HANA.</p> <p>Values:</p> <ul style="list-style-type: none"> <li><i>True</i> (Default): The columns in the first row are used as the column names of the virtual table in SAP HANA.</li> <li><i>False</i>: The column names of the virtual table in SAP HANA are defined as COL1, COL2, COL3, and so on.</li> </ul> |
|          | Start Row of Data           | <p>Determines which row of the sheet is the first data row the Microsoft Excel adapter loads into the virtual table.</p> <p>The value must be no greater than the maximum row number of the sheet.</p> <p>If <i>First Row as Header</i> is set to <i>True</i>, its default value is 2.</p> <p>If <i>First Row as Header</i> is set to <i>False</i>, its default value is 1.</p>                                                                                                                   |
|          | End Row of Data             | <p>Determines which row of the sheet is the last data row the adapter loads into the virtual table.</p> <p>The value must be no greater than the maximum row number of the sheet.</p> <p>By default, all rows of the sheet are loaded.</p>                                                                                                                                                                                                                                                        |
|          | Show Hidden Column and Rows | <p>Determines whether to process the columns that are hidden from the sheet.</p> <p>Values:</p> <ul style="list-style-type: none"> <li><i>True</i>: The hidden columns are processed as normal columns.</li> <li><i>False</i> (Default): The hidden columns are ignored.</li> </ul>                                                                                                                                                                                                               |

| Category                | Parameter                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         | Column Filter                      | <p>The list of columns that are processed. Any column that does not exist in the list is ignored.</p> <p>Enter a list of column names separated by a semicolon.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>If the Column Filter option is empty, all columns are processed. If the Column Filter option is not empty, only the listed columns are processed.</p> <p>For example, if you set the option to COL1;COL2;COL3, all columns other than COL1, COL2, and COL3 are ignored.</p> </div> <p>Default: All columns are processed.</p> |
| SharePoint on Office365 | Authentication Mode                | <p>Choose the type of credentials needed to access SharePoint on Office365</p> <ul style="list-style-type: none"> <li>Client Credential (default)</li> <li>Username Password:</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                         | Site URL                           | Enter the site URL, in the form of <code>https://&lt;company&gt;.sharepoint.com/sites/&lt;siteName&gt;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                         | Application ID                     | Enter the application ID, as defined in the Microsoft Azure Portal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                         | Tenant ID                          | Enter the tenant ID, as defined in the Microsoft Azure Portal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                         | Local Folder Path                  | The path to the folder that you want to access on the local file system where the Data Provisioning Agent is deployed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Credentials             | Credentials mode                   | <p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><b>Technical User:</b> A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><b>Secondary User:</b> A unique access credential on the remote source assigned to a specific user.</li> </ul>                                                                                                                                                                                       |
| User Token              | User Token for Excel Folder Access | The same password as the adapter <a href="#">Access Token</a> preference. If this parameter is left blank or is different from the <a href="#">Access Token</a> , the remote source is not allowed to read the Microsoft Excel files. <a href="#">Microsoft Excel Adapter Preferences [page 359]</a>                                                                                                                                                                                                                                                                                                                      |
| HANA Credential         |                                    | The SAP HANA user name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Category                                  | Parameter                           | Description                                                        |
|-------------------------------------------|-------------------------------------|--------------------------------------------------------------------|
|                                           | HANA Password                       | The SAP HANA password.                                             |
| SharePoint Credential                     | SharePoint logon (Domain\User-Name) | The domain and user name for the SharePoint account.               |
|                                           | SharePoint Password                 | The password for the SharePoint account.                           |
| SharePoint on Office365 Credential        | Client Credential                   | Enter the client secret you created on the Microsoft Azure Portal. |
| SharePoint on Office365 Username Password | Username                            | Enter the username for the Microsoft account                       |
|                                           | Password                            | Enter the password for the Microsoft account.                      |

The following code samples illustrate how to create a remote source using the SQL console.

## Local file system

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyExcelSource" ADAPTER "ExcelAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyEntry name="FileSourceType">File System</PropertyEntry>
<PropertyGroup name="File System" displayName="File System">
  <PropertyEntry name="folder" displayName="Folder">myfolder</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="Table" displayName="Table">
  <PropertyEntry name="firstRowAsHeader" displayName="First Row as
Header">true</PropertyEntry>
  <PropertyEntry name="rowMin" displayName="rowMin">2</PropertyEntry>
  <PropertyEntry name="showHiddenColRow" displayName="Show Hidden Column
and Rows">false</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="usertoken">
<password>mytoken</password>
</CredentialEntry' ;
```

## SharePoint location

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyExcelSource" ADAPTER "ExcelAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyEntry name="FileSourceType" type="STRING">SharePoint</PropertyEntry>
  <PropertyGroup name="SharePoint">
    <PropertyEntry isRequired="false" name="ServerUrl" type="STRING">http://
myhost.sap.corp/mysharepointsite</PropertyEntry>
    <PropertyEntry isRequired="false" name="LocalFolder"
type="STRING">mySubFolder</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="Table" displayName="Table">
    <PropertyEntry name="firstRowAsHeader" displayName="First Row as
Header">true</PropertyEntry>
    <PropertyEntry name="rowMin" displayName="rowMin">2</PropertyEntry>
    <PropertyEntry name="showHiddenColRow" displayName="Show Hidden Column
and Rows">false</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="usertoken">
<password>mytoken</password>
</CredentialEntry>
<CredentialEntry name="sharePointCredential">
<user>mydomain\mysharepointuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

### Example: Microsoft SharePoint on Office365

```
CREATE REMOTE SOURCE "MyExcelSource" ADAPTER "ExcelAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyEntry isRequired="false" name="FileSourceType"
type="STRING">SharePointOnOffice365</PropertyEntry>
  <PropertyGroup name="SharePointOnOffice365">
    <PropertyEntry name="AuthenticationMode">ClientCredential</PropertyEntry>
    <PropertyEntry name="SiteUrl">https://mycompany.sharepoint.com/sites/
mysharepointsite</PropertyEntry>
    <PropertyEntry name="ApplicationId">myApplicationID</PropertyEntry>
    <PropertyEntry name="TenantId">myTenantId</PropertyEntry>
    <PropertyEntry name="LocalFolder">mySubFolder</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="Table" displayName="Table">
    <PropertyEntry name="firstRowAsHeader" displayName="First Row as
Header">true</PropertyEntry>
    <PropertyEntry name="rowMin" displayName="rowMin">2</PropertyEntry>
    <PropertyEntry name="rowMax" displayName="rowMax"></PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="usertoken">
<password>mytoken</password>
</CredentialEntry>
<CredentialEntry name="sharePointCredential">
<user>mydomain\mysharepointuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

```

    <PropertyEntry name="showHiddenColRow">false</PropertyEntry>
    <PropertyEntry name="columnVisibility"></PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
    ' WITH CREDENTIAL TYPE 'PASSWORD' USING
    '<CredentialEntry name="usertoken"><password>mytoken</password>
</CredentialEntry>
<CredentialEntry name="sharePoint365Credential">
<password>myClientSecret</password>
</CredentialEntry>' ;

```

## Related Information

[Accessing Microsoft Excel Data Files in a Shared Network Directory \[page 366\]](#)

## 6.2.15.4 Access SharePoint Using HTTPS/SSL

Information about how to access SharePoint using HTTPS/SSL.

### Context

You can access the SharePoint server using HTTPS or SSL. You first must download the SharePoint certificate (CER) and configure your system.

### Procedure

1. Navigate to `<DPAgent_root>/ssl` folder.
2. Run the command to change the default keystore password `changeit`.

```

c:\<user>\dpagent\ssl>keytool -storepasswd -keystore cacerts
Enter keystore password:changeit
New keystore password:
Re-enter new keystore password:

```

#### Note

Keytool is in the `jre/bin` folder. Add it to the `$PATH` environment. For example, `C:\Program Files\Java\jre7\bin\keytool.exe`

3. Import the certificate that you exported.

```

c:\<user>\dpagent\ssl>keytool.exe -importcert -keystore
c:\user\dpagent\ssl\cacerts
-storepass <New Key Store Password> -file
C:\<user>\dpagent\ssl\SharePointSSL.cer

```

```

Owner: CN=RQA16CWIN2.sjc.sap.corp
Issuer: CN=RQA16CWIN2.sjc.sap.corp
Serial number: 34973632d6cb31934fdfbe04352cc5dc
Valid from: Thu Jan 05 01:29:45 PST 2017 until: Thu Jan 04 16:00:00 PST 2018
Certificate fingerprints:
    MD5: 0C:7E:CA:38:1B:1E:2A:2A:47:21:78:86:50:1C:85:CE
    SHA1: 25:CE:CF:F8:9A:2C:70:0A:66:CD:39:D5:C5:EC:10:4D:57:42:28:0B
    SHA256:
40:80:A0:E1:56:1A:9A:F4:9F:63:20:37:F3:41:B0:27:B6:1F:9C:33:3C:
0A:E8:79:0B:91:7E:E6:6B:E8:08:3A
    Signature algorithm name: SHA1withRSA
    Version: 3
Extensions:
#1: ObjectId: 2.5.29.37 Criticality=false
ExtendedKeyUsages [
    serverAuth
]
#2: ObjectId: 2.5.29.15 Criticality=false
KeyUsage [
    Key_Encipherment
    Data_Encipherment
]
Trust this certificate? [no]: yes
Certificate was added to keystore

```

4. Use the agent configuration tool to enter the agent keystore file path and password that you used in the previous step.
5. If you are not using the TCP SSL connection between SAP HANA and the DP Agent, clear the *Use SSL to communicate with HANA on Cloud* and *Enable SSL for Agent to HANA communication on TCP* parameters.
6. Open `<DPAgent_root>/dpagent.ini`, and add the following configuration:

```
-Djavax.net.ssl.trustStore=<keystore file path>
```

For example: `-Djavax.net.ssl.trustStore=C:\<user>\dpagent\ssl\cacerts`

7. Restart the Data Provisioning Agent.

## Related Information

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

[Manage the Agent Service \[page 63\]](#)

### 6.2.15.5 Accessing Microsoft Excel Data Files in a Shared Network Directory

Information about how to use a shared network directory for data files with the Microsoft Excel adapter.

You can access Microsoft Excel data files in a shared directory, however you must follow a few rules:

## Windows

When using Windows, make sure that you first manually access the network folder using a user name and password before trying to connect via creating a remote source.

## Linux

To access a Linux network folder, mount the folder under the Data Provisioning Agent root installation directory.

## Excel Adapter Remote Source Parameters

Observe the instructions for the *Folder* parameter when creating your Microsoft Excel remote source.

## Related Information

[Microsoft Excel Remote Source Configuration \[page 359\]](#)

### 6.2.15.6 Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365

You must register an application on Microsoft Azure Portal as a precondition for using the Microsoft Graph API, which is what allows you to access SharePoint on Office365 using the File or Microsoft Excel adapters.

## Procedure

1. Go to <https://portal.azure.com> and sign in with your Microsoft account.
2. Navigate to *Azure Active Directory*, and click *App registrations*.
3. Click *New registration*.
4. Choose a name for your Data Provisioning Agent--for example, *sdi-dpagent*--to use as the name for your application.
5. Choose the proper *Supported account types*: either *Account in this organizational directory only* or *Accounts in any organizational directory*.

6. Leave *Redirect URL* empty, and click *Register*.

## Next Steps

After registration, note the application (client) ID and Directory (tenant) ID, which you use during remote source configuration.

## Related Information

[File Adapter Remote Source Configuration \[page 236\]](#)

[Configure Your Microsoft Azure Application \[page 274\]](#)

## 6.2.15.7 Configure Your Microsoft Azure Application

Configure your Azure application to set up your credentials and Microsoft Graph API.

### Context

Further configuration of your Azure application is necessary to create credentials for when you create a remote source. You must also grant permissions for using the Microsoft Graph API.

### Procedure

1. Click *Authentication* to configure the client type.  
If you want to authenticate using the username and password mode, set the *Default client type* to *Yes*.  
If you want to authenticate the Client Credential mode, set the *Default client type* to *No*.
  - a. If you chose to authenticate using Client Credential mode, create a credential by clicking *Certificates & secrets*. If you chose to authenticate using the username and password mode, skip to step 2.
  - b. Click *New client secret*, give it a name and an expiration time, and click *Add*.
  - c. Note the secret password for use during remote source creation.
2. Add permissions by clicking *API permissions* on the application page, and then clicking *Add a permission*.
3. Click *Microsoft Graph*.
4. If you use the Client Credential mode, click *Application Permission*. If you use the Username and password mode, click *Delegated permission*.
5. Add the following permissions:



- Directory.Read.All
  - Files.Read.All
  - Group.Read.All
  - Sites.Read.All
  - User.Read.All
6. Grant consent for these permissions.

If you have an administrator role, click [Grant consent](#).

If you do not have an administrator role, ask your administrator to grant permission for you.

#### Note

If permissions are not granted, you will not be able to access SharePoint Office365.

Every time a permission is changed, you should redo the grant operations.

## Next Steps

You can now create your remote source, using the information created while setting up your Microsoft Azure Portal application.

## Related Information

[File Adapter Remote Source Configuration \[page 236\]](#)

[Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365 \[page 273\]](#)

## 6.2.16 Microsoft Outlook

Access Microsoft Outlook data by using the Outlook adapter.

You can access Microsoft Outlook data stored in a PST file using the Outlook adapter.

This adapter supports the following functionality:

- Virtual table as a source

### 6.2.16.1 Microsoft Outlook Adapter Preferences

Configuration parameters for the Microsoft Outlook adapter.

You can adjust Microsoft Outlook adapter settings in the Data Provisioning Agent configuration tool.

| Parameter    | Description                                                                                                                        |
|--------------|------------------------------------------------------------------------------------------------------------------------------------|
| Access Token | A password to access Microsoft Outlook PST files. This exact value must be used when setting up a Microsoft Outlook remote source. |

## Related Information

[Configure Adapter Preferences \[page 587\]](#)

### 6.2.16.2 Microsoft Outlook Remote Source Configuration

Configuration settings for accessing a Microsoft Outlook source. Also included is sample code for creating a remote source using the SQL console.

Configure the following options in smart data access to configure your connection to a Microsoft Outlook PST file.

| Option                | Description                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PST File Location     | Specifies the path and file name to the PST file from which the adapter will read. The user of the Data Provisioning Agent must have permission to access this PST file.                                                                                                                                                                                                                                                     |
| Ignore Extra Folder   | Select <i>True</i> to not show any irrelevant folders when browsing metadata.                                                                                                                                                                                                                                                                                                                                                |
| Credentials Mode      | Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials. <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul> |
| PST File Access Token | Specifies the access token. This value must be the same as the Access Token value in the Outlook adapter preferences set in the Data Provisioning agent configuration tool.                                                                                                                                                                                                                                                  |

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyOutlookSource" ADAPTER "OutlookAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?'>
```

```

<ConnectionProperties name="configurations" displayName="Configurations">
<PropertyGroup name="PSTFileInformation" displayName="PST File Information">
<PropertyEntry name="PSTLocation" displayName="PST File Location"
>mymail.pst</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
' <CredentialEntry name="PstAccessToken">
<password>mytoken</password>
</CredentialEntry>' ;

```

## 6.2.17 Microsoft SQL Server Log Reader

Use the Microsoft SQL Server Log Reader adapter to connect to a remote Microsoft SQL Server instance.

### Note

If your data source is an SAP ERP Central Component (ECC) system, use the [SAP ECC adapter \[page 510\]](#) for this database instead of the log reader adapter. The SAP ECC adapters provide extra ECC-specific functionality such as ECC metadata browsing and support for cluster and pooled tables in SAP ECC.

### Note

Before you register the adapter with the SAP HANA system, ensure that you've downloaded and installed the correct JDBC libraries. Place the files in the `<DPAgent_root>/lib` folder.

For more information about the supported JDBC libraries, see the *Product Availability Matrix (PAM)*.

### Note

The user configured during the installation of the Data Provisioning Agent must have read access to the transaction log, which is the `.ldf` file.

### Note

If you're using Microsoft SQL Server on Amazon RDS or Microsoft Azure, observe the following limitations:

- To avoid remote access issues in Amazon RDS, ensure the database instance setting *Publicly Accessible* has been enabled.
- Real-time replication is not supported.

## Adapter Functionality

This adapter supports the following functionality:

| Feature                   | SQL Server (on premise) |
|---------------------------|-------------------------|
| Virtual table as a source | Yes                     |

| Feature                                                             | SQL Server (on premise)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Real-time change data capture (CDC)                                 | <p>Yes. Both log reader and trigger-based real-time replication are supported.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>The TRUNCATE TABLE operation is supported only in log reader mode.</li> <li>The Microsoft SQL Server Log Reader adapter doesn't support WRITETEXT and UPDATETEXT.</li> <li>For CDC replication, data imported into Microsoft SQL Server using the bcp tool isn't supported because the tool bypasses writing to the Microsoft SQL Server transaction logs.</li> <li>View replication isn't supported.</li> </ul> </div>                                                                                                                                                                                 |
| Virtual table as a target using a Data Sink node in a flow-graph    | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Connect multiple remote sources in HANA to the same source database | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Loading options for target tables                                   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| DDL propagation                                                     | <p>Yes</p> <p>The supported schema changes are:</p> <ul style="list-style-type: none"> <li>ADD COLUMN</li> <li>DROP COLUMN</li> <li>RENAME TABLE</li> <li>RENAME COLUMN</li> <li>ALTER COLUMN DATATYPE</li> </ul> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>For trigger-based CDC, the supported schema changes are:</p> <ul style="list-style-type: none"> <li>ADD COLUMN</li> <li>DROP COLUMN</li> <li>ALTER COLUMN DATA TYPE</li> </ul> </div> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Restriction</b></p> <p>Source transactions that contain both DDL (such as ALTER TABLE) and DML (INSERT, UPDATE, DELETE, UPSERT, etc.) within the same transaction are not supported.</p> </div> |
| Replication monitoring and statistics                               | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Search for tables                                                   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Feature            | SQL Server (on premise) |
|--------------------|-------------------------|
| Virtual procedures | Yes                     |

In addition, this adapter supports the following capabilities:

- Global: SELECT, INSERT, UPDATE, DELETE
- Select: WHERE, JOIN, GROUP BY, DISTINCT, TOP or LIMIT, ORDER BY

## Related Information

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

[Amazon Virtual Private Cloud \(VPCs\) and Amazon RDS](#)

## 6.2.17.1 Microsoft SQL Server Real-time Replication

Information about setting up your source system and adapter for real-time replication.

### Note

For Microsoft SQL Server on Amazon RDS or Microsoft Azure, real-time replication is supported only when you use trigger-based mode. Log-based real-time replication is not supported for these scenarios.

### 6.2.17.1.1 Remote Database Setup for Microsoft SQL Server Real-time Replication

The remote database must be set up properly for Log Reader adapters to function correctly when using real-time replication.

This setup process is necessary only when using real-time replication.

## Real-time Replication Limitations

The following limitations exist when performing real-time replication:

- View replication is not supported.
- Unsupported table types:
  - Table with all LOB columns
  - Table with non-persisted computed columns as part of primary keys.

### Note

If the non-persisted computed columns are not part of primary keys, values for these columns will be propagated to the target table during initial load. However, because changes in values for these columns are not recorded in transaction logs, the changed values for these columns cannot be replicated during realtime (CDC), and they will be set to NULL for the changed rows.

- Table with LOB column and no primary key or unique index
- Table with duplicated rows and no primary key
- Table with user-defined identifier
- Nested table
- Table with REF constraint
- Table with a clustered column store index
- WRITETEXT and UPDATETEXT
- Update LOB data types using a LIKE statement
- Big size TEXT data using BCP

### Note

The Microsoft SQL Server Log Reader relies on database logs to perform data movement. Logs must be available until the data is successfully read and replicated to the target SAP HANA database. To ensure that the data is replicated to SAP HANA, configure Microsoft SQL Server in Full Recovery Mode.

### Restriction

Microsoft SQL Server with Transparent Data Encryption (TDE) is not supported.

Real-time replication for Microsoft SQL Server relies on the ability of the adapter to read transactions from physical log files. Because these files are encrypted by Microsoft SQL Server, the adapter cannot read the transactions; therefore, real-time capability is not available.

## 6.2.17.1.1.1 Create Users and Grant Privileges

Follow these steps to create users and grant privileges.

### Procedure

1. Create a Microsoft SQL Server user, for example DP\_USER, for the remote source.
2. Grant the required privileges as follows:

```
use master
go
create login DP_USER with password = 'MyPW'
go
use <primary database>
go
create user DP_USER for login DP_USER
```

```
go
EXEC sp_addsrvrolemember 'DP_USER', 'sysadmin'
go
```

## 6.2.17.1.1.2 Enable Remote Dedicated Administrator Connection (DAC)

Enable Dedicated Administrator Connection (DAC) to allow remote connections when using the Microsoft SQL Server Log Reader adapter in log-based mode.

### Context

#### ⓘ Note

This procedure is required only when using the Microsoft SQL Server Log Reader adapter in log-based mode.

### Procedure

1. Log on to Microsoft SQL Server using the newly created user, and change the Microsoft SQL Server `remote admin connections` configuration option to enable DAC to allow remote connections:

```
sp_configure 'remote admin connections', 1
go
```

2. Update the remote administrator connection setting:

```
reconfigure
go
```

3. Verify the `remote admin connections` string:

```
sp_configure 'remote admin connections'
go
```

### 6.2.17.1.1.2.1 Make Log Files Readable

Install and set up the sybfilter driver so that the Log Reader can read the primary transaction log files.

#### ⓘ Note

This procedure is required only when using the Microsoft SQL Server Log Reader adapter in log-based mode.

## Prerequisites

On Windows Server 2008 R2, Windows Security Update KB3033929 must already be installed on the host system.

## Procedure

1. In Windows Explorer, navigate to the sybfilter driver installation directory. This directory is located at `<DPAgent_root>\LogReader\sybfilter\system\<platform>`, where `<DPAgent_root>` is the root directory or Data Provisioning Agent installation and `<platform>` is either **winx86** or **winx64**.
  - Use **winx86** for 32-bit Windows versions
  - Use **winx64** for 64-bit Windows versions
2. Right-click `sybfilter.inf`, and click *Install* to install the sybfilter driver.
3. Under any directory, create a configuration file to save all log file paths for primary databases. The configuration file must have a `.cfg` suffix. For example, under `<DPAgent_root>\LogReader\sybfilter\system\<platform>`, create a file named `LogPath.cfg`.
4. Add a system environment variable named `<RACFGFilePath>`, then set its value to the path and file name of the configuration file.
5. In Windows Explorer, navigate to `<DPAgent_root>\LogReader\sybfilter\bin\`, right-click the `sybfiltermgr.exe` file, then select *Run as administrator* to access the sybfilter driver management console.
6. To start the sybfilter driver, enter **start** at the management console.
7. Add the log file path to the sybfilter driver with the user manager or by modifying the configuration file directly:
  - For user manager, use the `add` command in the management console. The syntax for this command is `add serverName dbName logFilePath`.  
For example, to add the log file named `pdb1_log.ldf` for the database `pdb1` on the data server `PVGD50857069A\MSSQLSERVER`:

```
add PVGD50857069A\MSSQLSERVER pdb1
C:\Mssql2012\MSSQL11.MSSQLSERVER\MSSQL\DATA\pdb1_log.ldf
```
  - Add the following into the `LogPath.cfg` file directly:

```
[PVGD50857069A\MSSQLSERVER, pdb1]
log_file_path=C:\Mssql2012\MSSQL11.MSSQLSERVER\MSSQL\DATA\pdb1_log.ldf
```
8. Refresh the configuration with the newly-added path.  
In the sybfilter management console, enter **refresh** and press `Enter`.
9. If Microsoft SQL Server was running while the log paths were added, restart it to make the log files readable.
10. Verify whether the log files are readable.  
In the sybfilter management console, enter **check** and press `Enter`.



## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

### 6.2.17.1.1.3 Enable TCP/IP

Follow these steps to enable TCP/IP for the Microsoft SQL Server adapter.

#### Procedure

1. Go to *SQL Server Configuration Tool*, and choose **SQL Server Configuration Manager** > *SQL Server Network Configuration* > *Protocols for <SQLInstanceName>*, where *<SQLInstanceName>* is your Microsoft SQL Server instance.
2. Right-click *TCP/IP*, and choose *Enable*.

### 6.2.17.1.1.4 Configure the Primary Data Server for the First Time

Configure the primary data server.

#### Note

This procedure is required only when using the Microsoft SQL Server Log Reader adapter in log-based mode.

#### Context

Before you can begin using the SQL Server Log Reader adapter, you must configure the primary data server.

#### Note

If the *Database Data Capture Mode* parameter is set to *MSSQL CDC Mode* when you create a remote source, this step is not necessary.

#### Note

If you are using Microsoft SQL Server installed on Windows 2012 and later, you must restart Microsoft SQL Server in single-user mode from the command line opened with the *Run as Administrator* parameter enabled.

## Procedure

1. Stop the Microsoft SQL Server service.
  - a. In **Control Panel > Administrative Tools > Services**, find the service named *MicrosoftSQLServer (<SERVER>)*, where *<SERVER>* is the name of your Microsoft SQL Server data server. For example, *Microsoft SQL Server (TEAMSTER)*.
  - b. Right-click your Microsoft SQL Server instance and choose *Properties*.
  - c. In the *General* tab, click *Stop*.

### → Tip

You can also stop Microsoft SQL Server in single-user mode from the command line using Administrator privileges.

For example, if you started the instance using a command prompt, enter **Ctrl+C** in the window and enter **y** to stop it.

2. Restart Microsoft SQL Server in single-user mode.
  - a. Click **Start > Control Panel > Administrative Tools > Services**.
  - b. Right-click your Microsoft SQL Server instance, and choose *Properties*.
  - c. In the *General* tab, click *Stop*.
  - d. Under *Start parameters*, enter **-m**.
  - e. Switch to the *Log On* tab, make note of the account, then change to a user who has Administrator privileges.
  - f. Click *Start*.

### → Tip

Restart Microsoft SQL Server in single-user mode from the command line using Administrator privileges.

```
For example, Run > C:\Program Files\Microsoft SQL Server\MSSQL12.MSSQLSERVER\MSSQL\Binn> .\sqlservr.exe -sMSSQLSERVER -m
```

3. Connect to Microsoft SQL Server using dedicated administrator connection (DAC).
  - a. In Microsoft SQL Server Management Studio, with no other DACs open, click *Database Engine Query* on the toolbar.
  - b. In the *Connect to Database Engine* dialog box, in the *Server* name box, type **ADMIN:**, followed by the name of the server instance. For example, to connect to a server instance named ACCT\PAYABLE, type **ADMIN:ACCT\PAYABLE**.
  - c. Complete the *Authentication* section, providing credentials for a member of the sysadmin group, and then click *Connect*.

The connection is made. If the DAC is already in use, the connection fails with an error indicating it cannot connect.

4. To initialize the server, execute script  
`<DPAgent_root>\LogReader\scripts\mssql_server_init.sql`. Script  
`<DPAgent_root>\LogReader\scripts\mssql_server_deinit.sql` can be used to de-initialize the server if necessary.

5. Open the Microsoft SQL Server service properties window: by clicking ► *Start* ► *Control Panel* ► *Administrative Tools* ► *Services* ], then right-click your Microsoft SQL Server instance, and choose *Properties*. Then, recover the user account to the previous value in the *Log On* tab.
6. Stop and restart the Microsoft SQL Server service back to normal mode.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

### 6.2.17.1.1.5 Run a Microsoft SQL Server Log Reader Adapter on Linux

Set up your environment to run your Microsoft SQL Server database on one computer and run the Data Provisioning Agent on a separate Linux computer.

#### Note

This procedure is required only when you use the Microsoft SQL Server Log Reader adapter in log-based mode.

## Context

This example demonstrates how to set up an environment with a SQL Server database named “mypdb” installed on Windows computer A and a Data Provisioning Agent installed on Linux computer B.

## Procedure

1. Install the Data Provisioning Agent on computer B (Linux).
2. Configure Sybfilter on computer A (the Windows computer where the Microsoft SQL Server database is installed).

You can copy Sybfilter from the Data Provisioning Agent installation directory on computer B. For example, `<DPAgent_root>/LogReader/Sybfilter`.

3. Run the following SQL query to get the exact location of the log files:

```
SELECT physical_name FROM sys.database_files WHERE type=1;
```

For example, you might get a return of the following paths:

- `C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb_log.ldf`

- C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb\_log\_2.ldf
  - C:\MSSQL\_LOG\mypdb\mypdb\_log\_3.ldf
4. Share the SQL Server transaction log directory and mount to the Linux computer.

For example, in step 2, the Microsoft SQL log files are stored in two directories:

- C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA
- C:\MSSQL\_LOG\mypdb

Share these two directories on computer A, and then mount them on computer B.

- Create a directory on computer B where you want to mount the MSSQL log file folder. For example, create directories on computer B named /MSSQL\_share\_folder1 and /MSSQL\_share\_folder2.
- Mount each share on computer B with the `mount` command:

```
sudo mount -v -t cifs -o
username=<windows_username>,password=<windows_password>,domain=<windows_dom
ain>,ro,cache=none <windows_share_directory> <linux_mount_directory>
```

For SLES SP 11, add the additional `directio` option:

```
sudo mount -v -t cifs -o
username=<windows_username>,password=<windows_password>,domain=<windows_dom
ain>,ro,cache=none,directio <windows_share_directory>
<linux_mount_directory>
```

For example, if the username and password for computer A are **ABC** and **123456**, the domain is **localhost**, and the log file folder share names are //10.172.162.145/DATA and //10.172.162.145/mypdb, the following commands mount the MSSQL log file folders on computer B:

```
sudo mount -v -t cifs
-o username=ABC,password=123456,domain=localhost,ro,cache=none //
10.172.162.145/DATA /MSSQL_share_folder1
sudo mount -v -t cifs
-o username=ABC,password=123456,domain=localhost,ro,cache=none //
10.172.162.145/mypdb /MSSQL_share_folder2
```

- Configure the `mssql_log_path_mapping.props` file on computer B. Open `<DPAgent_root>/Logreader/config/mssql_log_path_mapping.props` and add the following information, assuming the database name you use is **R01**:

```
[R01]
C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA=/
MSSQL_share_folder1
C:\MSSQL_LOG\mypdb=/MSSQL_share_folder2
```

- In SAP Web IDE, create a Microsoft SQL Server remote source, and open the remote source configuration page. In the remote source configuration page, expand the *Configurations* category and expand the *Database* option.
- Make sure that the *Use Remote Database* option is set to *True*.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

### 6.2.17.1.1.6 Configure a Microsoft SQL Server Log Reader Adapter with Always On Support

More steps are necessary when configuring a Microsoft SQL Server Log Reader Adapter to connect to a Microsoft SQL Server host that uses Always On Availability Groups.

#### Note

These steps are required only when using the Microsoft SQL Server Log Reader adapter in log-based mode.

## Prerequisites

Before you can configure the log reader adapter with Always On support, Microsoft SQL Server must be configured with an Availability Group Listener. For more information, see the Microsoft SQL Server documentation.

## Context

The following is an example that shows you how to set up an environment with a Microsoft SQL Server database named "mypdb". The database is also configured with an Always On Availability Group with a secondary database, in addition to the primary database.

## Procedure

1. Install and configure Sybfilter on each host in the Microsoft SQL Server Always On Availability Group, including the primary and secondary databases.

You can copy Sybfilter from the agent installation directory on the Data Provisioning Agent host. For example, `C:\usr\sap\dataprovagent\LogReader\sybfilter`.

2. Run a SQL query to get the exact location of the log files.

```
SELECT physical_name FROM sys.database_files WHERE type=1;
```

For example, you might get a return of the following path:

```
C:\Program Files\Microsoft SQL  
Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb_log.ldf
```

3. Share the folders that contain "mypdb" database log files on each host computer in the Always On Availability Group.

#### Note

Grant READ permissions for the shared folders to the DPAGENT user on each host in the Always On Availability Group. If you haven't done so already, make sure that your log files are readable by following the instructions in [Make Log Files Readable \[page 375\]](#).

For example, share the folder `C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA`.

4. Edit and include the mapping relationship into the `mssql_log_path_mapping.props` file as shown in the following example. Also, provide the database name as shown in the following example.
  - Because the mapping is based on a parent directory and not on the log file itself, only one entry is sufficient for both `mypdb_log_1.ldf` and `mypdb_log_2.ldf`.
  - Put the original path on the left side of the equal sign and the UNC pathname of each share folder on the right side, separated by semicolons.

For example, suppose that you are connecting to the database "mypdb", with the primary database on computer A and one secondary database on computer B.

```
[myrs:mypdb]
C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA=\
\<host_name_A>\mssql_data;\\<host_name_B>\mssql_data
```

5. When you create the remote source, set the value of the *SQL Server Always On* parameter to *True* and specify the *Availability Group Listener Host* and *Availability Group Listener Port*.

#### Tip

We recommend that you also set *Database Data Capture Mode* to *MS SQL CDC Mode*. If you do not use the Microsoft CDC data capture mode, you need to execute server-level initialization scripts on each host in the Always On Availability Group.

## 6.2.17.1.1.7 Configure a Microsoft SQL Server Log Reader Adapter with Failover Cluster Support

More steps are necessary when configuring a Microsoft SQL Server Log Reader Adapter to connect to a Microsoft SQL Server host that is part of a failover cluster.

#### Note

These steps are required only when using the Microsoft SQL Server Log Reader adapter in log-based mode.

## Context

The following procedure is an example, which shows you how to set up an environment with a Microsoft SQL Server database named "mypdb" that is configured as part of a failover cluster.

## Procedure

1. Install and configure Sybfilter on each host in the failover cluster, including the primary and secondary databases.

You can copy Sybfilter from the agent installation directory on the Data Provisioning Agent host. For example, `C:\usr\sap\dataprovagent\LogReader\sybfilter`.

2. Run a SQL query to get the exact location of the log files.

```
SELECT physical_name FROM sys.database_files WHERE type=1;
```

For example, you might get a return of the following path:

```
C:\Program Files\Microsoft SQL
Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb_log.ldf
```

3. Share the folders that contain mypbd database log files on the active node of the failover cluster.

### Note

Grant READ permissions for the shared folder to the DPAGENT user. If you haven't done so already, make sure that your log files are readable by following the instructions in [Make Log Files Readable \[page 375\]](#).

For example, share the folder `C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA`.

4. Edit and include the mapping relationship into the `mssql_log_path_mapping.props` file as shown in the following example. Also, provide the database name as shown in the following example.

- Because the mapping is based on a parent directory and not on the log file itself, only one entry is sufficient for both `mypdb_log.ldf` and `mypdb_log_2.ldf`.
- Put the original path on the left side of the equal sign and the UNC pathname of the share folder on the right side.

```
[myrs:mypdb]
C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA=\
\<host_name>\mssql_data
```

5. When you create the remote source, set the value of the *Use Remote Database* parameter to *True*.

## Results

By default, during a failover event, the agent tries to reopen an inaccessible log file three times at intervals of 5 seconds. If the agent is unable to open the log file after these attempts, the task fails.

You can modify the number of attempts and the retry interval by changing the `lr_reopen_device_times` and `lr_reopen_device_interval` parameters in `<DPAgent_root>\LogReader\config\mssql.cfg`.

## 6.2.17.1.2 Installing Data Provisioning Agent and Microsoft SQL Server on Different Servers

More steps are necessary when installing the Data Provisioning Agent and Microsoft SQL server on different computers.

### Note

These steps are required only when using the Microsoft SQL Server Log Reader adapter in log-based mode.

## Context

The following example shows you how to set up an environment with a Microsoft SQL Server database named “mypdb” on computer A and a Data Provisioning Agent installed on another computer B.

## Procedure

1. Install and configure Sybfilter on computer A (`<host_name>`).

Sybfilter can be copied from the Data Provisioning Agent installation directory on computer B. For example, `C:\usr\sap\dataprovgent\LogReader\sybfilter`.

2. Run a SQL query to get the exact location of the log files.

```
SELECT physical_name FROM sys.database_files WHERE type=1;
```

For example, you might get a return of the following paths:

- `C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb_log_1.ldf`
- `C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb_log_2.ldf`
- `C:\MSSQL_LOG\mypdb\mypdb_log_3.ldf`

3. Share the folders that contain mypbd database log files on computer A.

### Note

Grant READ permissions for the shared folders to the DPAGENT user on computer B. If you haven't done so already, make sure that your log files are readable by following the instructions in [Make Log Files Readable \[page 375\]](#).

For example, share the folders:



- C:\MSSQL\_LOG\mypdb
  - C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA
4. Edit and include the mapping relationship into the `mssql_log_path_mapping.props` file as shown in the following example. Also, provide the database name, as shown in the following example.
- Because the mapping is based on a parent directory and not on the log file itself, only one entry is sufficient for both `mypdb_log.ldf` and `mypdb_log_2.ldf`
  - Put the original path on the left side of the equal symbol and the UNC path name of the share folder on the right side.
  - C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA=\<host\_name>\mssql\_data
  - C:\MSSQL\_LOG\mypdb=\\<host\_name>\mssql\_log\mypdb
  - You can also include multiple databases in the same file.
5. If you are using remote databases, you should edit the `mssql_log_path_mapping.props` file to differentiate database names and instances.

For example, suppose that you have the following scenario:

- User1 creates remote source RS1 connecting to DB1
- User2 creates remote source RS2 connecting to DB2

In this case, you would add the following to the `mssql_log_path_mapping.props` file:

If DB1 and DB2 have different names:

```
[DB1]
D:\Program Files\Microsoft SQL Server\MSSQL10_50.MSSQLSERVER\MSSQL\DATA=\\
\computer1\mssql_data
[DB2]
D:\Program Files\Microsoft SQL Server\MSSQL10_50.MSSQLSERVER\MSSQL\DATA=\\
\computer2\mssql_data
```

If DB1 and DB2 have the same name, add a remote source name to differentiate:

```
[RS1:DB1]
D:\Program Files\Microsoft SQL Server\MSSQL10_50.MSSQLSERVER\MSSQL\DATA=\\
\computer1\mssql_data
[RS2:DB1]
D:\Program Files\Microsoft SQL Server\MSSQL10_50.MSSQLSERVER\MSSQL\DATA=\\
\computer2\mssql_data
```

6. When you create the remote source, set the value of the *Use Remote Database* parameter to *True*.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Make Log Files Readable \[page 375\]](#)

### 6.2.17.1.3 Connecting Multiple Remote Sources to the Same SQL Server Source Database

You can connect multiple remote sources to the same remote database, providing that you meet the following conditions:

- In log-based mode, each remote source uses a unique schema, specified in the *LogReader Objects Schema in Remote Database* remote source configuration parameter.
- In trigger-based mode, each remote source uses a unique schema, specified in the *System Object Prefix in Remote Database* remote source configuration parameter.
- Each remote source uses a unique name, in case the remote sources are created on different SAP HANA instances.

### 6.2.17.1.4 Remote Database Cleanup for Microsoft SQL Server Real-time Replication

Run SQL scripts to disable replication and clean up objects manually from the Microsoft SQL Server source database.

Cleanup scripts disable replication of a source database and drop database-level objects. Usually, you do not need to execute a cleanup script after an adapter is dropped, because replication is disabled and the adapter automatically drops database-level objects. However, in some cases, if any errors occur during or before automatically disabling replication and dropping these objects, the replication may still be enabled and objects may not be dropped. At that point, you may need to execute the cleanup script to drop the objects.

You can find the Microsoft SQL Server cleanup script files at `<DPAgent_root>\LogReader\scripts`.

The script to be executed depends on which *Database Data Capture Mode* you select in your remote source configuration. If you select *MSSQL CDC Mode*, execute `mssql_logreader_mscdc_cleanup.sql`. If you select *Native Mode*, execute `mssql_logreader_native_cleanup.sql`.

You can find Trigger-based cleanup scripts at `<DPAgent_root>\Trigger`.

## 6.2.17.1.5 Validate the Microsoft SQL Server Log Reader Environment

You can use the Data Provisioning Agent command-line configuration tool to validate the configuration of the Microsoft SQL Server log reader environment, before creating remote sources that use the SQL Server Log Reader adapter.

### Prerequisites

Before validating the log reader environment, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA Smart Data Integration Product Availability Matrix (PAM)*.

Before performing these steps, place your files in `<DPAgent_root>/lib` and manually create the `/lib` folder.

### Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose *Microsoft SQL Server Replication Setup*.
4. Choose *Config Mssql Connection Info* to configure the connection used for other validation tasks.

Specify the information required for the configuration tool to connect to the database:

- The data server, port number, and database name for the Microsoft SQL Server database
- Whether to use SSL
- The username and password to use to connect to the database

The configuration tool connects to the database with the specified parameters when performing other validation tasks.

5. Perform validation tasks for the Microsoft SQL Server log reader environment.
  - To test whether the Microsoft SQL Server environment is ready for replication, choose *Mssql Replication Precheck*.
  - To create a new Microsoft SQL Server user with the permissions required for replication, choose *Create A Mssql User With All Permissions Granted*.

For each task, provide any additional parameters required by the task. For example, to test whether the Microsoft SQL Server environment is ready for replication, you must specify the name of the Microsoft SQL Server user and whether CDC is being used.

## Next Steps

After you have validated the configuration of the Microsoft SQL Server log reader environment, you can create remote sources with the Microsoft SQL Server Log Reader adapter. You can manually create remote sources or generate a creation script with the command-line configuration tool.

## Related Information

[Generate a Log Reader Remote Source Creation Script \[page 388\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

### 6.2.17.1.6 Generate a Log Reader Remote Source Creation Script

Use the Data Provisioning Agent command-line configuration tool to validate parameters and generate a usable script to create a remote source for log reader adapters.

## Prerequisites

Before generating a remote source creation script for your source, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

Before performing these steps, place your files in `<DPAgent_root>/lib`. Note that you must manually create the `/lib` folder.

## Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose the appropriate replication setup option for your remote source type.
4. Choose the appropriate log reader setup option for your remote source type.
5. Provide the configuration details for your remote source as prompted.

Specify the name of the agent to use and the name of the remote source to create, as well as any connection and configuration information specific to your remote source.

For more information each configuration parameter, refer to the remote source configuration section for your source type.

## Results

The configuration tool validates the configuration details for your remote source and generates a script that can be used to create the remote source. You can view the validation results in the Data Provisioning Agent log.

By default, the configuration tool generates the remote source creation script in the user temporary directory. For example, on Windows: `C:\Users\\AppData\Local\Temp\remoteSource-<remote_source_name>.txt`.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

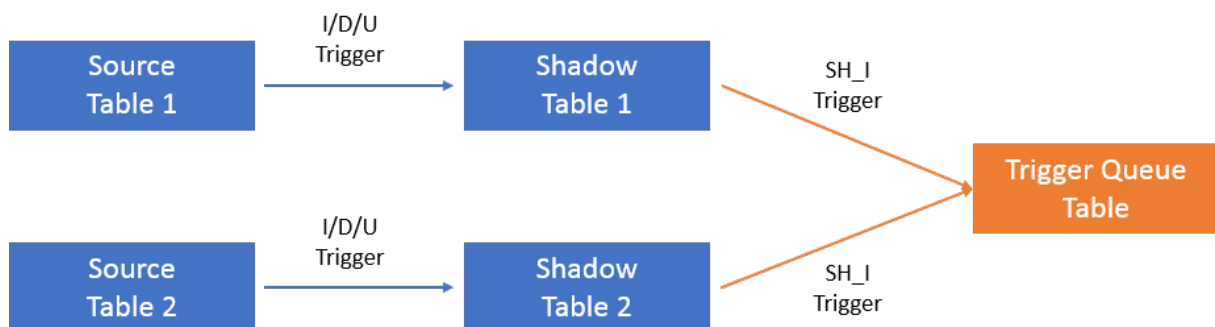
### 6.2.17.1.7 Microsoft SQL Server Trigger-Based Replication

When you use trigger-based replication, the adapter creates triggers to capture changed data and then continuously queries the source database to get the changed data. When you subscribe to a table for replication, the adapter creates three triggers (INSERT, UPDATE, and DELETE) on the table for capturing data.

The supported operations are:

- Add a column
- Delete a column
- Alter a column datatype
- Rename a column

The adapter also creates a shadow table for the subscribed table. Except for a few extra columns for supporting replication, the shadow table has the same columns as its replicated table. Triggers record changed data in shadow tables. For each adapter instance (remote source), the adapter creates a Trigger Queue table to mimic a queue. Each row in shadow tables has a corresponding element (or placeholder) in the queue. The adapter continuously scans the queue elements and corresponding shadow table rows to get changed data and replicate them to the target SAP HANA database.



## 6.2.17.1.7.1 Required Permissions for SQL Server Trigger-Based Replication

Grant permissions and privileges to use MS SQL Server trigger-based replication.

### → Tip

Detailed information about the required permissions can be found in `<DPAgent_root>/Trigger/mssql_trigger_based_init.sql`.

Creating a DML trigger requires ALTER permission on the table or view on which the trigger is being created.

Creating a DDL trigger with database scopes (ON DATABASE) requires ALTER ANY DATABASE DDL TRIGGER permission in the current database.

```
GRANT CREATE PROCEDURE TO [pds_user].
```

```
GRANT SELECT, INSERT, UPDATE, DELETE, ALTER, EXECUTE, VIEW DEFINITION ON SCHEMA::[schema of the target subscribed table] TO [pds_user].
```

GRANT VIEW SERVER STATE permission to view data processing state, such as transaction ID. This permission must be granted on the master database.

### ⓘ Note

“GRANT VIEW SERVER STATE TO SDI\_USER” isn’t permitted for SQL Server on Azure. On SQL Database Premium Tiers, the VIEW DATABASE STATE permission is required in the database. On SQL Database Standard and Basic Tiers, the Server admin or an Azure Active Directory admin account is required.

## Related Information

[sys.dm\\_tran\\_current\\_transaction \(Transact-SQL\)](#) 

## 6.2.17.1.7.2 System Objects Created in Microsoft SQL Server

When you create a remote source to use trigger-based replication, a few system objects—such as tables, triggers, or procedures—are created on the SQL Server source.

### Remote Source Level

All of the system objects are created under `<pds_user>`. The “SDI\_” prefix is an example, and it is set in the remote source configuration parameters.

(table) Trigger queue table: "`<pds_user>`". "SDI\_TRIGGER\_QUEUE"

(table) Marker table: "<pds\_user>".SDI\_MARKERS"

(trigger) Insert trigger on marker table: "<pds\_user>".<pds\_user>\_SDI\_MARKERS\_I\_SDI\_TRIG"

(trigger) Delete trigger on marker table: "<pds\_user>".<pds\_user>\_SDI\_MARKERS\_D\_SDI\_TRIG"

(trigger) Update trigger on marker table: "<pds\_user>".<pds\_user>\_SDI\_MARKERS\_U\_SDI\_TRIG"

(table) Shadow table of Marker table: "<pds\_user>".SDI\_SHADOW\_<pds\_user>\_SDI\_MARKERS"

(trigger) Insert trigger on shadow table of marker table:  
"<pds\_user>".<pds\_user>\_SDI\_MARKERS\_SH\_I\_SDI\_TRIG"

(table) DDL table: "pds\_user".SDI\_DDL\_CHANGE"

(trigger) Insert trigger on DDL table: "<pds\_user>".<pds\_user>\_SDI\_DDL\_CHANGE\_I\_SDI\_TRIG"

(trigger) Delete trigger on DDL table: "<pds\_user>".<pds\_user>\_SDI\_DDL\_CHANGE\_D\_SDI\_TRIG"

(trigger) Update trigger on DDL table: "<pds\_user>".<pds\_user>\_SDI\_DDL\_CHANGE\_U\_SDI\_TRIG"

(table) Shadow table of DDL table: "<pds\_user>".SDI\_SHADOW\_<pds\_user>\_SDI\_DDL\_CHANGE"

(trigger) Insert trigger on shadow table of DDL table:  
"<pds\_user>".<pds\_user>\_SDI\_DDL\_CHANGE\_SH\_I\_SDI\_TRIG"

(procedure) Mark procedure: "<pds\_user>".SDI\_PROC\_V1"

(sequence) Scan sequence: "<pds\_user>".SDI\_SCAN\_SEQ"

(sequence) Trans sequence: "<pds\_user>".SDI\_TRIGGER\_SEQ"

(table) Table to show the table name and its corresponding shadow table: "<pds\_user>".SDI\_SRC\_TO\_ST"

(table) Subscribed table metadata table: "<pds\_user>".SDI\_COLUMNS\_METADATA"

## Source Table Level

(table) Shadow table of source table: "<pds\_user>".SDI\_SHADOW\_<table\_owner>\_<table\_name>"

(trigger) Insert trigger on shadow table of source table:  
"<pds\_user>".<table\_owner>\_<table\_name>\_SH\_I\_SDI\_TRIG"

(trigger) Insert trigger on source table: "<pds\_user>".<table\_owner>\_<table\_name>\_I\_SDI\_TRIG"

(trigger) Delete trigger on source table: "<pds\_user>".<table\_owner>\_<table\_name>\_D\_SDI\_TRIG"

(trigger) Update trigger on source table: "<pds\_user>".<table\_owner>\_<table\_name>\_U\_SDI\_TRIG"

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

## 6.2.17.2 MssqlLogReaderAdapter Preferences

Configuration parameters for the Microsoft SQL Server Log Reader adapter.

### Note

Log Reader adapter preferences are no longer set in the Data Provisioning Agent Configuration Tool with the exception of *Number of wrapped log files*, *Enable verbose trace*, and *Maximum log file size*. They are now in the remote source configuration options in SAP HANA. If you have upgraded from a previous version, the settings you find in the Agent Configuration Tool are the previous settings and are displayed for your reference.

You can adjust Microsoft SQL Server Log Reader adapter preferences in the Data Provisioning Agent configuration tool.

| Parameter                               | Description                                                                                      | Default value |
|-----------------------------------------|--------------------------------------------------------------------------------------------------|---------------|
| Maximum operation queue size            | The maximum number of operations permitted in the log reader operation queue during replication. | 1000          |
| Maximum scan queue size                 | The maximum number of log records permitted in the log reader log scan queue during replication. | 1000          |
| Maximum wait interval between log scans | The maximum wait interval between Log Reader transaction log scans.                              | 2             |

### Note

- The value of the parameter is the maximum number of seconds that can elapse before the Log Reader component scans the transaction log for a transaction to be replicated, after a previous scan yields no such transaction.
- For reduced replication latency in an infrequently updated database, we recommend lower number settings for the parameter.
- If the primary database is continuously updated, the value of the parameter is not significant to performance.



| Parameter                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Default value |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Seconds to add to each log scan wait interval             | <p>The number of seconds to add to each wait interval before scanning the transaction log, after a previous scan yields no transaction to be replicated.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>The value of the parameter is the number of seconds added to each wait interval before the Log Reader component scans the log for a transaction to be replicated, after a previous scan yields no such transaction.</li> <li>The number of seconds specified by the parameter is added to each wait interval, until the wait interval reaches the value specified by the <i>Maximum wait interval between log scans</i> parameter.</li> <li>For optimal performance, the value of the parameter should be balanced with the average number of operations in the primary database over a period of time. In general, better performance results from reading more operations from the transaction log during each Log Reader scan.</li> <li>With a primary database that is less frequently updated, increasing the value of the parameter may improve overall performance.</li> <li>If the database is continuously updated, the value of the parameter may not be significant to performance.</li> </ul> </div> | 0             |
| Replicate LOB columns                                     | Determines whether the agent applies each LOB change.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | True          |
| Database connection pool size                             | Maximum number of connections allowed in the connection pool on a secondary node.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 15            |
| Number of times to retry to connect if a connection fails | Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5             |

| Parameter                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Default value |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Timeout in seconds to retry connecting               | The number of seconds the agent waits between retry attempts to connect to the primary database.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10            |
| Number of wrapped log files                          | The maximum size in 1-K blocks of the agent system log file before wrapping.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3             |
| Enable verbose trace                                 | Enables or disables extra diagnostic information in the agent system log files.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | False         |
| Maximum log file size                                | Limits the size of the message log to conserve disk space.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1000          |
| Turn on asynchronous logging mode                    | Specifies whether or not Log Reader should turn on asynchronized logging mode. (True, False)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | True          |
| Maximum size of work queue for asynchronous logging  | The maximum size of the work queue for the asynchronous logging file handler to collect the log records. The range is 1 to 2147483647.                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1000          |
| Discard policy for asynchronous logging file handler | <p>Specifies the discard policy for the asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>• BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>• DISCARD: The log records that cannot be offered into the queue are dropped.</li> </ul> <p>DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried, which can fail again, causing this process to be repeated.</p> | BLOCKING      |

## Related Information

[Configure Adapter Preferences \[page 587\]](#)

## 6.2.17.3 Microsoft SQL Server Log Reader Remote Source Configuration

Configure the following options for a connection to a Microsoft SQL Server remote source. Also included is sample code for creating a remote source using the SQL console.

### Note

When you set up a remote source and use a remote source name longer than 30 characters, the generated log reader folder name, under `<DPAgent_root>/LogReader/`, is converted to `AGENT<xxxx>`, where `<xxxx>` is an integer representing the hash code of the remote source name string.

The log file is located at `<DPAgent_root>/log/framework.trc` and reads: The instance name `<original_name>` exceeds 30 characters and it is converted to `<converted_name>`.

| Category             | Option                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Type Conversion | Always Map Character Types to Unicode      | <p>Determines whether a CHAR/VARCHAR/TEXT column in the source database is mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII. The default value is <i>False</i>.</p> <p>Set this parameter to <i>True</i> only when the remote database is non-ASCII, such as UTF-8, GBK, and JA16SJIS.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|                      | Map SQL Server Data Type Time to Timestamp | <p>The value is <i>False</i> by default, which means TIME is mapped to TIME. However, setting this parameter to <i>False</i> can lead to the loss of precision. When setting its value to <i>True</i>, TIME maps to TIMESTAMP.</p>                                                                                                                                                                                                                                                                                                                               |
|                      | Allow Map Character Types to LOB           | <p>The value is <i>True</i> by default, which means that VARCHAR columns with length greater than 5000 are mapped to CLOB/NCLOB in SAP HANA. However, CLOB and NCLOB columns can't be used in calculation views.</p> <p>When set to <i>False</i>, VARCHAR and CHAR columns with length greater than 5000 are mapped to VARCHAR(5000)/NVARCHAR(5000) based on <i>Always Map Character Types to Unicode</i>.</p>                                                                                                                                                   |

| Category | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Generic  | Load and Replicate LOB columns           | <p>When this parameter is set to <i>False</i>, the LOB columns are filtered out when doing an initial load and real-time replication.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>⚠ Restriction</b></p> <p>This option isn't available for an ECC adapter.</p> </div> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>📄 Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
| Database | Data Server<br>(serverName\instanceName) | <p>The Microsoft SQL Data Server name.</p> <p>If your Microsoft SQL Server instance is enabled with dynamic ports, you must provide the Instance Name of the Microsoft SQL Server instance instead of the port number. Provide the data server name and the instance name in the format</p> <p><code>&lt;serverName&gt;\&lt;instanceName&gt;</code>.</p> <p>If the instance name isn't provided, the default instance name (MSSQLSERVER) is used.</p>                                              |
|          | Port Number                              | <p>The Microsoft SQL Data Server port number. The value range is 1–65535.</p> <p>If you're using the instance name in the <i>Data Server</i> parameter, you don't need to provide the port number.</p>                                                                                                                                                                                                                                                                                             |
|          | Database Name                            | The Microsoft SQL Server database name.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|          | Use Remote Database                      | <p>Set to <i>True</i> if you're running the Data Provisioning Agent on a different computer than your source Microsoft SQL Server database.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                          |
|          | Additional JDBC Connection Properties    | Enter additional connection properties to pass to the Microsoft SQL Server JDBC driver when establishing a connection to the remote Microsoft                                                                                                                                                                                                                                                                                                                                                      |

| Category                  | Option                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           |                                    | SQL Server database. Separate multiple properties with semicolons (;).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                           | Include Table/Columns Remarks      | <p>Specifies whether to return descriptions of Microsoft SQL Server objects that you've defined with SQL Server Extended Properties.</p> <p>To create a description of an object, you must add a property called "MS_Description", and then add a description of the object as the value.</p> <ul style="list-style-type: none"> <li><b>True:</b> Descriptions of tables and views are returned when GET_REMOTE_SOURCE_OBJECT_S_LIST is called. Descriptions of tables, views, and columns are returned when GET_REMOTE_SOURCE_TABLE_DEFINITIONS is called. If you have many tables, returning the descriptions can impede performance.</li> <li><b>False:</b> No object descriptions are returned.</li> </ul> <p>The default value is <i>False</i>.</p> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|                           | Allowlist Table in Remote Database | Enter the name of table that contains the allowlist in the remote database.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                           | SQL Server Always On               | Specifies whether Microsoft SQL Server is configured for Always On availability group support.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                           | Availability Group Listener Host   | The host name of the listener for the Always On availability group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                           | Availability Group Listener Port   | The port used by the listener for the Always On availability group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Schema Alias Replacements | Schema Alias                       | Schema name to be replaced with the schema given in <i>Schema Alias Replacement</i> . If given, accessing tables under this alias is considered to be accessing tables under the schema given in <i>Schema Alias Replacement</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Category | Option                   | Description                                                                                                                                                                                                                           |
|----------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                          | <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                             |
|          | Schema Alias Replacement | <p>Schema name to use to replace the schema given in <i>Schema Alias</i>.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                               |
| Security | Use SSL                  | <p>Specify whether to use SSL.</p> <p>The default value is <i>False</i>.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                |
|          | Validate Certificate     | <p>Specify whether to validate the host name in the SSL certificate.</p> <p>The default value is <i>False</i>.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>          |
|          | Host Name in Certificate | <p>Enter the host name that is in the SSL certificate.</p> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                  |
|          | Authentication type      | <p>Specifies the authentication scheme to use for connecting to a source database:</p> <ul style="list-style-type: none"> <li><i>SQL Server Authentication</i><br/>Authenticate using a Microsoft SQL Server user account.</li> </ul> |

| Category | Option                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                             | <p>Specify the account credentials in the <i>User Name</i> and <i>Password</i> parameters.</p> <ul style="list-style-type: none"> <li> <p><i>Windows Authentication</i><br/>Authenticate using Windows credentials on the local machine. If <i>Capture Mode</i> is set to <i>Trigger</i>, you must also specify a schema in the <i>Schema to create system objects</i> parameter.</p> </li> <li> <p><i>Kerberos Authentication</i><br/>Authenticate using the Kerberos network authentication protocol. If <i>Capture Mode</i> is set to <i>LogReader</i>, you must also specify a schema in the <i>LogReader objects schema in remote database</i> parameter.<br/>If <i>Capture Mode</i> is set to <i>Trigger</i>, you must also specify a schema in the <i>Schema to create system objects</i> parameter.</p> </li> </ul> <p>The default value is <i>SQL Server Authentication</i>.</p> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter may not be changed when the remote source is suspended.</p> </div> |
|          | Use Agent Stored Credential | <p>Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.</p> <p>The default value is <i>False</i>.</p> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Authentication type</i> is set to <i>SQL Server Authentication</i>.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Kerberos | Realm                       | <p>If specified, authenticate using a principal from this realm instead of the system's default realm.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Category | Option                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                        | <p>You must also specify the principal's key distribution center in the <i>KDC</i> parameter.</p> <div style="border: 1px solid #ccc; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                                                           |
|          | KDC                    | <p>The address of the principal's key distribution center (KDC).</p> <p>You must also specify the realm in the <i>Realm</i> parameter.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|          | Service principal name | <p>The Kerberos service principal name (SPN), including the service class, host, and port:</p> <div style="border: 1px solid #ccc; padding: 5px;"> <pre>&lt;service_class&gt;/ &lt;host&gt;:&lt;port&gt;</pre> </div> <p>For Microsoft SQL Server, the server class is always <code>MSSQLSvc</code>.</p> <p>For example, a fully qualified domain name of <code>myserver.corp.mycompany.com</code> with listening port 1433 results in the following SPN:</p> <div style="border: 1px solid #ccc; padding: 5px;"> <pre>MSSQLSvc/ myserver.corp.mycompany. com:1433</pre> </div> |
|          | Use keytab             | <p>Specifies whether to get the principal's key from the keytab.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|          | Keytab                 | <p>The filename of the keytab that contains the principal key.</p> <div style="border: 1px solid #ccc; padding: 5px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Use keytab</i> is set to <i>True</i>.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                |
|          | Use ticket cache       | <p>Specifies whether to obtain the ticket-granting ticket (TGT) from the ticket cache.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |



| Category       | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Ticket cache                             | <p>The name of the ticket cache that contains the user's TGT.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Use ticket cache</i> is set to <i>True</i>.</p> </div>                                                                                                                                                                                                                                                                                                                                                                             |
| CDC Properties | Capture mode                             | <ul style="list-style-type: none"> <li><i>LogReader</i>: Choose <i>Log Reader</i> to enable log-based change data capture.</li> <li><i>Trigger</i>: Choose <i>Trigger</i> to enable trigger-based change data capture.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                | Enable ABAP Manageable Trigger Namespace | <ul style="list-style-type: none"> <li><i>False</i>: (default)</li> <li><i>True</i>: If the source is an ABAP system, triggers created by SAP HANA smart data integration match the name pattern of the ABAP system so that system can manage triggers if there's an upgrade, for example. Set the name pattern in the parameter <i>ABAP Manageable Trigger Namespace</i>.</li> </ul>                                                                                                                                                                                                                                                                          |
|                | ABAP Manageable Trigger Namespace        | <p>Only configurable when <i>Enable ABAP Manageable Trigger Namespace</i> is set to <i>true</i>.</p> <p>Type: String, case insensitive</p> <p>Default Value: /1DI/</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                | Table Subscribing Mode                   | <ul style="list-style-type: none"> <li><i>Native Mode</i> (default): SAP HANA smart data integration installs some procedures into the Microsoft SQL Server <code>mssqlsystemresource</code> database. These procedures are called every time you mark a table for replication.</li> <li><i>Microsoft SQL CDC Mode</i>: The adapter uses the Microsoft SQL CDC API to mark a table for replication, so that the first time you use it, server-level initialization isn't required. When the <i>Database Data Capture Mode</i> option is set to <i>Microsoft SQL CDC Mode</i>, the adapter doesn't support replicating the TRUNCATE TABLE operation.</li> </ul> |

| Category | Option                                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                              | <p>To switch to another mode, you must reset all of your subscriptions and then alter this mode.</p> <div> <p><b>Note</b></p> <p>You don't need to enable Microsoft SQL Server CDC.</p> </div> <div> <p><b>Tip</b></p> <p>Both of these database data capture modes require the SYSADMIN role to execute.</p> </div>                                                                                                                                                                                                                                                                                           |
|          | LogReader objects schema in remote database (Case Sensitive) | <p>Optional. The schema name to use when creating log reader objects in the remote database. This schema name uniquely identifies the objects belonging to a specific remote source, and enables replication for multiple remote sources on a single source database.</p> <div> <p><b>Note</b></p> <p>When replicating using multiple remote sources and a single source database, each schema name and each remote source name must be unique.</p> </div>                                                                                                                                                                                 |
|          | Maintenance User Filter (Case Sensitive)                     | <p>Optional. Enter one or more source database user names. Source database transactions (INSERT, UPDATE, DELETE, and DDL changes such as ALTER TABLE) conducted by these users are filtered out (ignored) and not propagated to the SAP HANA target. For example, if you log in to the source database with a maintenance user and delete a row from a source table that is subscribed for replication, this row isn't deleted from the SAP HANA target table.</p> <p>Don't use the same name as the <i>User Name</i> credential.</p> <div> <p><b>Note</b></p> <p>If the S-ID of this user is changed using ALTER USER DDL, the</p> </div> |

| Category | Option                                 | Description                                                                                                                                                                                                                                                                                                                                           |
|----------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                        | <p><i>Maintenance User Filter</i> doesn't work.</p> <p>Specify multiple user names by separating them with a backslash (\). For example, for maintenance users named <b>MAINT_USER</b> and <b>APP_USER</b>:</p> <pre>MAINT_USER\APP_USER</pre> <p><b>Note</b><br/>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Schema to create system objects        | <p>Required when <i>Use Windows authentication</i> is set to <i>True</i>, optional when set to <i>False</i>. The schema name to use when creating system objects in the remote database.</p> <p>If this parameter isn't configured, system objects are created under the user name configured in the <i>Credentials</i> property group.</p>           |
|          | Interval of transaction log truncation | <p>The interval to truncate the transaction log, in minutes. Set to 0 to disable the truncation.</p> <p>The default value is 10 minutes.</p> <p><b>Note</b><br/>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                   |
|          | Ignore log record processing errors    | <p>Specifies whether the Log Reader ignores the errors that occur during log record processing. If set to <i>True</i>, the replication doesn't stop if log record processing errors occur. The default value is <i>False</i>.</p> <p><b>Note</b><br/>The value of this parameter can be changed when the remote source is suspended.</p>              |

| Category | Option                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Ignore log record decluster errors      | <p>Specifies whether to ignore log record declustering errors. If set to <i>True</i>, the replication doesn't stop if log record declustering errors occur. The default value is <i>False</i>.</p> <div> <p><b>Note</b></p> <p>This parameter is available only when you're using the Microsoft SQL Server Log Reader ECC adapter.</p> </div> <div> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Maximum operation queue size            | <p>The maximum number of operations permitted in the log reader operation queue during replication.</p> <p>The default value is 1000. The value range is 25–2147483647.</p> <div> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                               |
|          | Maximum scan queue size                 | <p>The maximum number of log records permitted in the log reader log scan queue during replication.</p> <p>The default value is 1000. The value range is 25–2147483647.</p> <div> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                               |
|          | Maximum wait interval between log scans | <p>The default value is 2 seconds. The value range is 1–3600.</p> <div> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                         |

| Category | Option                                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Seconds to add to each log scan wait interval             | <p>The default value is 0. The value range is 0–3600.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                      |
|          | Database connection pool size                             | <p>Maximum number of connections allowed in the connection pool on a secondary node.</p> <p>The default value is 15. The value range is 1–64.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                              |
|          | Number of times to retry to connect if a connection fails | <p>Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt as long as the server isn't found for the specified number of times.</p> <p>The default value is 5. The value range is 0–2147483647.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Timeout in seconds to retry connecting                    | <p>The number of seconds the agent waits between retry attempts to connect to the primary database.</p> <p>The default value is 10. The value range is 0–3600.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                             |
|          | Trigger-based: System object prefix                       | <p>The prefix of the names of the SQL Server adapter system objects created in the source SQL Server</p>                                                                                                                                                                                                                                                                                                                                       |

| Category | Option                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                 | database by the adapter. This value is case-insensitive, and we recommend keeping the default value of "SDI_".                                                                                                                                                                                                                                                                                                                                                                                                       |
|          | Trigger-based: Connection pool size             | <p>Maximum number of connections allowed in the connection pool. The default value is 4.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                         |
|          | Trigger-based: Minimum scan interval in seconds | <p>The minimum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 0 (seconds), which means there's no waiting time before the next scan.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                |
|          | Trigger-based: Maximum scan interval in seconds | <p>The maximum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 10 (seconds). If the adapter scans the queue and finds that the queue is empty, it gradually increases the scan interval from the minimum scan interval to the maximum scan interval.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Trigger-based: Maximum batch size               | <p>The maximum number of consecutive change data on the same table that is batched to process and send to Data Provisioning Server together. The default value is 128.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                           |

| Category    | Option                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | Trigger-based: Batch queue size                  | <p>The internal batch queue size. The batch queue size determines the maximum number of batches of change data that are queued in memory. The default value is 64.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                          |
|             | Trigger-based: Maximum transaction count in scan | The maximum number of transactions being processed in a scan of the remote source database.                                                                                                                                                                                                                                                                                                                                                                                        |
|             | Trigger-based: Maximum scan size                 | The maximum number of rows being fetched from the trigger queue table in one scan and assigned to batch jobs for further processing.                                                                                                                                                                                                                                                                                                                                               |
|             | Trigger-based: Enable compound trigger           | <p>Set to <i>True</i> to insert only one record into the trigger queue table per statement-level sequence. This action may improve the performance in the source database.</p> <p>When set to <i>False</i>, a record is inserted into the trigger queue for each individual record in a statement sequence.</p> <p>The default value is <i>False</i>.</p>                                                                                                                          |
|             | Trigger-based: Triggers record PK only           | <p>Set to <i>True</i> to have the triggers record only primary keys of delta data during CDC processing. This action may improve the DML performance in the source database.</p> <p>The default value is <i>False</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>When this parameter is set to <i>True</i>, only support DML (INSERT &amp; DELETE) is supported; no DDL is supported.</p> </div> |
| Credentials | Credentials Mode                                 | Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.                                                                                                                                                                                                                                                                                                                                                          |

| Category              | Option    | Description                                                                                                                                                                                                                                                                                        |
|-----------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       |           | <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul> |
|                       | User Name | Microsoft SQL Server user name.                                                                                                                                                                                                                                                                    |
|                       | Password  | Microsoft SQL Server user password.                                                                                                                                                                                                                                                                |
|                       |           | <p><b>Note</b></p> <p>This option is valid only when <i>Use Agent Stored Credential</i> is set to <i>False</i>.</p>                                                                                                                                                                                |
|                       |           | <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                          |
| Credential (Kerberos) | User Name | The Kerberos principal name.                                                                                                                                                                                                                                                                       |
|                       |           | <p><b>Note</b></p> <p>This option is valid only when <i>Authentication type</i> is set to <i>Kerberos Authentication</i>.</p>                                                                                                                                                                      |
|                       | Password  | The Kerberos principal password.                                                                                                                                                                                                                                                                   |
|                       |           | <p><b>Note</b></p> <p>This option is valid only when <i>Authentication type</i> is set to <i>Kerberos Authentication</i>.</p>                                                                                                                                                                      |

The following examples illustrate how to create a remote source using the SQL console.

## Example: Basic Remote Source

```
CREATE REMOTE SOURCE "MySQLServerSource" ADAPTER "MssqlLogReaderAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="data_type_conversion" displayName="Data Type Conversion">
  <PropertyEntry name="map_char_types_to_unicode" displayName="Always Map
Character Types to Unicode">false</PropertyEntry>
```



```

    <PropertyEntry name="map_time_to_timestamp" displayName="Map SQL Server Data
Type Time to Timestamp">true</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="pds_server_name" displayName="Host">myserver.sap.corp</
PropertyEntry>
    <PropertyEntry name="pds_port_number" displayName="Port Number">1433</
PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc" displayName="CDC Properties">
    <PropertyEntry name="pdb_dcmode" displayName="Database Data Capture
Mode">MSCDC</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="logreader" displayName="LogReader">
    <PropertyEntry name="skip_lr_errors" displayName="Ignore log record
processing errors">false</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
'WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
</CredentialEntry>'

```

## Example: Microsoft SQL Server AlwaysOn

```

CREATE REMOTE SOURCE "MySQLServerSource" ADAPTER "MssqlLogReaderAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="pds_always_on" displayName="SQL Server Always On">true</
PropertyEntry>
    <PropertyEntry name="pds_aglistener_host" displayName="Availability Group
Listener Host">myhost.sap.corp</PropertyEntry>
    <PropertyEntry name="pds_aglistener_port" displayName="Availability Group
Listener Port">1433</PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>'

```

## Related Information

[CREATE REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 639\]](#)

[Creating Secondary User Credentials](#)

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

[Security Aspects of SAP HANA Smart Data Access \(SAP HANA Security Guide\)](#)

[MssqlECCAdapter Preferences \[page 514\]](#)

[Creating an Allowlist to Limit Access to a Source Database \[page 413\]](#)

[Using a Schema Alias \[page 410\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 91\]](#)

[Store Remote Data Source Credentials Securely \[page 68\]](#)

## 6.2.17.4 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database (for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

[SAP HANA Remote Source Configuration \[page 529\]](#)

[SAP ASE LTL Remote Source Configuration \[page 505\]](#)

## 6.2.17.5 Log Reader Adapter Log Files

You can review processing information in the Log Reader log files.

The following files are available:

| Log file name and location                                   | Description                   |
|--------------------------------------------------------------|-------------------------------|
| <DPAgent_root>/LogReader/admin_logs/admin<instance_name>.log | Log Reader administration log |
| <DPAgent_root>/log/<instance_name>.log                       | Log Reader instance log       |

### Note

By default, the adapter instance name is the same as the remote source name when the remote source is created from the SAP HANA Web-based Development Workbench.

## 6.2.17.6 Configure SSL for the Microsoft SQL Server Log Reader Adapter

Set up secure SSL communication between Microsoft SQL Server and the Data Provisioning Agent.

### Context

If you want to use SSL communication between your Microsoft SQL Server source and the Data Provisioning Agent, you must create and import certificates and configure the source database.

### Procedure

1. On the Microsoft SQL Server host, create a certificate authority (CA) certificate using the sha1 algorithm. You can also create a certificate using the `makecert.exe` utility included in the Windows SDK.

For example:

```
makecert -r -pe -n "CN=<hostname>" -b 01/01/2017 -e 01/01/2023 -eku 1.3.6.1.5.5.7.3.1 -ss my -sr localmachine -sky exchange -sp "Microsoft RSA SChannel Cryptographic Provider" -sy 21 -a sha1
```

2. Import the new certificate on the Microsoft SQL Server host.  
You can use the [Certificates](#) snap-in for the Microsoft Management Console (MMC) to import the certificate.
  - a. In the Microsoft Management Console, choose **File > Add/Remove Snap-in** and add the [Certificates](#) snap-in to the MMC.  
In the wizard, specify the account and local computer.

- b. In *Certificates (Local Computer)*, right-click on the CA certificate that you created and choose **All Tasks > Manage Private Keys**.

#### Note

If the CA certificate does not appear, first choose **All Tasks > Import** to import the certificate.

- c. In *Group or user names*, click *Add* and specify the name of the account used by the Microsoft SQL Server service.
  - d. Copy the certificate and paste it under **Certificates (Local Computer) > Trusted Root Certification Authorities > Certificates**.
3. Specify the certificate for the Microsoft SQL Server instance.  
Use the SQL Server Configuration Manager (SSCM) to specify the certificate.
    - a. Expand *SQL Server Network Configuration*, and choose **Protocols for <SQL Server instance> > Properties**.
    - b. In the *Certificate* tab, select the certificate that you imported and click *OK*.

#### Tip

If the certificate does not appear, verify that the hostname in the certificate is correct, and that the Microsoft SQL Server service user has been added to the certificate.

4. Restart Microsoft SQL Server to ensure that the new certificate is picked up.  
In the SQL Server error log, a message such as the following should appear:

```
The certificate [Cert Hash(sha1) "<hash>"] was successfully loaded for encryption.
```

5. Export the certificate from the Microsoft SQL Server host.
  - a. In the *Certificates* snap-in for the Microsoft Management Console, navigate to **Personal > Certificates**.
  - b. Right-click on the certificate and choose **All Tasks > Export**.  
  
Export the certificate in the DER encoded binary X.509 (.CER) format. You do not need to export the private key with the certificate.
6. Prepare the Data Provisioning Agent for SSL connections.
  - a. Copy the certificate from the Microsoft SQL Server host to the Data Provisioning Agent installation.
  - b. Import the certificate into the Data Provisioning Agent keystore.

Use the Java keytool to import the certificate. By default, `keytool` is located in `<DPAgent_root>/sapjvm/bin`.

For example:

```
keytool -importcert -alias mssql -keystore <DPAgent_root>\ssl\cacerts  
-storepass <password> -file <path_to_exported_certificate> -noprompt
```

- c. Configure the SSL password with the Data Provisioning Agent configuration tool.

Specify the same password used when importing the certificate, and then restart the Data Provisioning Agent.

## Next Steps

When you create a Microsoft SQL Server remote source, ensure that the following parameters are set appropriately:

- *Use SSL: True*
- *Host Name in Certificate*: The host name specified when creating the certificate on the Microsoft SQL Server host.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

## 6.2.17.7 Creating an Allowlist to Limit Access to a Source Database

There are times when you might want to limit access to all of the tables in a source database. For data provisioning log reader adapters as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create an allowlist.

Restricting access to only those tables that are to be replicated is done by creating an allowlist of source database objects in a separate table.

### Note

The allowlist impacts only the virtual table created and the replications created after the allowlist was created.

You can use SQL to create the allowlist table.

### Note

- The allowlist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and ALLOWLIST.
- The allowlist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of an allowlist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of allowlisted tables for a single remote source.

## Microsoft SQL Server Example

```
create table allowlist(REMOTE_SOURCE_NAME varchar(128), ALLOWLIST varchar(4000));
```

To add an allowlist for the remote source called "localmssqlldb", insert a row into the allowlist table:

```
insert into allowlist values('localmssqlldb', 'object.A, object.B*');  
insert into allowlist values('localmssqlldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source "localmssqlldb".

## SAP HANA Example

```
create schema SAP_RESTRICTIONS;  
create table ALLOW_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, ALLOWLIST  
varchar(4000));
```

To add an allowlist for the remote source called "localhadp", insert a row into the allowlist table:

```
insert into ALLOW_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT,APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source localhadp.

## 6.2.17.8 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. In the *Agent Preferences* menu, choose *Set Agent Preferences*.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter , OracleLogReaderAdapter , HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Agent Configuration Parameters \[page 112\]](#)

### 6.2.17.9 Configure Microsoft Windows Authentication

Install a JDBC driver and configure your remote source to enable Windows authentication.

#### ⓘ Note

You can use Windows authentication to connect to a Microsoft SQL Server only when the Data Provisioning Agent is deployed on a Windows host system.

## Context

#### ⓘ Note

The Data Provisioning Agent service user is used by the Microsoft SQL Server JDBC driver to perform Windows Authentication.

## Procedure

1. Download and install the Windows JDBC driver to a location of your choice.

The `sqljdbc_auth.dll` or `mssql-jdbc_auth-<version>.x64.dll` file is found in the `/x64` directory at the installation location.


Consider the following examples:

```
<JDBC installation directory>\sqljdbc_4.0\enu\auth\x64\sqljdbc_auth.dll  
<JDBC installation directory>\sqljdbc_12.4\enu\auth\x64\mssql-jdbc_auth-12.4.0.x64.dll
```

2. Copy the driver DLL file into the `<DPAgent_root>/lib` directory.
3. Ensure that the DLL file version matches that of the Microsoft SQL Server JDBC JAR file in the same directory and start the Data Provisioning Agent.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[SAP HANA Smart Data Integration: Potential issues when connecting to SQL Server using the MssqlLogReader Adapter and Windows Authentication](#) 

## 6.2.17.10 Connect to Microsoft Azure Data Explorer

You can connect to Microsoft Azure Data Explorer (ADX) using the Microsoft SQL Server Log Reader adapter.

### Prerequisites

- The Microsoft JDBC driver version 9.1.0 or later is required to connect to ADX. If you're using an older version, replace the JDBC driver in the `<dp_agent>/lib` folder and restart the Data Provisioning Agent.
- If necessary for your ADX connection, you must configure HTTP(S) proxy authentication in the Data Provisioning Agent command-line configuration tool. For more information, see [Configure HTTPS Proxy Authentication for Adapters \[page 70\]](#).

### Context

The connection is established by the Microsoft JDBC Driver and lets you perform SQL queries on ADX remote tables.



### ⚠ Restriction

- Only read-only queries are supported for ADX remote tables (INSERT, DELETE, and UPDATE aren't supported).
- Not all SQL syntax is compatible with ADX. Correlated subqueries in SELECT, WHERE, and JOIN clauses aren't supported. For details, refer to the Microsoft documentation: <https://docs.microsoft.com/en-us/azure/data-explorer/kusto/api/tds/sqlknownissues>.
- Real-time replication isn't supported.

Configure the Microsoft SQL Server adapter as follows for a connection to Microsoft Azure Data Explorer:

| Option                                | Values                                                                                                                                               |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Server (serverName\instanceName) | <ADX access URL>                                                                                                                                     |
| Port Number                           | <Port number>                                                                                                                                        |
| Database Name                         | <Your database name>                                                                                                                                 |
| Additional JDBC Connection Properties | If you're using Azure Active Directory (AD) password authentication, add the following setting:<br><pre>authentication=ActiveDirectoryPassword</pre> |
| Use SSL                               | True                                                                                                                                                 |
| Host Name in Certificate              | <Host name in certificate>                                                                                                                           |
| User Name                             | <Your Azure AD user name>                                                                                                                            |
| Password                              | <Your Azure AD password>                                                                                                                             |

## Results

You can now browse remote objects, create virtual tables, and perform remote queries on the ADX remote source in SAP HANA.

## Related Information

[Configure HTTPS Proxy Authentication for Adapters \[page 70\]](#)

## 6.2.17.11 Connect to Microsoft Azure Synapse Analytics

You can connect to Microsoft Azure Synapse Analytics using the Microsoft SQL Server Log Reader adapter.

### Prerequisites

Microsoft JDBC driver version 9.1.0 or later is required to connect to Azure Synapse Analytics. If you're using an older version, replace the JDBC driver in the `<dp_agent>/lib` folder and restart the Data Provisioning Agent.

### Context

The connection is established by the Microsoft JDBC Driver and lets you work with data using SQL queries.

#### ⚠ Restriction

- Only read-only queries are supported for remote tables (INSERT, DELETE, and UPDATE aren't supported).
- Real-time replication isn't supported.

Configure the Microsoft SQL Server adapter as follows for a connection to Microsoft Azure Synapse Analytics:

| Option                                | Values                                                                                                                                               |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Server (serverName\instanceName) | <code>&lt;Synapse dedicated or serverless SQL endpoint&gt;</code>                                                                                    |
| Port Number                           | <code>&lt;Port number&gt;</code>                                                                                                                     |
| Database Name                         | <code>&lt;Database name&gt;</code>                                                                                                                   |
| Additional JDBC Connection Properties | If you're using Azure Active Directory (AD) password authentication, add the following setting:<br><pre>authentication=ActiveDirectoryPassword</pre> |
| Use SSL                               | <i>True or False</i>                                                                                                                                 |
| Validate Certificate                  | If <i>Use SSL</i> is set to <i>True</i> : <b>True</b>                                                                                                |
| Host Name in Certificate              | If <i>Use SSL</i> is set to <i>True</i> : <code>&lt;Host name in certificate&gt;</code>                                                              |
| User Name                             | <code>&lt;Username&gt;</code> or <code>&lt;Active Directory user name&gt;</code>                                                                     |
| Password                              | <code>&lt;Password&gt;</code>                                                                                                                        |

## Results

You can now browse remote objects, create virtual tables, and perform remote queries on the Azure Synapse Analytics remote source in SAP HANA.

### 6.2.18 OData

Set up access to the OData service provider and its data and metadata.

Open Data Protocol (OData) is a standardized protocol for exposing and accessing information from various sources, based on core protocols including HTTP, AtomPub (Atom Publishing Protocol), XML, and JSON (Java Script Object Notation). OData provides a standard API on service data and metadata presentation, and data operations.

The SAP OData adapter provides OData client access to the OData service provider and its data and metadata. The OData service provider is created as a remote source. OData resources are exposed as metadata tables of the remote source. These metadata tables can be added as virtual tables. An SAP HANA SQL query can then access the OData data. Collections of OData data entries are represented as rows of the virtual table.

The OData adapter supports the following functionality:

- Virtual table as a source
- Virtual table as a target using a Data Sink in a flowgraph

The data of the main navigation entities can be accessed via SQL with the following restrictions:

- Without a join, selected projection columns appear in the OData system query `"$select"`.
- With a join, columns of the joined table, which is the associated OData entity, can occur in the projection. Selected projection columns appear in the OData system query `"$select"`. All joined tables appear in the OData system query `"$expand"`.
- Due to a restriction of the OData system queries `"$select"` and `"$orderby"`, no expressions can occur in the Projection and the Order By clause.
- The Where clause supports logical, arithmetic, and ISNULL operators, string functions, and date functions. The expression is translated into the OData system query `"$filter"`.

Refer to OData documentation for the OData URI conventions.

## Related Information

[URI Conventions](#) 

## 6.2.18.1 Installation and Deployment

You must configure the SAP HANA server and provide the appropriate settings when you create a remote source to connect to the service provider.

Unlike other adapters, the OData adapter is not installed with the Data Provisioning Agent.

### 6.2.18.1.1 Set up the SAP HANA Server

Follow these steps to set up the SAP HANA server before using the OData adapter.

#### Procedure

1. Ensure that the Data Provisioning server is enabled.
2. If the OData service provider site supports only HTTPS connection, use the SAP HANA cryptography tool SAGENPSE to create a personal security environment (PSE) file and to import the public certificate provided by the server.  
Make sure that you place the PSE file into the SECUDIR (<HDB\_INSTANCE> / <HOST\_NAME> / sec) folder.
3. If the OData service provider requires HTTP basic authentication, set up a user and password.

### 6.2.18.1.2 Create an OData Remote Source

Follow these steps to create an OData remote source.

#### Procedure

1. Register the OData adapter to the ADAPTERS table.

```
CREATE ADAPTER "ODataAdapter" PROPERTIES 'display_name=OData Adapter;description=OData Adapter' AT LOCATION DPSEVER;
```

You can verify whether an entry for the OData adapter exists in the ADAPTERS table:

```
SELECT * FROM ADAPTERS
```

2. Create an ODataAdapter-type remote source and enter the configuration information.
3. Expand the new OData adapter remote source to browse for table metadata information and add tables from that remote source as virtual tables.
4. Expand *Catalog* / <SCHEMA> / *Tables* to find the added virtual tables and to view the table definition or to preview table data.

## Related Information

[OData Remote Source Configuration \[page 421\]](#)

[Creating Secondary User Credentials](#)

### 6.2.18.1.3 OData Remote Source Configuration

Configuration settings for accessing an OData source. Also included is sample code for creating a remote source using the SQL console.

Configure the following options in smart data access.

| Option                  | Description                                                                                                                                                                                          |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| URL                     | OData service root URL.<br><br>The OData service exposes its entity model at the metadata URL, which is formed by appending <code>\$metadata</code> to the service root URL.                         |
| Proxy Server            | Proxy host if URL is outside the firewall.                                                                                                                                                           |
| Proxy Port              | Proxy port if URL is outside the firewall.                                                                                                                                                           |
| Proxy Authentication    | Enter <i>True</i> if the proxy server requires authentication. The default value is <i>False</i> .                                                                                                   |
| Trust Store             | The trust store that contains the OData client public certificate, either a file in SECUDIR or a database trust store.                                                                               |
| Is File Trust Store     | Select <i>True</i> if the trust store is a file in SECUDIR, or <i>False</i> if the trust store resides in the SAP HANA database.<br><br>The default value is <i>True</i> .                           |
| Support Format Query    | If set to <i>True</i> , <code>\$format=json</code> is appended to get OData entities in JSON format. If set to <i>False</i> , no format query is appended.<br><br>The default value is <i>True</i> . |
| Require CSRF Header     | Enter <i>True</i> if OData Service requires CSRF Header.<br><br>The default value is <i>True</i> .                                                                                                   |
| CSRF Header Name        | Enter the name used for CSRF Header.<br><br>The default value is <i>X-CSRF-Token</i> .                                                                                                               |
| CSRF Header Fetch Value | Enter the value used for CSRF Header Fetch.<br><br>The default value is <i>Fetch</i> .                                                                                                               |
| Support Date Functions  | Select <i>False</i> if the OData service site doesn't support the date functions hour, minute, month, or year.                                                                                       |

| Option                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Show Navigation Properties   | <p>The default value is <i>True</i>.</p> <p>Select <i>True</i> or <i>False</i> for the OData Service to return Navigation Properties.</p> <p>If <i>Show Navigation Properties</i> is <i>False</i>, the <code>select *</code> SQL query returns only the regular properties.</p> <p>If <i>Show Navigation Properties</i> is <i>True</i>, the <code>select *</code> SQL query also returns the navigation properties.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>Because the maximum length of an HTTP request is restricted, avoid using the <code>select *</code> query if the total lengths for all Property and Navigation Property names exceed the restriction.</p> </div> <p>The default value is <i>False</i>.</p> |
| Support accept-encoding:gzip | <p>Select <i>True</i> if the OData Service supports accept-encoding:gzip.</p> <p>If <i>Support accept-encoding:gzip</i> is <i>True</i>, the OData HTTP request adds the header <code>accept-encoding:gzip</code>. If the OData Service HTTP response contains the header <code>Content-Encoding: gzip</code>, the response body is unzipped.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Follow Redirects             | <p>Select <i>True</i> for the OData adapter to follow redirected URLs.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Extra Connection Parameters  | <p>Enter extra connection parameters or leave blank.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Verify Server Certificate    | <p>Select <i>True</i> to have the OData adapter verify the server certificate.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Extra Header Parameters      | <p>Enter extra header parameters or leave blank.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Convert to Local Timezone    | <p>Select <i>True</i> or <i>False</i> for the OData adapter to convert the timestamp value to a local timezone.</p> <p>The default value is <i>True</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Authentication Type          | <p>Specify the authentication type to use to connect to the OData endpoint:</p> <ul style="list-style-type: none"> <li>• <i>Basic</i></li> <li>• <i>OAuth2</i></li> <li>• <i>OAuth2Saml</i></li> </ul> <p>The default value is <i>Basic</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Option                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OAuth2 Token Endpoint                  | <p>Enter the API endpoint to use to request an access token for authentication.</p> <p>For SAP SuccessFactors, enter <b>&lt;SFSF_INSTANCE&gt;/oauth/token</b>.</p>                                                                                                                                                                                                                                                                                                                                                                              |
| OAuth2 Token Request Method            | <p>Enter the OAuth2 token request method:</p> <ul style="list-style-type: none"> <li>• <i>POST</i></li> <li>• <i>GET</i></li> </ul> <p>The default value is <i>POST</i>.</p>                                                                                                                                                                                                                                                                                                                                                                    |
| OAuth2 Token Request Content Type      | <p>Enter the content type of the OAuth2 token request:</p> <ul style="list-style-type: none"> <li>• <i>URLEncoded</i></li> <li>• <i>JSON</i></li> </ul> <p>The default value is <i>URLEncoded</i>.</p>                                                                                                                                                                                                                                                                                                                                          |
| OAuth2 Scope                           | Enter the OAuth2 scope, if applicable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| OAuth2 Resource                        | Enter the OAuth2 resource, if applicable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| OAuth2 API Endpoint                    | <p>When using OAuth2Saml authentication, enter the API endpoint to use to request a SAML assertion.</p> <p>For SAP SuccessFactors, enter <b>&lt;SFSF_INSTANCE&gt;/oauth/idp</b>.</p> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>This parameter is deprecated and removed in SAP HANA Cloud, SAP HANA 2.00.065, and later versions. Instead, use the <i>OAuth2 Client ID</i> and <i>OAuth2 SAML Assertion</i> parameters.</p> </div> |
| OAuth2 User ID                         | When using OAuth2Saml authentication, enter the user ID to use to request a SAML assertion.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| OAuth2 Company ID                      | When using OAuth2Saml authentication, enter the company ID to use to request a SAML assertion.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Enable Anonymous SSL Connection        | <p>Select <i>True</i> to allow the OData Adapter to use anonymous SSL connections.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                |
| Support NCLOB data type for Edm String | <p>Enter <i>True</i> if the OData service supports NCLOB data type for Edm String.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                |
| HTTP Connection Timeout                | <p>Enter the HTTP connection timeout, in seconds.</p> <p>The default value is <i>900</i> (15 minutes).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Credentials Mode                       | Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Option                | Description                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>                                                                                                                                       |
| User Name             | <p>Enter the user name to use when connecting with Basic authentication, in <code>&lt;username@companyId&gt;</code> format.</p> <p>Required only if <i>Authentication Type</i> is set to <i>Basic</i>.</p>                                                                                                                                                                                                                               |
| Password              | <p>Enter the password to use when connecting with Basic authentication.</p> <p>Required only if <i>Authentication Type</i> is set to <i>Basic</i>.</p>                                                                                                                                                                                                                                                                                   |
| OAuth2 Client ID      | <p>Enter the client ID or API key to use when connecting:</p> <ul style="list-style-type: none"> <li>For OAuth2 authentication, the OAuth2 client ID to use when requesting an access token.</li> <li>For OAuth2Saml authentication, the API key for an OAuth2 client such as a registered SAP SuccessFactors OAuth2 client.</li> </ul> <p>Required only if <i>Authentication Type</i> is set to <i>OAuth2</i> or <i>OAuth2Saml</i>.</p> |
| OAuth2 Client Secret  | <p>Enter the OAuth2 client secret to use when requesting an access token.</p> <p>Required only if <i>Authentication Type</i> is set to <i>OAuth2</i>.</p>                                                                                                                                                                                                                                                                                |
| OAuth2 SAML Assertion | <p>Enter the OAuth2 SAML assertion generated by a third-party identity provider or the SAP SuccessFactors SAML generator tool.</p> <p>Required only if <i>Authentication Type</i> is set to <i>OAuth2Saml</i>.</p>                                                                                                                                                                                                                       |
| Proxy User            | <p>Enter the username to use to connect to the proxy.</p> <p>Required only if <i>Proxy Authentication</i> is set to <i>True</i>.</p>                                                                                                                                                                                                                                                                                                     |
| Proxy Password        | <p>Enter the password to use to connect to the proxy.</p> <p>Required only if <i>Proxy Authentication</i> is set to <i>True</i>.</p>                                                                                                                                                                                                                                                                                                     |

## Example: Basic Authentication

```
CREATE REMOTE SOURCE "MyODataSource" ADAPTER "ODataAdapter" AT LOCATION DPSEVER
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
  <ConnectionProperties name="connection_properties">
    <PropertyEntry name="URL" displayName="URL">http://<host>:<port>/<path1>/
<path2>/<pathN>/MyODataService.svc</PropertyEntry>
    <PropertyEntry name="proxyserver" displayName="Proxy
Server">myproxyserver</PropertyEntry>
```



```

        <PropertyEntry name="proxyport" displayName="Proxy Port">8080</
PropertyEntry>
        <PropertyEntry name="supportformatquery" displayName="Support Format
Query">true</PropertyEntry>
        <PropertyEntry name="extraHeaderparameters">APIKey:
pX7dvtDvXLUjVCVAwsTAud0ilyluH8aC</PropertyEntry>
    </ConnectionProperties>
    WITH CREDENTIAL TYPE 'PASSWORD' USING
    '<CredentialEntry name="password">
        <user>myuser</user>
        <password>mypassword</password>
    </CredentialEntry>';

```

## Example: OAuth2 Authentication

```

CREATE REMOTE SOURCE "MyODataOAuth2Source" ADAPTER "ODataAdapter" AT LOCATION
DPSEVER CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
    <ConnectionProperties name="connection_properties">
        <PropertyEntry name="URL">https://<host>:<port>/<path1>/<path2>/<pathN>/
MyODataService.svc</PropertyEntry>
        <PropertyEntry name="authenticationType">OAuth2</PropertyEntry>
        <PropertyEntry name="oauth2TokenEndpoint">https://<host>:<port>/oauth/
token</PropertyEntry>
    </ConnectionProperties>
    WITH CREDENTIAL TYPE 'PASSWORD' USING
    '<CredentialEntry name="oauth2" displayName="OAuth2 Credential">
        <user displayName="OAuth2 Client ID">myclientid</user>
        <password displayName="OAuth2 Client Secret">myclientsecret</password>
    </CredentialEntry>';

```

## 6.2.18.2 Consume HTTPS OData Services (On Premise)

Steps to configure SSL to consume HTTPS OData services in an on-premise environment.

### Context

If you want to consume HTTPS-based OData Services, as opposed to non-secured HTTP-based OData Services, you must import the SSL certificate from the OData Services provider into the trust store on your SAP HANA platform.

Set up the Trust Manager to consume the OData Services.

### Procedure

1. Obtain the SSL certificate from the OData Services provider.

You can use your browser to navigate to the OData URL and export the certificate from the browser.

2. Import the SSL certificate using the SAP HANA XS Admin Trust Manager. The following is for downloading and importing to existing or user-created PSE files.
  - For file trust stores, import the certificate to the Trust Manager SAML trust store. This action imports the certificate to the `sapsrv.pse` file in SECUDIR. The XSC Trust Manager can only import only to a `sapsrv.pse` file.
  - For database trust stores, create a database trust store and import the certificate to that new trust store.

See the *SAP HANA Administration Guide* for more information about the Trust Manager and trust relationships.

3. Create the remote source:
  - For file trust stores, set *Trust Store* to the `sapsrv.pse` file.
  - For database trust stores, set *Trust Store* to the new database trust store and *Is File Trust Store* to *False*.

For file trust stores, add the certificate to the file trust store using the following steps:

- a. In the browser for the source site click ► *Padlock* ► *Details* ► *Copy to File* ► *Next* ► *DER encoded binary* ► *Next* ► *Next* ► *Finish* ►, and select a location to download.
- b. Copy the certificate to the SAP HANA machine, and use `sapgenpse` to import the server, logged in as the `<SID>adm` user (for example `a71adm`).

```
sapgenpse maintain_pk -p <Hana sec dir path>/sapcli.pse -a <downloaded certificate path>
```

Path to HANA sec directory example: `/usr/sap/XXX/HDBXX/<hostname>/sec`

4. Use SAP HANA studio or Web Workbench to browse the remote source and to create virtual tables.

## Related Information

### 6.2.18.3 Consume HTTPS OData Services (Cloud)

Steps to configure SSL to consume HTTPS OData services in a cloud environment.

#### Context

##### ⓘ Note

This topic applies specifically to SAP HANA as a Service (SAP HANA 2.0 SP4) or SAP HANA Cloud environment.

If you want to consume HTTPS-based OData Services, as opposed to non-secured HTTP-based OData Services, the SSL certificate from the OData Services provider needs to be imported into the SAP HANA In-Database Certificate Store and Certificate Collection on your SAP HANA platform in order to establish the connection between the OData adapter and the OData Service.

Set up the In-Database Certificate Store and Certificate Collection using SAP HANA Cockpit or SQL to consume the OData Services.

## Procedure

1. Obtain the SSL certificate from the OData Services provider in PEM (X.509) format.

You can use your browser to navigate to the OData URL and export the certificate from the browser.

2. Import the SSL certificate using the SAP HANA Certificate Store page of the SAP HANA Cockpit.

```
CREATE CERTIFICATE FROM '<certificate_content>' COMMENT '<comment>'
```

3. Create a Certificate Collection using the SAP HANA Certificate Collections page of the SAP HANA Cockpit.

```
CREATE PSE <PSE_name>
```

4. Add the trusted Certificate created in step (2) to the Certificate Collection created in step (3), using the SAP HANA Certificate Collections page of the SAP HANA Cockpit.

```
ALTER PSE <PSE_name> ADD CERTIFICATE <certificate_id>
```

Obtain the certificate ID by running the following command:

```
SELECT * from PUBLIC.CERTIFICATES
```

5. Use SAP HANA studio or Web Workbench to create the remote source. Be sure that the `<REMOTE_SOURCE_NAME>` is capitalized.

```
CREATE REMOTE SOURCE <REMOTE_SOURCE_NAME> ADAPTER "ODataAdapter" AT LOCATION  
DPSESERVER ...
```

6. Add purpose REMOTE SOURCE to the Certificate Collection created in step (3) and associate with the remote source created in step (5) using the SAP HANA Certificate Collections page of the SAP HANA Cockpit.

```
SET PSE <PSE_name> PURPOSE REMOTE SOURCE;
```

This makes the usage of the certificates in the PSE store available to all remote sources.

### Note

You can restrict the usage of the certificates to a certain remote source as follows (the remote source must already exist):

```
SET PSE <PSE_name> PURPOSE REMOTE SOURCE FOR REMOTE SOURCE  
<REMOTE_SOURCE_NAME>
```

7. Use SAP HANA studio or Web Workbench to browse the remote source and to create virtual tables.

## Related Information

[Certificate Management in SAP HANA](#)

### 6.2.19 Oracle Log Reader

Use the Oracle Log Reader adapter to connect to an Oracle source.

#### Note

If your data source is an SAP ERP Central Component (ECC) system, use the [SAP ECC adapter \[page 510\]](#) for this database instead of the log reader adapter. The SAP ECC adapters provide extra ECC-specific functionality such as ECC metadata browsing and support for cluster and pooled tables in SAP ECC.

The Oracle Log Reader adapter provides real-time changed-data capture capability to replicate changed data from a database to SAP HANA. You can also use it for batch loading.

The Log Reader service provider is created as a remote source, and it requires the support of artifacts like virtual tables and remote subscriptions for each source table to perform replication.

With this adapter, you can add multiple remote sources using the same Data Provisioning Agent.

#### Note

Before you register the adapter with the SAP HANA system, ensure that you've downloaded and installed the correct JDBC libraries. Place the files in the `<DPAgent_root>/lib` folder.

For more information about the supported JDBC libraries, see the *Product Availability Matrix (PAM)*.

## Adapter Functionality

This adapter supports the following functionality:

- Oracle 12c multitenant database support
- Virtual table as a source
- Real-time change data capture (CDC) including support for database or table-level (default) supplemental logging.
- Trigger-based real-time CDC

#### Note

The TRUNCATE TABLE operation is not supported.

### Note

The following data types are not supported:

- TIMESTAMP ENCRYPT
- INTERVAL DAY TO SECOND ENCRYPT
- INTERVAL YEAR TO MONTH ENCRYPT

For more information, see SAP Notes [2957020](#) and [2957032](#).

- Virtual table as a target using a Data Sink node in a flowgraph
- Loading options for target tables
- DDL propagation.

Table 58: Supported Schema Changes

| Schema Change          | Trigger-based Mode | Log-reader Mode |
|------------------------|--------------------|-----------------|
| ADD COLUMN             | Yes                | Yes             |
| DROP COLUMN            | Yes                | Yes             |
| ALTER COLUMN DATA TYPE | Yes                | Yes             |
| RENAME COLUMN          | Yes                | Yes             |
| RENAME TABLE           | No                 | Yes             |

### Restriction

When SQL-type subscriptions are used to replicate only selected fields instead of all columns in a table, DDL replication is not supported for either adapter mode.

### Restriction

Source transactions that contain both DDL (such as ALTER TABLE) and DML (INSERT, UPDATE, DELETE, UPSERT, etc.) within the same transaction are not supported.

- Replication monitoring and statistics
- Search for tables
- Connect multiple remote sources in HANA to the same source database
- LDAP Authentication
- Virtual procedures

In addition, this adapter supports the following capabilities:

Table 59: Global Settings

| Functionality                                | Supported? |
|----------------------------------------------|------------|
| SELECT from a virtual table                  | Yes        |
| INSERT into a virtual table                  | Yes        |
| Execute UPDATE statements on a virtual table | Yes        |
| Execute DELETE statements on a virtual table | Yes        |
| Different capabilities per table             | No         |

| Functionality                           | Supported? |
|-----------------------------------------|------------|
| Different capabilities per table column | No         |
| Real-time                               | Yes        |

Table 60: Select Options

| Functionality                               | Supported? |
|---------------------------------------------|------------|
| Select individual columns                   | Yes        |
| Add a WHERE clause                          | Yes        |
| JOIN multiple tables                        | Yes        |
| Aggregate data via a GROUP BY clause        | Yes        |
| Support a DISTINCT clause in the select     | Yes        |
| Support a TOP or LIMIT clause in the select | Yes        |
| ORDER BY                                    | Yes        |
| GROUP BY                                    | Yes        |

## Related Information

[Connecting Multiple Remote Sources to the Same Oracle Source Database \[page 442\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

### 6.2.19.1 Oracle Database Permissions

Oracle database users must have certain permissions granted to them in order to carry out real-time change data capture or batch or initial load transactions.

You can run a script to assign all necessary permissions, or choose which ones suit users best. The following scripts can be found in the `oracle_init_example.sql` file, which is located in the `scripts` folder of the Data Provisioning Agent installation at `<DPAgent_root>\LogReader\scripts`.

#### Note

Be aware that the `oracle_init_example.sql` file is a template script. You may need to alter the following:

- Change `LR_USER` to the configured database user name in the remote source options, if it is not `LR_USER`.
- Change `<replace_with_password>` to the password of the database user.

For on-premise deployment, grant select access to the log reader user by issuing the following statement. In these examples – taken from the `oracle_init_example.sql` file – the user is named LR\_USER. Change this user name to whatever you need.

```
GRANT SELECT ON <table_to_be_replicated> TO LR_USER;
```

For convenience, you can also grant SELECT ANY TABLE.

However, for cloud deployment such as when accessing a database instance on Amazon Web Services (AWS) as a Relational Database Service (RDS), some privileges require granting using the AWS rdsadmin package. The following example shows how to GRANT SELECT on SYS.INDCOMPART\$ to the LR\_USER using the rdsadmin package. The privileges that require this method are noted in the `oracle_init_example.sql` file.

```
begin
  rdsadmin.rdsadmin_util.grant_sys_object(
    p_obj_name      => 'INDCOMPART$',
    p_grantee       => 'LR_USER',
    p_privilege     => 'SELECT',
    p_grant_option  => true);
end;
/
```

### Note

- As of 2.0 SP 03 Patch 53, the list of Oracle users can be accessed through the RA\_ALL\_USERS\_VIEW instead of directly accessing SYS.USERS\$. Create this view manually following the example in `oracle_init_example.sql`. Note that the default view is based on ALL\_USERS. Although this view requires lesser permission privileges, it may not include all Oracle users and may affect the replication process. For additional information, see SAP Note [2757950](#).
- We have removed the following permissions, as of SPS 11:
  - CREATE PUBLIC SYNONYM
  - DROP PUBLIC SYNONYM
  - ALTER SYSTEM
  - EXECUTE on DBMS\_FLASHBACK
- If you are using Oracle 12c, the permission LOGMINING is required. Additionally, the permission SELECT ANY TRANSACTION is not required.
- The GRANT SELECT ON SYS.DEFERRED\_STG\$ TO LR\_USER permission is not required for versions of Oracle below 11gR2.

| Permission                        | Reason                                                                           | Required For CDC/Non-CDC |
|-----------------------------------|----------------------------------------------------------------------------------|--------------------------|
| GRANT CREATE SESSION TO LR_USER;  | Required to connect to Oracle                                                    | CDC and Non-CDC          |
| GRANT CREATE TRIGGER TO LR_USER;  | Required to administer the DDL trigger used for Schema change (DDL) replication. | CDC                      |
| GRANT CREATE SEQUENCE TO LR_USER; | Required to create a sequence that SDI needs                                     | CDC                      |

| Permission                                     | Reason                                                                                                                                                                                                                                                                                                                      | Required For CDC/Non-CDC |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| GRANT CREATE TABLE TO LR_USER;                 | Required to create tables in the primary database that SDI needs.                                                                                                                                                                                                                                                           | CDC                      |
| GRANT CREATE PROCEDURE TO LR_USER;             | Required to create rs_marker and rs_dump stored procedures.                                                                                                                                                                                                                                                                 | CDC                      |
| GRANT ALTER ANY TABLE TO LR_USER;              | Temporary permission to turn on table level supplemental logging when a table is marked for replication in the source system. Needed only for the mark. However, if you turn on DDL replication and you expect to create tables, it must be left on so that tables can be altered by having supplemental logging turned on. | CDC                      |
| GRANT EXECUTE_CATALOG_ROLE TO LR_USER;         | Required to use Oracle LogMiner.                                                                                                                                                                                                                                                                                            | CDC                      |
| GRANT LOGMINING TO LR_USER;                    | Required to use LogMiner for Oracle 12c.                                                                                                                                                                                                                                                                                    | CDC                      |
| GRANT SELECT ANY TRANSACTION TO LR_USER;       | Required to use Oracle LogMiner.                                                                                                                                                                                                                                                                                            | CDC                      |
| GRANT SELECT ON SYS.ATTRIBUTE\$ TO LR_USER;    | Required to process Oracle types.                                                                                                                                                                                                                                                                                           | CDC                      |
| GRANT SELECT ON SYS.CCOL\$ TO LR_USER;         | Required to support table replication (column constraint information).                                                                                                                                                                                                                                                      | CDC                      |
| GRANT SELECT ON SYS.CDEF\$ TO LR_USER;         | Required to support table replication (constraint information).                                                                                                                                                                                                                                                             | CDC                      |
| GRANT SELECT ON SYS.COL\$ TO LR_USER;          | Required to support table replication (column information).                                                                                                                                                                                                                                                                 | CDC                      |
| GRANT SELECT ON SYS.COLLECTION\$ TO LR_USER;   | Required to support table replication. (column information)                                                                                                                                                                                                                                                                 | CDC                      |
| GRANT SELECT ON SYS.CON\$ TO LR_USER;          | Required to support table replication (constraint information).                                                                                                                                                                                                                                                             | CDC                      |
| GRANT SELECT ON SYS.DEFERRED_STG\$ TO LR_USER; | Required to suppress replication of compressed tables in versions of Oracle, on which LogMiner does not support compressed tables, such as Oracle 11g Release 2.                                                                                                                                                            | CDC                      |



| Permission                                   | Reason                                                                                                                                                           | Required For CDC/Non-CDC |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| GRANT SELECT ON SYS.ICOL\$ TO LR_USER;       | Required to support the use of a unique index on columns as the primary key of the replication definition when there is no primary key defined for that table.   | CDC                      |
| GRANT SELECT ON SYS.IND\$ TO LR_USER;        | Required when marking tables and to identify indexes.                                                                                                            | CDC                      |
| GRANT SELECT ON SYS.INDCOMPART\$ TO LR_USER; | Required when marking tables and to identify indexes.                                                                                                            | CDC                      |
| GRANT SELECT ON SYS.INDPART\$ TO LR_USER;    | Required when marking tables and to identify indexes.                                                                                                            | CDC                      |
| GRANT SELECT ON SYS.INDSUBPART\$ TO LR_USER; | Required when marking tables and to identify indexes.                                                                                                            | CDC                      |
| GRANT SELECT ON SYS.LOB\$ TO LR_USER;        | Required for LOB replication.                                                                                                                                    | CDC                      |
| GRANT SELECT ON SYS.LOBCOMPART\$ TO LR_USER; | Required to support partitioned LOB replication.                                                                                                                 | CDC                      |
| GRANT SELECT ON SYS.LOBFRA\$ TO LR_USER;     | Required to support partitioned LOB replication.                                                                                                                 | CDC                      |
| GRANT SELECT ON SYS.MLOG\$ TO LR_USER;       | Required to filter materialized view log tables.                                                                                                                 | CDC                      |
| GRANT SELECT ON SYS.NTAB\$ TO LR_USER;       | Required to support table replication.                                                                                                                           | CDC                      |
| GRANT SELECT ON SYS.OBJ\$ TO LR_USER;        | Required for processing procedure DDL commands in the repository.                                                                                                | CDC                      |
| GRANT SELECT ON SYS.OPQTYPE\$ TO LR_USER;    | Required for DDL replication and XMLTYPE data replication. XMLTYPE is not supported in SDI yet.                                                                  | CDC                      |
| GRANT SELECT ON SYS.PARTOBJ\$ TO LR_USER;    | Required to support partitioned table replication.                                                                                                               | CDC                      |
| GRANT SELECT ON SYS.SEG\$ TO LR_USER;        | Required to suppress replication of compressed tables in versions of Oracle, on which LogMiner does not support compressed tables, such as Oracle 11g Release 2. | CDC                      |

| Permission                                                                                                                                                                       | Reason                                                                                                            | Required For CDC/Non-CDC |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------------------------|
| GRANT SELECT ON SYS.SEQ\$ TO LR_USER;                                                                                                                                            | Required to support sequence replication. Replication of sequences is not supported in SDI yet.                   | CDC                      |
| GRANT SELECT ON SYS.SNAP\$ TO LR_USER;                                                                                                                                           | Required to filter out materialized view tables.                                                                  | CDC                      |
| GRANT SELECT ON SYS.TAB\$ TO LR_USER;                                                                                                                                            | Required to support table replication.                                                                            | CDC                      |
| GRANT SELECT ON SYS.TABCOMPART\$ TO LR_USER;                                                                                                                                     | Required when marking partitioned tables.                                                                         | CDC                      |
| GRANT SELECT ON SYS.TABPART\$ TO LR_USER;                                                                                                                                        | Required when marking partitioned tables.                                                                         | CDC                      |
| GRANT SELECT ON SYS.TABSUBPART\$ TO LR_USER;                                                                                                                                     | Required when marking partitioned tables.                                                                         | CDC                      |
| GRANT SELECT ON SYS.TS\$ TO LR_USER;                                                                                                                                             | Required to identify tablespace encryption in Oracle 11g.                                                         | CDC                      |
| GRANT SELECT ON SYS.TYPE\$ TO LR_USER;                                                                                                                                           | Required to process Oracle predefined and user-defined types.                                                     | CDC                      |
| GRANT SELECT ON SYS.USER\$ TO LR_USER;                                                                                                                                           | Required for Oracle user identification. Required during Schema change (DDL) replication and when marking tables. | CDC                      |
| <div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p><b>Note</b></p> <p>Required only if your RA_ALL_USERS_VIEW is based on SYS.USER\$.</p> </div> |                                                                                                                   |                          |
| GRANT SELECT ON V_\$DATABASE TO LR_USER;                                                                                                                                         | Required to identify current SCN (for example, end of log) and information about supplemental logging.            | CDC                      |
| GRANT SELECT ON V_\$LOGMNR_CONTENTS TO LR_USER;                                                                                                                                  | Required to use Oracle LogMiner.                                                                                  | CDC                      |
| GRANT SELECT ON V_\$LOGMNR_LOGS TO LR_USER;                                                                                                                                      | Required to use Oracle LogMiner.                                                                                  | CDC                      |
| GRANT SELECT_CATALOG_ROLE TO LR_USER;                                                                                                                                            | Required to use Oracle LogMiner.                                                                                  | CDC                      |

Granting the EXECUTE CATALOG ROLE or the SELECT CATALOG ROLE is not necessary. Instead, you can grant the following specific permissions that are part of those roles:

| Role                 | Permissions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EXECUTE CATALOG ROLE | <ul style="list-style-type: none"> <li>GRANT EXECUTE ON SYS.DBMS_LOGMNR TO LR_USER;</li> <li>GRANT EXECUTE ON SYS.DBMS_LOGMNR_D TO LR_USER;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| SELECT CATALOG ROLE  | <ul style="list-style-type: none"> <li>GRANT SELECT ON SYS.DBA_ERRORS TO LR_USER;</li> <li>GRANT SELECT ON SYS.DBA_LIBRARIES TO LR_USER;</li> <li>GRANT SELECT ON SYS.DBA_LOG_GROUPS TO LR_USER;</li> <li>GRANT SELECT ON SYS.DBA_OBJECTS TO LR_USER;</li> <li>GRANT SELECT ON SYS.DBA_SYNONYMS TO LR_USER;</li> <li>GRANT SELECT ON SYS.DBA_TABLES TO LR_USER;</li> <li>GRANT SELECT ON SYS.DBA_TRIGGERS TO LR_USER;</li> <li>GRANT SELECT ON SYS.GV_\$INSTANCE TO LR_USER;</li> <li>GRANT SELECT ON SYS.GV_\$SESSION TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$ARCHIVE_DEST TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$ARCHIVED_LOG TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$DATABASE TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$DATABASE_INCARNATION TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$INSTANCE TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$LOG TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$LOGFILE TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$LOGMNR_CONTENTS TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$LOGMNR_LOGS TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$PARAMETER TO LR_USER;</li> <li>GRANT SELECT ON SYS.V_\$TRANSACTION TO LR_USER;</li> </ul> |

## Multitenant Database Permissions

To set permissions for a multitenant database, run the scripts in the following files. They are also located in `<DPAgent_root>\LogReader\Scripts`. The same rules concerning `<LR_USER>` apply to this script, and so on.

### Note

The `<C##LR_USER>` in the container database must be the “common user” and the `<LR_USER>` user in the pluggable database is the “local user”.

- `oracle_multitenant_init_example_for_container_database.sql`
- `oracle_multitenant_init_example_for_pluggable_database.sql`

## Permissions for Processing Pool or Cluster Tables

If you want to process pool or cluster tables, you must uncomment the following lines from the `oracle_init_example.sql` file:

```
--grant select on SAPSR3.DM41S to LR_USER;  
--grant select on SAPSR3.DM26L to LR_USER;  
--grant select on SAPSR3.DD02VV to LR_USER;  
--grant select on SAPSR3.DM40T to LR_USER;  
--grant select on SAPSR3.DD02L to LR_USER;  
--grant select on SAPSR3.DD16S to LR_USER;  
--grant select on SAPSR3.DD03L to LR_USER;  
--grant select on SAPSR3.DD02T to LR_USER;  
--grant select on SAPSR3.DD03T to LR_USER;  
--grant select on SAPSR3.DD04T to LR_USER;  
--grant select on SAPSR3.DDNTT to LR_USER;  
--grant select on SAPSR3.DDNTF to LR_USER;
```

For cluster and pool tables, multiple ECC tables are stored in a single physical Oracle table. Grant permission to access the physical Oracle table associated with the ECC table that you want to access. For example, to access the ECC BSEG table, you must grant access to the RFBLG Oracle physical. The `oracle_init_example.sql` file contains many examples of these tables, such as:

```
--grant select on SAPSR3.T000 to LR_USER;  
--grant select on SAPSR3.KNA1 to LR_USER;  
--grant select on SAPSR3.RFBLG to LR_USER;  
--grant select on SAPSR3.VBAK to LR_USER;  
--grant select on SAPSR3.VBAP to LR_USER;
```

You may need to add your own tables to this script.

## Related Information

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

## 6.2.19.2 Oracle Real-time Replication

Information about setting up your source system and adapter for real-time replication.

### Note

We have found that the Oracle Log Miner maximum throughput is approximately 1 TB/day. With anything more than that, Oracle Log Miner begins to lag behind.

Therefore, no matter the amount of overage, if the replication volume is greater than 1 TB/day, there will be a delay in replication.

## 6.2.19.2.1 Remote Database Setup for Oracle Real-time Replication

The remote Oracle database must be set up properly for this adapter to function correctly when using real-time replication.

This setup process is necessary only when using real-time replication.

### Oracle 12c Multitenant support

Multitenant databases are supported for Oracle 12c. Be aware that some of the setup procedures are different for multitenant. For example, in remote sources, the configuration, permissions, and cleanup procedures are different.

### LOB replication

When attempting LOB replication, be sure to set the `db_securefile` parameter to "PERMITTED" in the Oracle system. Depending on the Oracle version, the parameter may be set to a different value by default.

To do this, you can uncomment the following in the `oracle_init_example.sql` file:

```
ALTER SYSTEM SET db_securefile='PERMITTED';
```

#### Note

LOB replication through Oracle logminer gives unexpected results, and therefore it is not supported. LOB replication is supported via trigger-based replication.

### Oracle to SAP HANA replication limitation

During real-time (CDC) replication for Oracle to SAP HANA, if the table in Oracle has a BLOB column as the first column, the replication fails due to `NullPointerException`, which LogMiner returns as an invalid SQL statement. This exception occurs on Oracle 11.2.0.3 and 11.2.0.4.

### Other Real-time Replication Limitations

The following limitations exist when performing real-time replication:

- Unsupported table types:
  - Table with all LOB columns

- Table with computed columns
- Table with LOB column and no primary key or unique index
- Table with duplicated rows and no primary key
- Table with user-defined identifier
- Nested table

## 6.2.19.2.1.1 Oracle Supplemental Logging

Decide which logging level is best for you and set it up.

Set your logging level in the Adapter Preferences in the Data Provisioning Agent configuration tool for the Oracle Log Reader adapter. Then, run the necessary scripts found in the `oracle_init_example.sql` file, located in `<DPAgent_root>\LogReader\Scripts`.

### Note

Be aware that the `oracle_init_example.sql` file is a template script. Execute only the DDL statements for your logging level by commenting or uncommenting lines as necessary.

## Table-level Logging

We recommend table-level logging, which turns on supplemental logging for subscribed tables and some required system tables.

To configure table-level logging, execute the following DDL statements from `oracle_init_example.sql` on your Oracle client and set the *Oracle supplemental logging level* Adapter Preferences option to *Table*.

```
ALTER DATABASE ADD SUPPLEMENTAL LOG DATA;
```

```
ALTER TABLE <table_name> ADD SUPPLEMENTAL ...
```

### Restriction

When using Amazon Web Services in the cloud, you can configure only database-level supplemental logging for Oracle.

## Database-level Logging

Database-level logging turns on supplemental logging for all tables, including system tables.

To configure database-level logging, execute the following DDL statements from `oracle_init_example.sql` on your Oracle client and set the *Oracle supplemental logging level* Adapter Preferences option to *Database*.

```
ALTER DATABASE ADD SUPPLEMENTAL LOG DATA;
```

```
ALTER DATABASE ADD SUPPLEMENTAL LOG DATA (PRIMARY KEY, UNIQUE) COLUMNS;
```

## Database-level Logging for Amazon Web Services

When using Amazon Web Services in the cloud, instead of using the ALTER DATABASE ADD SUPPLEMENTAL commands, enable database-level supplemental logging as shown in the following example:

```
begin
  RDSADMIN.RDSADMIN_UTIL.ALTER_SUPPLEMENTAL_LOGGING(
    P_ACTION => 'ADD');
END;
/
begin
  RDSADMIN.RDSADMIN_UTIL.ALTER_SUPPLEMENTAL_LOGGING(
    P_ACTION => 'ADD',
    P_TYPE => 'PRIMARY KEY');
  RDSADMIN.RDSADMIN_UTIL.ALTER_SUPPLEMENTAL_LOGGING(
    P_ACTION => 'ADD',
    P_TYPE => 'UNIQUE');
END;
/
```

## Related Information

[OracleLogReaderAdapter Preferences \[page 445\]](#)

[Configure Adapter Preferences \[page 587\]](#)

### 6.2.19.2.2 Remote Database Cleanup for Oracle Real-time Replication

Run SQL scripts to clean objects manually from the source database.

Cleanup scripts are used to drop database-level objects. Usually, you do not need to execute a cleanup script after an adapter is dropped, because the adapter drops these database-level objects automatically. However, in some cases, if any errors occur during or before automatically dropping these objects, the objects may not be dropped. At that point, you may need to execute the cleanup script to drop the objects.

You can find the script file at `<DPAgent_root>\LogReader\scripts\oracle_logreader_cleanup.sql`.

## 6.2.19.2.3 Validate the Oracle Log Reader Environment

You can use the Data Provisioning Agent command-line configuration tool to configure and validate the Oracle log reader environment before creating remote sources that use the Oracle Log Reader adapter.

### Prerequisites

Before validating the log reader environment, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA Smart Data Integration Product Availability Matrix (PAM)*.

Place your files in `<DPAgent_root>/lib`. Note that you must manually create the `/lib` folder.

### Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose *Oracle Replication Setup*.
4. Choose *Config Oracle Connection Info* to configure the connection used for other validation tasks.

Specify the information required to connect the configuration tool to the database:

  - Whether to use SSL
  - Whether the Oracle database is configured as a multitenant database
  - Whether to use LDAP authentication
  - The hostname, port number, database name, and service name for the Oracle database
  - The Oracle username and password to use to connect to the database

The configuration tool connects to the database with the specified parameters when performing other validation tasks.
5. Perform validation and configuration tasks for the Oracle log reader environment.
  - To test whether the Oracle environment is ready for replication, choose *Oracle Replication Precheck*.
  - To retrieve a list of all open transactions, choose *List Open Transactions*.
  - To create an Oracle user with the permissions required for replication, choose *Create An Oracle User With All Permissions Granted*.

For each task, provide any additional parameters required by the task. For example, to test whether the Oracle environment is ready for replication, you must specify the supplemental logging level when prompted.



## Next Steps

After you have validated the configuration of the Oracle log reader environment, you can create remote sources with the Oracle Log Reader adapter. You can manually create remote sources or generate a creation script with the command-line configuration tool.

## Related Information

[Generate a Log Reader Remote Source Creation Script \[page 441\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

### 6.2.19.2.4 Generate a Log Reader Remote Source Creation Script

Use the Data Provisioning Agent command-line configuration tool to validate parameters and generate a usable script to create a remote source for log reader adapters.

## Prerequisites

Before generating a remote source creation script for your source, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

Before performing these steps, place your files in `<DPAgent_root>/lib`. Note that you must manually create the `/lib` folder.

## Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose the appropriate replication setup option for your remote source type.
4. Choose the appropriate log reader setup option for your remote source type.
5. Provide the configuration details for your remote source as prompted.

Specify the name of the agent to use and the name of the remote source to create, as well as any connection and configuration information specific to your remote source.

For more information each configuration parameter, refer to the remote source configuration section for your source type.

## Results

The configuration tool validates the configuration details for your remote source and generates a script that can be used to create the remote source. You can view the validation results in the Data Provisioning Agent log.

By default, the configuration tool generates the remote source creation script in the user temporary directory. For example, on Windows: `C:\Users\\AppData\Local\Temp\remoteSource-<remote_source_name>.txt`.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

### 6.2.19.2.5 Connecting Multiple Remote Sources to the Same Oracle Source Database

You can connect multiple remote sources to the same remote database when the prerequisites are met.

To connect multiple remote sources to the same remote database, the following conditions must be met:

- Each remote source uses a unique Oracle database user to connect to the source database.
- A different source table is marked for replication; the same table cannot be marked for replication by different remote sources.

### 6.2.19.2.6 Oracle Trigger-Based Replication

When you use trigger-based replication, the adapter creates triggers to capture changed data and then continuously queries the source database to get the changed data. When you subscribe to a table for replication, the adapter creates three triggers (INSERT, UPDATE, and DELETE) on the table for capturing data.

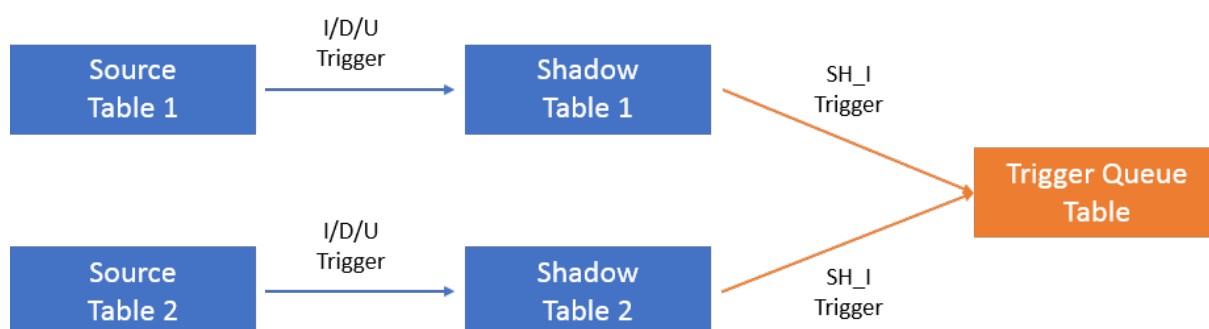
The supported operations are:

- Add a column
- Delete a column
- Alter a column datatype

The adapter also creates a shadow table for the subscribed table. Except for a few extra columns for supporting replication, the shadow table has the same columns as its replicated table. Triggers record changed

data in shadow tables. For each adapter instance (remote source), the adapter creates a Trigger Queue table to mimic a queue. Each row in shadow tables has a corresponding element (or placeholder) in the queue. The adapter continuously scans the queue elements and corresponding shadow table rows to get changed data and replicate them to the target SAP HANA database.

## Architecture



### 6.2.19.2.6.1 System Objects Created in Oracle

When you create a remote source to use trigger-based replication, a few system objects--such as tables, triggers, or procedures--are created on the Oracle source.

#### Remote Source Level

(table) Trigger queue table: "LR\_USER"."SDI\_TRIGGER\_QUEUE"

(table) Mapping source to shadow table: "LR\_USER"."SDI\_SRC\_TO\_ST"

(table) Marker table: "LR\_USER"."SDI\_MARKERS"

(table) Shadow table of Marker table: "LR\_USER"."SDI\_<marker\_table\_oid>"

(trigger) Insert trigger on marker table: "LR\_USER"."SDI\_<marker\_table\_oid>\_I"

(trigger) Delete trigger on marker table: "LR\_USER"."SDI\_<marker\_table\_oid>\_D"

(trigger) Update trigger on marker table: "LR\_USER"."SDI\_<marker\_table\_oid>\_U"

(trigger) Insert trigger on shadow table of marker table: "LR\_USER"."SDI\_<marker\_table\_oid>\_SHI"

(table) DDL table: "LR\_USER"."SDI\_DDL\_CHANGE"

(table) Shadow table of DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>"

(trigger) Insert trigger on DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>\_I"

(trigger) Delete trigger on DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>\_D"

(trigger) Update trigger on DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>\_U"

(trigger) Insert trigger on shadow table of DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>\_SHI"

(procedure) Mark procedure: "LR\_USER"."SDI\_PROC\_V1"

(sequence) Scan sequence: "LR\_USER"."SDI\_SCAN\_SEQ"

(sequence) Trans sequence: "LR\_USER"."SDI\_TRIGGER\_SEQ"

(trigger) DDL trigger: "LR\_USER"."SDI\_DDL\_TRIG"

## Source Table Level

(table) Shadow table of source table: "LR\_USER"."SDI\_<source\_table\_oid>"

(trigger) Insert trigger on source table: "LR\_USER"."SDI\_<source\_table\_oid>\_I"

(trigger) Delete trigger on source table: "LR\_USER"."SDI\_<source\_table\_oid>\_D"

(trigger) Update trigger on source table: "LR\_USER"."SDI\_<source\_table\_oid>\_U"

(trigger) Insert trigger on shadow table of source table: "LR\_USER"."SDI\_<source\_table\_oid>\_SHI"

### 6.2.19.2.6.2 Required Permissions for Oracle Trigger-Based Replication

Grant permissions and privileges to use Oracle trigger-based replication.

```
GRANT CREATE SESSION TO <remote_source_user>;
GRANT CREATE SEQUENCE TO <remote_source_user>;
GRANT CREATE PROCEDURE TO <remote_source_user>;
GRANT CREATE ANY TRIGGER TO <remote_source_user>;
GRANT ADMINISTER DATABASE TRIGGER TO <remote_source_user>;
GRANT CREATE TABLE TO <remote_source_user>;
GRANT SELECT ON <source_table> TO <remote_source_user>;
```

#### Note

Depending on your security policies, you can grant select permissions for all tables instead of granting select permissions for an individual source table. For example:

```
GRANT SELECT ANY TABLE TO LR_USER;
```

## 6.2.19.3 OracleLogReaderAdapter Preferences

Configuration parameters for the Oracle Log Reader adapter.

### Note

Log Reader adapter preferences - with the exception of `Number of wrapped log files`, `Enable verbose trace`, and `Maximum log file size` - are no longer set in the Data Provisioning Agent Configuration Tool. They are part of the remote source configuration options in SAP HANA. If you have upgraded from a previous version, then the settings you find in the Agent Configuration Tool are your previous settings, displayed for your reference.

You can adjust Oracle Log Reader adapter settings in the Data Provisioning Agent configuration tool.

| Parameter                              | Description                                                                                                                                                                                                                                                                                                                                                                               | Default value |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Distinguished Name (DN) in Certificate | <p>The distinguished name (DN) of the primary data server certificate.</p> <ul style="list-style-type: none"><li>This parameter is valid only if <a href="#">Use SSL</a> is set to "true".</li><li>If this parameter is set, the DN field in the server certificate is verified to match this parameter. If it does not match, the connection to the primary data server fails.</li></ul> |               |
| Oracle supplemental logging level      | <p>Specifies the level of supplemental logging.</p> <ul style="list-style-type: none"><li>Table: Table level turns on supplemental logging for subscribed tables and some required system tables.</li><li>Database: Database level turns on supplemental logging for all tables, including system tables.</li></ul>                                                                       | table         |
| Maximum operation queue size           | The maximum number of operations permitted in the log reader operation queue during replication.                                                                                                                                                                                                                                                                                          | 1000          |
| Maximum scan queue size                | The maximum number of log records permitted in the log reader log scan queue during replication.                                                                                                                                                                                                                                                                                          | 1000          |
| Maximum session cache size             | The maximum number of Oracle sessions to be cached in memory during replication.                                                                                                                                                                                                                                                                                                          | 1000          |
| Enable parallel scanning               | <p>Specifies whether to turn on parallel scanning.</p> <p>To achieve better performance for high volume log throughput, set the parameter to <b>true</b> to enable parallel scanning.</p>                                                                                                                                                                                                 | false         |

| Parameter                                                  | Description                                                                                                                                                                        | Default value |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Queue size of parallel scan tasks                          | Specifies the number of tasks in the queue.                                                                                                                                        | 0             |
| Parallel scan SCN range                                    | The maximum number of system change numbers (SCN) processed by each Oracle LogMiner scanner, when parallel scan is enabled, that is, when <code>lr_parallel_scan</code> is true.   | 1024          |
| Number of parallel scanners                                | Specifies the number of parallel scanners.                                                                                                                                         | 4             |
| Number of log record rows fetched by the scanner at a time | Specifies the number of log record rows fetched by the scanner.                                                                                                                    | 1             |
| Ignore log record processing errors                        | Determines whether to ignore log record processing errors.                                                                                                                         | false         |
| Replicate LOB columns                                      | Oracle logs all LOB data in the Oracle redo log, except for BFILE datatypes . This allows the agent to apply each LOB change. However, for BFILE data, the same technique is used. | true          |
| Ignore data of unsupported types stored in ANYDATA         | Specifies whether you want to ignore data with unsupported types housed in ANYDATA wrapper.                                                                                        | false         |
| Database connection pool size                              | Maximum number of connections allowed in the connection pool on a secondary node.                                                                                                  | 15            |
| Number of times to retry to connect if a connections fails | Instructs the client library, such as DBLIB, ODBC, ADO, and so on, to keep retrying the connection attempt, as long as the server is not found, for the specified number of times. | 5             |
| Timeout in seconds to retry connecting                     | The number of seconds the agent waits between retry attempts to connect to the primary database.                                                                                   | 10            |
| Number of wrapped log files                                | The maximum size, in 1K blocks, of the agent system log file before wrapping.                                                                                                      | 3             |
| Enable verbose trace                                       | Enables or disables additional diagnostic information in the agent system log files.                                                                                               | false         |
| Maximum log file size                                      | Limit the size of the message log to conserve disk space.                                                                                                                          | 1000          |
| Turn on asynchronous logging mode                          | Specifies whether or not LogReader should turn on asynchronous logging mode. (TRUE, FALSE)                                                                                         | TRUE          |
| Maximum size of work queue for asynchronous logging        | The maximum size of the work queue for asynchronous logging file handler to collect the log records (1 to 2147483647)                                                              | 1000          |

| Parameter                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Default value |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Discard policy for asynchronous logging file handler | <p>Specifies the discard policy for the asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>• BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>• DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>• DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried, which can fail again, causing this to be repeated.</li> </ul> | BLOCKING      |

## Related Information

[Oracle Database Permissions \[page 430\]](#)

[Oracle Supplemental Logging \[page 438\]](#)

[Configure Adapter Preferences \[page 587\]](#)

## 6.2.19.4 Oracle Log Reader Remote Source Configuration

Configure the following options for a connection to an Oracle remote source.

### Note

When setting up a remote source and you use a remote source name longer than 30 characters. The generated log reader folder name, under `<DPAgent_root>/LogReader/`, is converted to `AGENT<xxxx>`, where `<xxxx>` is an integer representing the hash code of the remote source name string.

The log file is located at `<DPAgent_root>/log/framework.trc`, and reads: "The instance name `<original_name>` exceeds 30 characters and it is converted to `<converted_name>`."

| Category | Option                                | Description                                                                                                                                                                                                   |
|----------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Generic  | Always Map Character Types to Unicode | Determines whether a CHAR/VARCHAR2/CLOB column in the source database is mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII. The default value is <i>False</i> . |

| Category | Option                               | Description                                                                                                                                                                                                                                                                                                                                                                                |
|----------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                      | <p>The value of this parameter can be changed when the remote source is suspended.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>Set this parameter to <i>True</i> only when the remote database is multibyte character sets, such as UTF-8, GBK, and JA16SJIS.</p> </div>                                                     |
|          | Convert NULL to Space for write back | <p>Converts NULL to space for character types when writing back to a column with a NOT NULL constraint.</p> <p>The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                               |
|          | Map INTEGER/NUMBER to DECIMAL(38,0)  | <p>Set this parameter to <i>True</i> when you want to map INTEGER/NUMBER to DECIMAL(38,0). Otherwise, INTEGER/NUMBER maps to DECIMAL, which has a precision of 34.</p> <p>The default is <i>False</i>.</p>                                                                                                                                                                                 |
|          | Timezone Format                      | <p>The time zone format to use for time stamps that include a time zone data type.</p> <ul style="list-style-type: none"> <li><i>TZR</i>: The time zone name. For example, <code>US/Pacific</code></li> <li><i>TZH:TZM</i>: The hour and minute time zone offset. For example, <code>+8:00</code></li> </ul>                                                                               |
|          | Load and Replicate LOB columns       | <p>When this parameter is set to false, the LOB columns are filtered out when doing an initial load and real-time replication.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>This option isn't available for an ECC adapter.</p> </div> <p>The value of this parameter can be changed when the remote source is suspended.</p> |



| Category | Option                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Database | Multitenant Database            | Specifies whether to enable multitenant support. <ul style="list-style-type: none"> <li><i>True</i>: Replicate multitenant database</li> <li><i>False</i>: Replicate normal database</li> </ul>                                                                                                                                                                                                                                 |
|          | Use Oracle TNSNAMES File        | Specifies whether to use the connection information from the Oracle <code>tnsnames.ora</code> file to connect to the Oracle database. If set it to <i>False</i> , you must configure the <i>Host</i> , <i>Port Number</i> , and <i>Database Name</i> parameters. If set to <i>True</i> , configure the <i>Oracle TNSNAMES File</i> and <i>Oracle TNSNAMES Connection</i> parameters.<br><br>The default value is <i>False</i> . |
|          | Host                            | The host name or IP address on which the remote Oracle database is running.<br><br>The value of this parameter can be changed when the remote source is suspended.                                                                                                                                                                                                                                                              |
|          | Port Number                     | The Oracle database server port number                                                                                                                                                                                                                                                                                                                                                                                          |
|          | Database Name                   | The Oracle database name                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | Service Name                    | Specifies the service name of Oracle database. When creating a remote source, you must set only one of the following parameters: <i>Database Name</i> and <i>Service Name</i> . If you set both, the Data Provisioning agent connects to Oracle by the service name as the first choice.                                                                                                                                        |
|          | Container Database Service Name | The service name of the container database                                                                                                                                                                                                                                                                                                                                                                                      |
|          | Pluggable Database Service Name | The service name of the pluggable database                                                                                                                                                                                                                                                                                                                                                                                      |
|          | Oracle TNSNAMES File            | The full path of the Oracle <code>tnsnames.ora</code> file. For example, <code>C:\usr\sap\dataprovagent\lib\tnsnames.ora</code> .                                                                                                                                                                                                                                                                                               |

**Note**

The `tnsnames.ora` file must be local to the Data Provisioning Agent machine or available to the

| Category            | Option                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     |                                        | <p>Data Provisioning Agent. Copy the file from the Oracle location to the Agent machine.</p> <p>The <code>tnsnames.ora</code> file is typically located at <code>\$ORACLE_HOME\NETWORK\ADMIN\tnsnames.ora</code> on the Oracle database machine.</p>                                                                                                                                                                                                                                                                                         |
|                     | Oracle TNSNAMES Connection             | The Oracle connection name that identifies the primary database connection in the Oracle <code>tnsnames.ora</code> file.                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                     | Container Database TNSNAMES Connection | The Oracle connection name that identifies the container database connection in the Oracle <code>tnsnames.ora</code> file.                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                     | Pluggable Database TNSNAMES Connection | The Oracle connection name that identifies the pluggable database connection in the Oracle <code>tnsnames.ora</code> file.                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                     | Allowlist Table in Remote Database     | Enter the name of table that contains the allowlist in the remote database.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                     | NLS Date Format in Oracle              | The Oracle NLS date format that specifies the default date format to use with the <code>TO_CHAR</code> and <code>TO_DATE</code> functions. For example, <code>yyyy-mm-dd</code> .                                                                                                                                                                                                                                                                                                                                                            |
| LDAP Authentication | Use LDAP Authentication                | <p>Set to <i>True</i> to enable LDAP authentication for the Oracle database. The default is <i>False</i>.</p> <div style="border: 1px solid #ccc; padding: 10px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>The Oracle log reader adapter doesn't support the following LDAP scenarios:</p> <ul style="list-style-type: none"> <li>• Oracle multi-tenant architecture</li> <li>• LDAP + SSL authentication</li> <li>• LDAP + Kerberos authentication</li> <li>• LDAP failover mode</li> </ul> </div> |
|                     | LDAP Server                            | The host name or IP address of the LDAP server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Category                  | Option                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | LDAP Port                              | The port number of the LDAP server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                           | Database Service Name                  | The service name of the Oracle database                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                           | Base Distinguished Name (DN)           | The base distinguished name of a directory user on the LDAP server for authentication.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Schema Alias Replacements | Schema Alias                           | <p>Schema name to be replaced with the schema provided in the <a href="#">Schema Alias Replacement</a> parameter. If given, accessing tables under this alias is considered to be accessing tables under the schema given in <a href="#">Schema Alias Replacement</a>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                           |
|                           | Schema Alias Replacement               | <p>Schema name to be used to replace the schema given in <a href="#">Schema Alias</a>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                                           |
| Security                  | Use SSL                                | <p>Specifies whether you're using SSL.</p> <p>The default value is <a href="#">False</a>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                                        |
|                           | Distinguished Name (DN) in Certificate | <p>The distinguished name (DN) of the primary data server certificate.</p> <div> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>This parameter is valid only if <a href="#">Use SSL</a> is set to <a href="#">True</a>.</li> <li>If this parameter is set, the DN field in the server certificate is verified to match this parameter. If it doesn't match, the connection to the primary data server fails.</li> </ul> </div> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|                           | Require Client Authentication          | Specifies whether client authentication is required. If client authentication is required, the client sends its own                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Category                                | Option                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         |                                   | <p>certificate to the server and the server verifies that the client certificate is signed by a trusted CA.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                           |
|                                         | Use Agent Stored Credential       | <p>Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.</p> <p>The default value is <i>False</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>When you use credentials stored in the agent secure storage, you must still specify the user name in <i>Credentials</i>. Additionally, the <i>Credential Mode</i> must not be <i>none</i> or empty.</p> </div> |
| JDBC Driver Configuration               | Include Table/Columns Remarks     | <ul style="list-style-type: none"> <li><i>True</i>: Returns a description of the table/column. If you've many tables, setting this parameter to "True" can impede performance.</li> <li><i>False</i> (Default): Turns off the return of descriptions.</li> </ul> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                    |
| CDC Properties > Database Configuration | Oracle Supplemental logging level | <p>Specifies the level of supplemental logging.</p> <ul style="list-style-type: none"> <li><i>Table</i>: Enables supplemental logging for subscribed tables and some required system tables.</li> <li><i>Database</i>: Enables supplemental logging for all tables including system tables.</li> </ul> <p>The default value is <i>Table</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                    |
| CDC Properties > Parallel Scan          | Enable parallel scanning          | <p>Specifies whether to enable parallel scanning.</p>                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Category | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                          | <p>To achieve better performance for high volume log throughput, set the parameter to <i>True</i> to enable parallel scanning.</p> <p>The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                              |
|          | Number of parallel scanners              | <p>Specifies the number of parallel scanners. The value range is 1–250.</p> <p>As a general rule, the more scanners you've , the higher the memory usage and the better the throughput. Fewer scanners means less memory usage and lower throughput.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                  |
|          | Queue size of parallel scan tasks        | <p>Specifies the number of tasks in the queue. The value range is 0–2147483647 .</p> <p>Setting <i>Queue size of parallel scan tasks</i> to zero (0) means that each parallel scanner queue is of unlimited size (based on the <i>SCN range of parallel scan tasks</i> parameter). This puts many records in the queue and, because processing the queue is slower, the scanned records pile up and can lead to out-of-memory events.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Enable parallel scanning by archived log | <p>Determines whether the Replication Agent runs parallel Oracle LogMiner scanners using archive logs.</p> <p>This option takes effect when <i>Enable parallel scanning</i> is set to <i>True</i>, <i>Enable parallel scanning</i> by archived log is set to <i>True</i>.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                          |

| Category       | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |                                          | <p>When <i>Enable parallel scanning</i> by archived log is set to <i>True</i>, Redo logs with a “current” status are never touched. Oracle Logminer may read transactions from a redo log that has a status of <code>archived=yes</code>. There may be a delay in replication until the redo logs get saved to an archived status.</p> <div style="border: 1px solid #0070C0; padding: 5px; margin-bottom: 5px;"> <p><b>Note</b></p> <p>This parameter isn't supported for an Oracle RAC remote source.</p> </div> <div style="border: 1px solid #0070C0; padding: 5px; margin-bottom: 5px;"> <p><b>Note</b></p> <p>Use this option only after consultation with SAP support.</p> </div> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|                | SCN range of parallel scan tasks         | <p>The maximum number of system change numbers (SCN) processed by each Oracle LogMiner scanner when the <i>Enable parallel scanning</i> parameter is set to <i>True</i>. The value range is 0–2147483647 .</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| CDC Properties | Capture mode                             | <ul style="list-style-type: none"> <li>• <i>Trigger</i>: Choose <i>Trigger</i> to enable trigger-based change data capture.</li> <li>• <i>LogMiner</i>: Choose <i>LogMiner</i> to enable log-based change data capture.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                | Enable ABAP Manageable Trigger Namespace | <ul style="list-style-type: none"> <li>• <i>False</i>: (default)</li> <li>• <i>True</i> : If the source is an ABAP system, triggers created by SAP HANA Smart Data Integration should match the name pattern of the ABAP system so that system can manage triggers if there is an upgrade, for example. Set the name pattern in the parameter <i>ABAP Manageable Trigger Namespace</i>.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                              |

| Category | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | ABAP Manageable Trigger Namespace        | <p>Only configurable when <i>Enable ABAP Manageable Trigger Namespace</i> is set to <i>true</i>.</p> <p>Type: String, case insensitive</p> <p>Default Value: /1DI/</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|          | Maintenance User Filter (Case Sensitive) | <p>Optional. Enter one or more source database user names. Source database transactions (INSERT, UPDATE, DELETE, and DDL changes such as ALTER TABLE) conducted by these users are filtered out (ignored) and not propagated to the SAP HANA target. For example, if you log in to the source database with a maintenance user and delete a row from a source table that is subscribed for replication, this row isn't deleted from the SAP HANA target table.</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>Don't use the same name as the database user name.</p> </div> <p>The value of this parameter can be changed when the remote source is suspended.</p> <p>Specify multiple user names by separating them with a double quote character ("). For example, for maintenance users named <b>MAINT_USER</b> and <b>APP_USER</b>:</p> <div style="background-color: #f0f0f0; padding: 5px;"> <pre>MAINT_USER " APP_USER</pre> </div> |
|          | Ignore log record processing errors      | <p>Specifies whether the Log Reader ignores the errors that occur during log record processing. If set to <i>True</i>, the replication doesn't stop if log record processing errors occur. The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Category | Option                                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Ignore log record declustering errors                      | <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px; margin-bottom: 10px;"> <p><b>Note</b></p> <p>This parameter is available only when you're using the Oracle Log Reader ECC adapter.</p> </div> <p>Specifies whether to ignore log record declustering errors. If set to <i>True</i>, the replication doesn't stop if log record declustering errors occur. The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Maximum operation queue size                               | <p>The maximum number of operations permitted in the log reader operation queue during replication. The value range is 25–2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                     |
|          | Maximum scan queue size                                    | <p>The maximum number of log records permitted in the log reader log scan queue during replication. The value range is 25–2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                     |
|          | Maximum session cache size                                 | <p>The maximum number of Oracle sessions to be cached in memory during replication. The value range is 128–2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                    |
|          | Number of log record rows fetched by the scanner at a time | <p>Specifies the number of log record rows fetched by the scanner. The value range is 1–1000 .</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                            |
|          | Use database link to query pluggable database              | <p>Indicates whether the LogReader uses database link instead of the CONTAINERS clause to query the</p>                                                                                                                                                                                                                                                                                                                                                                                                              |



| Category | Option                                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                           | <p>pluggable database. The default value is "true".</p> <p>This parameter takes effect only when the <i>Multitenant Database</i> parameter is set to <i>True</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin: 10px 0;"> <p><b>Note</b></p> <p>Ensure that the user is granted the <code>GRANT CREATE DATABASE LINK to C##LR_USER;</code> permission, located in the <code>oracle_multitenant_init_example_for_pluggable_database.sql</code> file.</p> </div> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Ignore data of unsupported types stored in ANYDATA        | <p>Specifies whether you want to ignore data with unsupported types contained in the ANYDATA wrapper.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                                  |
|          | Sequence cache size                                       | <p>If <i>Sequence cache size</i> is set to a value of &gt; 0, it creates sequence objects using the statement <code>CREATE SEQUENCE ... CACHE &lt;cache size&gt; ...</code>, where <code>&lt;cache size&gt;</code> equals the value you entered for the <i>Sequence cache size</i> parameter.</p>                                                                                                                                                                                                                                                                                                 |
|          | Connection pool size                                      | <p>Maximum number of connections allowed in the connection pool on a secondary node. The value range is 1–64.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                          |
|          | Number of times to retry to connect if a connection fails | <p>Instructs the client library, such as DBLIB, ODBC, and ADO, to keep retrying the connection attempt, as long as the server isn't found, for the specified number of times. The value range is 1–2147483647.</p>                                                                                                                                                                                                                                                                                                                                                                                |

| Category | Option                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                        | The value of this parameter can be changed when the remote source is suspended.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|          | Timeout in seconds to retry connecting | <p>The number of seconds the Data Provisioning Agent waits between retry attempts to connect to the primary database. The value range is 1–3600.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|          | Keep supplemental logging on table     | <p>Determines whether the Data Provisioning Agent drops the supplemental logging when dropping the subscription of a table.</p> <ul style="list-style-type: none"> <li>• <i>True</i>: Keeps the supplemental logging.</li> <li>• <i>False</i>: Drops the supplemental logging. (Default value)</li> </ul> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|          | Enable deferrable rescan               | <p>By default, the Oracle adapter performs a rescan when encountering each invalid log record due to an Oracle LogMiner restriction. If there are many invalid log records in a transaction, the rescanning process may become a performance bottleneck. Deferred rescan provides a performance enhancement that performs a rescanning only one time per transaction to resolve all invalid log records together. Deferred rescan can also solve some types of invalid record problems in parallel scanning mode.</p> <div style="border-left: 2px solid orange; padding-left: 10px; margin-top: 10px;"> <p><b>⚠ Caution</b></p> <p>Before using this feature, SAP Support must analyze to identify the root cause of performance issues and determine whether it's appropriate to enable deferrable rescan mode. Use the two deferrable rescan options only after consultation with SAP support.</p> </div> |

| Category | Option                                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                            | <ul style="list-style-type: none"> <li>• <i>True</i>: If it encounters UNSUPPORTED LogMiner operations, it performs a deferred rescan on the current transaction.</li> <li>• <i>False</i>: Disables the deferred rescan and uses the default transaction processing logic. (Default value)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|          | Start LogMiner with online dictionary in deferrable rescan | <p>By default, the Oracle adapter performs a rescan when encountering each invalid log record due to an Oracle LogMiner restriction. If there are many invalid log records in a transaction, the rescanning process may become a performance bottleneck. Deferred rescan provides a performance enhancement that performs a rescanning only one time per transaction to resolve all invalid log records together. Deferred rescan can also solve some types of invalid record problems in parallel scanning mode.</p> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>⚠ Caution</b></p> <p>Before using this feature, SAP Support must analyze to identify the root cause of performance issues and determine whether it's appropriate to enable deferrable rescan mode. Use the two deferrable rescan options only after consultation with SAP support.</p> </div> <ul style="list-style-type: none"> <li>• <i>True</i> Indicates that the deferred rescan on the current transaction uses the LogMiner DBMS_LOGMNR.DICT_FROM_ONLINE_CATALOG option. (Default value)</li> <li>• <i>False</i> Indicates that the deferred rescan on the current transaction doesn't use the LogMiner DBMS_LOGMNR.DICT_FROM_ONLINE_CATALOG option.</li> </ul> <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>📌 Note</b></p> <p>Use this option only after consultation with SAP support.</p> </div> |
|          | Disable DDL scanner                                        | Disable scanning for DDL operations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Category | Option                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Enable rescan for rollback operations         | Enable rescanning for rollback operations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|          | Allow to read Oracle SYS.USER\$               | <p>Specifies whether the log reader can access SYS.USER\$ for Oracle user identification.</p> <ul style="list-style-type: none"> <li><i>True</i> Indicates that the log reader can access SYS.USER\$ directly.</li> <li><i>False</i> Indicates that the log reader must use a different view for user identification.<br/>The name of the view must be specified in the <i>View to obtain users information</i> parameter.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|          | View to obtain users information (Upper Case) | <p>Specifies the name of the view to use for user identification (upper case). This option takes effect when <i>Allow to read Oracle SYS.USER\$</i> is set to <i>False</i>.</p> <p>The default value is <i>RA_ALL_USERS_VIEW</i>. The template for the creation of this view can be found in <code>oracle_init_example.ini</code>.</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>This view must be created in the current database user schema and named in all upper-case characters.</p> </div> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The default view is based on ALL_USERS. Although this view requires lesser permission privileges, it may not include all Oracle users and may affect the replication process.</p> </div> |
|          | Trigger-based: System object prefix           | (Case Insensitive) The prefix of the names of the Oracle adapter system objects created in the source Oracle database by the adapter. We recommend keeping the default value of <code>SDL_</code> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | Trigger-based: Connection pool size           | Maximum number of connections allowed in the connection pool. The default value is 8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Category | Option                                           | Description                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                  | The value of this parameter can be changed when the remote source is suspended.                                                                                                                                                                                                                                                                                                                          |
|          | Trigger-based: Minimum scan interval in seconds  | <p>The minimum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 0 (seconds), which means there's is no waiting time before the next scan.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                          |
|          | Trigger-based: Maximum scan interval in seconds  | <p>The maximum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value 10 (seconds). If the adapter scans the queue and finds that the queue is empty, it gradually increases the scan interval from the minimum scan interval to the maximum scan interval.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Trigger-based: Maximum batch size                | <p>The maximum number of consecutive change data on the same table that are batched to process and send to Data Provisioning Server together. The default value is 128.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                       |
|          | Trigger-based: Batch queue size                  | <p>The internal batch queue size. The batch queue size determines the maximum number of batches of change data that are queued in memory. The default value is 64.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                            |
|          | Trigger-based: Maximum transaction count in scan | The maximum number of transactions being processed in a scan of the remote source database. The default value is 1000.                                                                                                                                                                                                                                                                                   |

| Category | Option                                                                              | Description                                                                                                                                                                                                                                                                                                                       |
|----------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                                                     | The value of this parameter can be changed when the remote source is suspended.                                                                                                                                                                                                                                                   |
|          | Trigger-based: Maximum scan size                                                    | <p>The maximum number of rows being fetched from the trigger queue table in one scan and assigned to batch jobs for further processing. The default value is 50000.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                    |
|          | Trigger-based: Enable compound trigger                                              | <p>Select <i>True</i> to create compound triggers on source tables, instead of row-level triggers by default. This can improve the performance of bulk DML changes on source tables.</p> <p>The default value is <i>False</i>.</p>                                                                                                |
|          | Trigger-based: Merge before and after images of update into one row in shadow table | <p>Select <i>True</i> to generate only a single merged row when processing UPDATE operations from the source database. By default, shadow table rows are generated for both the before and after images of UPDATE operations.</p> <p>The default value is <i>False</i>.</p>                                                       |
|          | Trigger-based: Triggers record PK only                                              | <p>Set to <i>True</i> to have the triggers record only primary keys of delta data during CDC processing. This action may improve the DML performance in the source database.</p> <p>The default value is <i>False</i>.</p>                                                                                                        |
|          |                                                                                     | <p><b>Note</b></p> <p>If this parameter is set to <i>False</i>, during the time period between when DDL changes occur on the source database and when they're replicated to the target HANA database, there must be no DML changes on the subscribed source tables. Replicating DDL changes would trigger the Oracle trigger-</p> |

| Category | Option                                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                               | <p>based adapter to update (drop and then re-create) triggers and shadow tables on the changed source tables. Errors may result if any data is inserted, updated, or deleted on the source tables during this time period.</p> <p>If this parameter is set to <i>True</i> simple table structure changes (for example, adding a non-key field) is supported in real time.</p> <p>To support UPDATE primary key values in this mode, you need to set <i>Capture before and after images</i> to <i>True</i>.</p>                                                                                                                                                                                          |
|          | <p>Trigger-based: Triggers record ROWID pseudocolumn only</p> | <p>Setting this parameter to <i>True</i> causes the Oracle scanner to capture only the ROWID pseudo column value for newly inserted and updated rows and can improve performance.</p> <div style="border: 1px solid #ccc; padding: 5px;"> <p><b>Note</b></p> <p>This parameter works only if <i>Capture mode</i> is set to <i>Trigger</i>, and <i>Triggers Record PK Only</i> is set to <i>False</i>.</p> </div> <p>You may need to split tables to another remote source; this parameter works only on tables with no primary key. The <i>Triggers Record PK Only</i> parameter works only on tables with a primary key.</p> <p>The default value is <i>False</i>.</p> |
|          | <p>Trigger-based: Capture before and after images</p>         | <ul style="list-style-type: none"> <li>• <i>True</i>: A trigger captures both before and after images of UPDATE operations on the remote table. Updates of primary key values are also supported, when this is set to True.</li> <li>• <i>False</i>: A trigger captures only the after image of UPDATE operations on the remote table.</li> </ul>                                                                                                                                                                                                                                                                                                                                                       |

| Category | Option                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                           | <p><b>Note</b></p> <p>This option is only valid when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|          | Trigger-based: Triggers record LOB values | <ul style="list-style-type: none"> <li><i>True</i>: The trigger-based adapter directly captures LOB data with other data types.</li> <li><i>False</i>: The trigger-based adapter refetches LOB data to improve performance.</li> </ul> <p><b>Note</b></p> <p>This option is valid only when <i>Triggers Record PK Only</i> and <i>Triggers Record ROWID Pseudocolumn Only</i> are set to <i>False</i>.</p> <p>The default value is <i>False</i>.</p> <p><b>Tip</b></p> <p>We recommend setting this parameter to <i>True</i> only when replicating SAP ECC cluster tables. For most other cases, we recommend keeping the default value of <i>False</i>.</p> |
|          | Enable shadow table partition             | <p>When set to <i>True</i>, this creates a shadow table with a hash partition.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|          | Number of shadow table partitions         | <p>This parameter is active when <i>Enable shadow table partition</i> is set to <i>True</i>.</p> <p>For optimal load balancing, specify a number of partitions that is a power of 2.</p> <p>The default value is 2.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|          | Enable trigger queue table partition      | <p>When set to <i>True</i>, this creates a trigger queue table with a hash partition.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



| Category                                    | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             | Number of trigger queue table partitions | <p>This parameter is active when <i>Enable trigger queue table partition</i> is set to <i>True</i>.</p> <p>For optimal load balancing, specify a number of partitions that is a power of 2.</p> <p>The default value is <i>2</i>.</p>                                                                                                                                                                                                   |
|                                             | Transmit data in compact mode            | <p>When set to <i>True</i>, the adapter packs and sends out the data of one table together in one scan round. However, doing so breaks referential integrity among tables.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                |
|                                             | Enable transaction merge                 | <p>When set to <i>True</i>, transactions on the same remote table are grouped together into one transaction in each scan round and replicated to the target.</p> <p>When set to <i>False</i>, transactions are replicated as is.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                          |
| Credentials                                 | Credentials Mode                         | <p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li>• <i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li>• <i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul> |
| Credentials > Oracle Connection Credential  | User Name                                | Oracle user name (case-sensitive)                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                             | Password                                 | <p>Oracle user password</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                                                                                                                                                      |
| Credentials > Oracle Multitenant Credential | Common User Name                         | The common user name in the container database (case-sensitive)                                                                                                                                                                                                                                                                                                                                                                         |
|                                             | Common User Password                     | The common user password in the container database                                                                                                                                                                                                                                                                                                                                                                                      |

| Category | Option | Description                                                                     |
|----------|--------|---------------------------------------------------------------------------------|
|          |        | The value of this parameter can be changed when the remote source is suspended. |

## SQL Example

```
CREATE REMOTE SOURCE "oracleadapter1" ADAPTER "OracleLogReaderAdapter" AT
LOCATION AGENT "MyAgentLocal" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="map_char_types_to_unicode"
displayName="map_char_types_to_unicode" isRequired="true">false</PropertyEntry>
    <PropertyEntry name="pds_host_name" displayName="Host"
isRequired="true">10.10.10.10</PropertyEntry>
    <PropertyEntry name="pds_port_number" displayName="Port Number"
isRequired="true">1521</PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database Name"
isRequired="true">or1211a</PropertyEntry>
    <PropertyEntry name="capture_mode" displayName="Capture Mode"
isRequired="true">logminer</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="logreader" displayName="LogReader">
    <PropertyEntry name="lr_parallel_scan" displayName="Enable parallel
scanning" isRequired="false">true</PropertyEntry>
    <PropertyEntry name="lr_parallel_scanner_count" displayName="Number of
parallel scanners" isRequired="false">4</PropertyEntry>
    <PropertyEntry name="lr_parallel_scan_queue_size" displayName="Queue
size of parallel scan tasks" isRequired="false">0</PropertyEntry>
    <PropertyEntry name="lr_parallel_scan_range" displayName="SCN range of
parallel scan tasks" isRequired="false">1024</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>LR_USER</user>
  <password>mypassword123</password>
</CredentialEntry>';
```

## Related Information

[CREATE REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 639\]](#)

[Creating Secondary User Credentials](#)

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

[Security Aspects of SAP HANA Smart Data Access \(SAP HANA Security Guide\)](#)

[Creating an Allowlist to Limit Access to a Source Database \[page 474\]](#)

[Using a Schema Alias \[page 467\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 91\]](#)

[Store Remote Data Source Credentials Securely \[page 68\]](#)

## 6.2.19.5 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database (for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

### Related Information

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

[SAP HANA Remote Source Configuration \[page 529\]](#)

[SAP ASE LTL Remote Source Configuration \[page 505\]](#)

## 6.2.19.6 Oracle RAC Configuration

Configure an Oracle Real Application Cluster (RAC) source by, among other requirements, setting up the tnsnames.ora file.

When a Data Provisioning Adapter for an Oracle instance initializes, the Oracle database is queried to determine how many nodes are supported by the cluster. Based on this information, the Data Provisioning Adapter automatically configures itself to process the redo log information from all nodes.

You configure the Data Provisioning Adapter to connect to a single Oracle instance by supplying the required *Host*, *Port Number*, and *Database Name* remote source configuration parameters. However, in an Oracle RAC environment, the Data Provisioning Adapter must be able to connect to any node in the cluster in the event

that a node fails or otherwise becomes unavailable. To support the configuration of multiple node locations, the Data Provisioning Adapter supports connectivity to all possible RAC nodes by obtaining necessary information from an Oracle `tnsnames.ora` file for one specified entry. As a result, instead of configuring individual host, port, and instance names for all nodes, the Data Provisioning Adapter requires only the location of a `tnsnames.ora` file and the name of the TNS connection to use. Therefore, it's recommended that you point the Data Provisioning Adapter to a `tnsnames.ora` entry that contains the address for all nodes in the cluster.

Refer to the following procedure for details on the correct configuration for an Oracle RAC source.

## Related Information

[Configure an Oracle RAC source \[page 468\]](#)

### 6.2.19.6.1 Configure an Oracle RAC source

Configure the remote source for Oracle Real Application Cluster (RAC) as follows.

#### Procedure

1. Use the `tnsnames.ora` file to connect to Oracle, instead of providing individual host names and SIDs, by setting the remote source property `Database > Use TNSNAMES file` to `true`.
2. Ensure the `tnsnames.ora` file includes details for all nodes.

```
RAC11G =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (LOAD_BALANCE = yes)
      (FAILOVER = ON)
      (ADDRESS = (PROTOCOL = TCP)(HOST = www.xxx.yyy.zz1)
        (PORT = 1521))
      (ADDRESS = (PROTOCOL = TCP)(HOST = www.xxx.yyy.zz2)
        (PORT = 1521))
      (ADDRESS = (PROTOCOL = TCP)(HOST = www.xxx.yyy.zz3)
        (PORT = 1521))
    )
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = rac11g)
    )
  )
```

3. Configure `tnsnames.ora` with the entry of the global SID to the remote source.

```
<net_service_name> =
  (DESCRIPTION =
    (ADDRESS = (<protocol_address_information>))
    (CONNECT_DATA =
      (SERVICE_NAME = <service_name>))
  )
```

For example:

```
ABC =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = hostname.com)(PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = ABC) ) )
```

4. If the Data Provisioning Agent and Oracle source are on different computers, for all versions up to and including HANA DP AGENT 1.0 SP03 Patch 2 (1.3.2), set the parameter [CDC Properties](#) > [Database Configuration](#) > [Oracle Timezone File](#) to a location that the Data Provisioning Agent can access. Note that the [Oracle Timezone File](#) parameter was removed in version HANA DP AGENT 1.0 SP03 Patch 3 (1.3.3).
5. Set the parameter [Database](#) > [Oracle TNSNAMES Connection](#) to use `<net_service_name>`.
6. Set the location of the [Database](#) > [Oracle TNSNAMES File](#) to `tnsnames.ora`. This location must be available to the Data Provisioning Agent computer.  
  
`Oracle TNSNAMES file = /usr/sap/dataprovagent/tnsnames.ora`
7. For HANA DP AGENT 1.0 versions SP00, SP01, and SP02, edit the `dpagentconfig.ini` file to include the entry `logreader.rasd.type=DERBYEMB` and restart the DP Agent.

## 6.2.19.7 Amazon Web Services Configuration

Extra configuration steps and tips for Oracle on Amazon Relational Database Service (RDS).

### Procedure

1. To avoid remote access issues, in Amazon RDS ensure the database instance setting [Publicly Accessible](#) has been enabled.
2. To avoid remote access issues, in Amazon RDS configure the security group as follows.
  - a. Open the EC2 console.
  - b. Select [Security Group](#) in the left pane.
  - c. Choose the Security Group ID.
  - d. Click the [Inbound](#) tab and click [Edit](#).
  - e. Click [Add Rule](#) and configure the following options:
    - [Type](#) = [Oracle-RDS](#)
    - [Source](#) = [Anywhere](#)
  - f. Click [Save](#).
3. Grant access rights as described in the `oracle_init_example.sql` template file, which is located in the Data Provisioning Agent installation folder `<DPAgent_root>\LogReader\scripts`.
4. Enable database-level supplemental logging as described in the `oracle_init_example.sql` template file in `<DPAgent_root>\LogReader\scripts`.

## Related Information

[Oracle Database Permissions \[page 430\]](#)

[Oracle Supplemental Logging \[page 438\]](#)

[Amazon Virtual Private Cloud \(VPCs\) and Amazon RDS](#) ➔

[Controlling Access with Amazon RDS Security Groups](#) ➔

## 6.2.19.8 Log Reader Adapter Log Files

You can review processing information in the Log Reader log files.

The following files are available:

| Log file name and location                                                            | Description                   |
|---------------------------------------------------------------------------------------|-------------------------------|
| <code>&lt;DPAgent_root&gt;/LogReader/admin_logs/admin&lt;instance_name&gt;.log</code> | Log Reader administration log |
| <code>&lt;DPAgent_root&gt;/log/&lt;instance_name&gt;.log</code>                       | Log Reader instance log       |

### Note

By default, the adapter instance name is the same as the remote source name when the remote source is created from the SAP HANA Web-based Development Workbench.

## 6.2.19.9 Synchronize the Oracle and Data Provisioning Agent Timestamp

### Context

If there is timestamp with a local time zone column in an Oracle table, the Data Provisioning Agent must have the same time zone. To change the timezone, use the following procedure before starting the Data Provisioning Agent.

### Procedure

1. Find the Oracle server time zone. For example, use “date -R” in linux. Example: -04:00.
2. Open the `dpagent.ini` file in Data Provisioning Agent install root directory.

3. Add "-Duser.timezone=GMT-4" to the `dpagent.ini` file.
4. Start the Data Provisioning Agent.

## 6.2.19.10 Configure SSL for the Oracle Log Reader Adapter

Set up secure SSL communication between Oracle and the Data Provisioning Agent.

### Context

If you want to use SSL communication between your Oracle source and the Data Provisioning Agent, you must create and import certificates and configure the source database.

#### Note

The SSLv3 protocol is disabled by default in JDK 8 Update 31 and newer. If SSLv3 is absolutely required for your environment, you can reactivate the protocol by removing `SSLv3` from the `jdk.tls.disabledAlgorithms` property in the `java.security` file.

### Procedure

1. On the Oracle source database host, create directories for the root certificate authority (CA) and server certificates.

For example:

- `c:\ssl\oracle\root`
- `c:\ssl\oracle\server`

2. Create and export a self-signed CA certificate.

Use the `orapki` tool on the Oracle host system.

- a. Create an empty wallet.

```
orapki wallet create -wallet c:\ssl\oracle\server -auto_login_only
```

- a. Add a self-signed CA certificate to the new wallet.

```
orapki wallet add -wallet c:\ssl\oracle\root -dn "CN=test_ca,C=US" -keysize 1024 -self_signed -validity 3650 -pwd <password>
```

- b. Export the certificate.

```
orapki wallet export -wallet c:\ssl\oracle\root -dn "CN=test_ca,C=US" -cert c:\ssl\oracle\root\cacert.cer -pwd <password>
```

3. Create the server certificate.

Use the `orapki` tool on the Oracle host system.

- a. Create a server wallet.

```
orapki wallet create -wallet c:\ssl\oracle\server -auto_login_only
```

- b. Add key pairs to the new server wallet.

```
orapki wallet add -wallet c:\ssl\oracle\server -dn  
"CN=PVG50869480A.SAP.COM,C=US" -keysize 1024 -auto_login_only
```

- c. Export a request to sign the server certificate.

```
orapki wallet export -wallet c:\ssl\oracle\server  
-dn "CN=PVG50869480A.SAP.COM,C=US" -request  
c:\ssl\oracle\server\server_req.cer
```

- d. Sign the exported request using the CA certificate.

```
orapki cert create -wallet c:\ssl\oracle\root  
-request c:\ssl\oracle\server\server_req.cer -cert  
c:\ssl\oracle\server\server_cert.cer -validity 3650 -pwd <password>
```

- e. Add the trusted CA certificate into server wallet.

```
orapki wallet add -wallet c:\ssl\oracle\server -trusted_cert -cert  
c:\ssl\oracle\root\cacert.cer -auto_login_only
```

- f. Add the server certificate into server wallet.

```
orapki wallet add -wallet c:\ssl\oracle\server -user_cert -cert  
c:\ssl\oracle\server\server_cert.cer -auto_login_only
```

#### 4. Configure Oracle server SSL (Optional, if not yet set up).

- a. Configure the listener.ora file.

```
WALLET_LOCATION =  
  (SOURCE =  
    (METHOD = FILE)  
    (METHOD_DATA = (DIRECTORY = C:\ssl\oracle\server)  
    )  
  )  
LISTENER =  
  (DESCRIPTION_LIST =  
    (DESCRIPTION =  
      (ADDRESS = (PROTOCOL = TCP)(HOST = PVGN50869480A.SAP.COM)(PORT =  
1521))  
      (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1521))  
      (ADDRESS = (PROTOCOL = TCPS)(HOST = PVGN50869480A.SAP.COM)(PORT =  
2484))  
    )  
  )  
  
SSL_CLIENT_AUTHENTICATION = FALSE  
SSL_CIPHER_SUITES = (SSL_RSA_WITH_RC4_128_SHA) (1)
```

- b. Configure the tnsnames.ora file.

```
ssl =  
  (DESCRIPTION =  
    (ADDRESS = (PROTOCOL = TCPS)(HOST = PVGN50869480A.SAP.COM)(PORT =  
2484))  
    (CONNECT_DATA =  
      (SERVER = DEDICATED)  
      (SERVICE_NAME = ORCL)  
    )  
  )
```



```
(SSL_SERVER_CERT_DN = "CN=PVG50869480A.SAP.COM,C=US" )
```

- a. Configure the `sqlnet.ora` file.

```
SQLNET.AUTHENTICATION_SERVICES= (BEQ, TCPS, NTS)
SSL_CLIENT_AUTHENTICATION=FALSE
SSL_CIPHER_SUITES = (SSL_RSA_WITH_RC4_128_SHA) (1)
WALLET_LOCATION =
  (SOURCE =
    (METHOD = FILE)
    (METHOD_DATA = (DIRECTORY = C:\ssl\oracle\server)
  )
)
```

5. Configure SSL for the Data Provisioning Agent.

Use the Java `keytool` utility to configure the agent keystore. By default, `keytool` is located in `$JAVA_HOME/bin`.

- a. Copy and import the CA certificate.

```
keytool -importcert -keystore C:\usr\sap\dataprovagent\ssl\cacerts
-storepass changeit -file c:\ssl\oracle\root\cacert.cer -noprompt -alias
ora_ca_cert
```

- b. Copy and import the server certificate.

```
keytool -importcert -keystore C:\usr\sap\dataprovagent\ssl\cacerts
-storepass changeit -file c:\ssl\oracle\server\server_cert.cer -noprompt
-alias ora_srv_cert
```

6. Set the allowed cipher suites in the `dpagentconfig.ini` file.

```
oracle.net.ssl_cipher_suites=SSL_RSA_WITH_RC4_128_SHA
```

For TLS cipher protocols, add the additional `jdk.tls.client.protocols` parameter to the `dpagentconfig.ini` file. For example:

```
jdk.tls.client.protocols=TLSv1.2
```

7. Restart the Oracle listener and the Data Provisioning Agent.

## Next Steps

When you create an Oracle remote source, ensure that the following parameters are set appropriately:

- **Use SSL:** `true`
- **Distinguished Name (DN) in Certificate:** The distinguished name must contain no quotes, and there must be a space between CN and C. For example, `CN= . . . , C= . . .`

## Related Information

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

## 6.2.19.11 Creating an Allowlist to Limit Access to a Source Database

There are times when you might want to limit access to all of the tables in a source database. For data provisioning log reader adapters as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create an allowlist.

Restricting access to only those tables that are to be replicated is done by creating an allowlist of source database objects in a separate table.

### Note

The allowlist impacts only the virtual table created and the replications created after the allowlist was created.

You can use SQL to create the allowlist table.

### Note

- The allowlist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and ALLOWLIST.
- The allowlist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of an allowlist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of allowlisted tables for a single remote source.

## Microsoft SQL Server Example

```
create table allowlist(REMOTE_SOURCE_NAME varchar(128), ALLOWLIST varchar(4000));
```

To add an allowlist for the remote source called "localmssqldb", insert a row into the allowlist table:

```
insert into allowlist values('localmssqldb', 'object.A, object.B*');  
insert into allowlist values('localmssqldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source "localmssqldb".

## SAP HANA Example

```
create schema SAP_RESTRICTIONS;
```

```
create table ALLOW_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, ALLOWLIST
varchar(4000));
```

To add an allowlist for the remote source called "localhadp", insert a row into the allowlist table:

```
insert into ALLOW_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT,APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source localhadp.

## 6.2.19.12 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. In the *Agent Preferences* menu, choose *Set Agent Preferences*.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:
```

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Agent Configuration Parameters \[page 112\]](#)

## 6.2.20 PostgreSQL Log Reader

Use the PostgreSQL Log Reader adapter to batch load or replicate changed data in real time from a PostgreSQL database to SAP HANA.

PostgreSQL, often referred to as “Postgres”, is an object-relational database management system (ORDBMS) with an emphasis on extensibility and standards compliance.

The PostgreSQL adapter is designed for accessing and manipulating data from a PostgreSQL database.

## Assign PostgreSQL Roles

The PostgreSQL adapter remote source user must be granted the following roles:

Table 61: PostgreSQL Roles

| Role               | Notes                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>REPLICATION</b> | Required in all scenarios.                                                                                                                                                                                               |
| <b>SUPERUSER</b>   | Required only if the <i>Enable DDL replication</i> remote source property is set to <b>TRUE</b> .                                                                                                                        |
|                    | <b>Note</b><br>The default value for this property is <b>TRUE</b> .                                                                                                                                                      |
| Table Owner        | Required only if the <b>SUPERUSER</b> role is not granted to the remote source user.<br><br>For example, if table <b>TABLE1</b> was created by role <b>ROLE1</b> , the remote source user must be granted <b>ROLE1</b> . |

## Adapter Functionality

This adapter supports the following functionality:

- Supports the following SQL statements: SELECT, INSERT, UPDATE, and DELETE
- Virtual table as a source, using a Data Source node in a flowgraph
- Real-time change data capture (CDC)
- Virtual table as a target using a Data Sink node in a flowgraph
- Batch loads (only) are supported for Greenplum databases.
- Replication monitoring and statistics
- DDL replication

### Restriction

Source transactions that contain both DDL (such as ALTER TABLE) and DML (INSERT, UPDATE, DELETE, UPSERT, etc.) within the same transaction are not supported.

## Restrictions

The following restriction applies to the PostgreSQL adapter:

- Remote subscriptions do not work with unlogged tables.

## 6.2.20.1 Configure PostgreSQL Source for Real-time Replication

Information about how to configure your source system for real-time replication.

### Context

If you plan on performing real-time replication from a PostgreSQL source, you must prepare that source by configuring a few system parameters.

### Procedure

1. Open the PostgreSQL main server configuration file `postgresql.conf`.
2. Set the following parameters to the suggested values:

| Parameter             | Value   |
|-----------------------|---------|
| wal_level             | logical |
| archive_mode          | true    |
| max_replication_slots | 2       |

#### Note

If you want to replicate multiple databases in one server, set this value to: "max\_replication\_slots = database\_need\_to\_replicate \* 2". You need 2 slots per instance.

- Restart the PostgreSQL server.

## 6.2.20.2 PostgreSQL Remote Source Configuration

Information about configuration parameters for creating a PostgreSQL remote source.

Configure the following options for a connection to a PostgreSQL remote source:

| Category                  | Option                   | Description                                                                                                                                                                                                                                                 |
|---------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Database Connection       | Host                     | Specifies the host name<br>The default value is <i>localhost</i>                                                                                                                                                                                            |
|                           | Port Number              | Specifies the port number<br>The default value is 5432.                                                                                                                                                                                                     |
|                           | Database Name            | Specifies the database name                                                                                                                                                                                                                                 |
| Schema Alias Replacements | Schema Alias             | Schema name to be replaced with the schema given in the <i>Schema Alias Replacement</i> parameter. If given, accessing tables under this alias is considered to be accessing tables under the schema given in the <i>Schema Alias Replacemen</i> parameter. |
|                           | Schema Alias Replacement | Schema name to use to replace the schema given in the <i>Schema Alias</i> parameter.                                                                                                                                                                        |

| Category          | Option                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Type Mapping | Map timestamptz type to                        | <ul style="list-style-type: none"> <li>VARCHAR</li> <li>TIMESTAMP</li> </ul> <p>When mapping as VARCHAR, target string values use a fixed ISO format, such as 2019-04-29 02:08:52.123456-06, using DP Agent's client time zone.</p> <p>When mapping as TIMESTAMP, target timestamp values are always in UTC.</p> <p>PostgreSQL timestamptz type does not store the time zone into database storage, so we can't replicate that information.</p> |
| LogReader         | Ignore log record processing errors            | <p>Specifies whether the Log Reader ignores the errors that occur during log record processing. If set to <i>True</i>, the replication does not stop if log record processing errors occur.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                       |
|                   | Enable DDL replication                         | <p>Specifies whether to enable replicating DDL.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                   |
|                   | Number of parallel operation processor threads | <p>Specifies the number of processor threads to use</p> <p>The default value is 4.</p>                                                                                                                                                                                                                                                                                                                                                          |
|                   | Maximum operation queue size                   | <p>The maximum number of log records permitted in the log reader log operation queue during replication</p> <p>The default value is 1000.</p>                                                                                                                                                                                                                                                                                                   |
|                   | Maximum scan queue size                        | <p>The maximum number of operations permitted in the log reader scan queue during replication</p> <p>The default value is 1000.</p>                                                                                                                                                                                                                                                                                                             |
|                   | Number of rows to fetch for each scan          | <p>Specifies the batch size for fetching the log record.</p> <p>The default value is 1000.</p>                                                                                                                                                                                                                                                                                                                                                  |
|                   | Maximum wait interval for polling a message    | <p>Specifies the amount of time in seconds to wait for an element to become available for processing</p>                                                                                                                                                                                                                                                                                                                                        |
|                   | Seconds to add to each log scan wait interval  | <p>The default value is 5 seconds.</p>                                                                                                                                                                                                                                                                                                                                                                                                          |
|                   | Maximum wait interval between log scans        | <p>The default value is 60 seconds.</p>                                                                                                                                                                                                                                                                                                                                                                                                         |

| Category | Option                                                                | Description                                                                                                                                                                                                                                                                                                                  |
|----------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Number of parallel formatter threads                                  | <p>Specifies the number of such threads to use to format the raw records to the change data row set in the Data Provisioning Agent</p> <p>The default value is 4.</p>                                                                                                                                                        |
|          | Maximum sender queue size                                             | <p>Specifies the buffer size</p> <p>Before formatting the raw records to the change data row, the records are placed into a queue, and then the formatter component (threads) attempts to pick up records to format.</p> <p>The default value is 1000.</p>                                                                   |
|          | Maximum number of rows sent to server in a batch                      | <p>Specifies the number of rows per batch to send to the Data Provisioning Server after the Data Provisioning Agent processes them.</p> <p>The default value is 512.</p>                                                                                                                                                     |
|          | Amount of time to allow for a batch to fill before flushing the batch | <p>Specifies the amount of elapsed time in seconds before flushing the batch of rows</p> <p>Depending on the number of rows you specified, there may be a lot of time to fill that batch. To avoid a long latency period, you can adjust the amount of time using this parameter.</p> <p>The default value is 5 seconds.</p> |
|          | Ignore formatting errors                                              | <p>Specifies whether to ignore any errors from the formatter component and allow records to continue processing</p>                                                                                                                                                                                                          |
|          | Interval of transaction log truncation                                | <p>The interval to truncate the PostgreSQL transaction log in minutes. Set to 0 to disable the truncation.</p> <p>The default value is 10 minutes.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                |
| Security | Use SSL                                                               | <p>Specify whether to use SSL.</p> <p>The default value is False.</p>                                                                                                                                                                                                                                                        |
|          | Skip Certificate Validation                                           | <p>Select true to skip SSL certificate validation.</p> <p>The default value is False.</p>                                                                                                                                                                                                                                    |



| Category                          | Option                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | SSL Mode                    | <p>Values include <i>disable</i>, <i>allow</i>, <i>prefer</i>, <i>require</i>, <i>verify-ca</i> and <i>verify-full</i>. <i>require</i>, <i>allow</i> and <i>prefer</i> all default to a non validating SSL factory and do not check the validity of the certificate or the host name. <i>verify-ca</i> validates the certificate, but does not verify the hostname. <i>verify-full</i> validates that the certificate is correct and verifies that the host connected to has the same hostname as the certificate.</p> <p>The default value is <i>verify-ca</i>.</p> <p>Setting these will necessitate storing the server certificate on the client machine</p> |
|                                   | SSL Root Certificate        | Enter the path of the server certificate file, such as <code>/usr/sap/dpagent/ssl/server-ca.pem</code> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                   | SSL Client Certificate      | Enter the path of the client certificate file, such as <code>/usr/sap/dpagent/ssl/client-cert.pem</code> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                   | SSL Client Key              | Enter the path of the client key file, such as <code>/usr/sap/dpagent/ssl/client-key.pk8</code> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                   | Use Agent Stored Credential | <p>Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Credentials                       | Credentials Mode            | <p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><b>Technical User:</b> A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><b>Secondary User:</b> A unique access credential on the remote source assigned to a specific user.</li> </ul>                                                                                                                                                                                                                             |
| Postgresql Connection Credentials | User Name                   | <p>The PostgreSQL user name</p> <p>Make sure that all users are assigned the required roles.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                   | Password                    | The PostgreSQL password                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## SQL Configuration

```
CREATE REMOTE SOURCE "posgresqladapter_sample" ADAPTER
"PostgreSQLLogReaderAdapter" AT LOCATION AGENT "PostgreSQLAgentLocal"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?'>
<ConnectionProperties name="configurations">
  <PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="pds_host_name" displayName="Host"
isRequired="true">localhost</PropertyEntry>
```

```

        <PropertyEntry name="pds_port_number" displayName="Port Number"
isRequired="true">5432</PropertyEntry>
        <PropertyEntry name="pds_database_name" displayName="Database Name"
isRequired="true">sample</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="logreader" displayName="logreader">
        <PropertyEntry name="skip_lr_errors" displayName="Ignore log record
processing errors">true</PropertyEntry>
        <PropertyEntry name="lr_processor_parallelism">5</PropertyEntry>
        <PropertyEntry name="lr_max_op_queue_size" >1500</PropertyEntry>
        <PropertyEntry name="lr_max_scan_queue_size">1500</PropertyEntry>
        <PropertyEntry name="scan_sleep_increment">6</PropertyEntry>
        <PropertyEntry name="scan_sleep_max">70</PropertyEntry>
        <PropertyEntry name="lr_scan_batch_size">1500</PropertyEntry>
        <PropertyEntry name="sender_formatter_parallelism">5</PropertyEntry>
        <PropertyEntry name="sender_max_row_queue_size">1500</PropertyEntry>
        <PropertyEntry name="skip_format_errors">true</PropertyEntry>
    </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
    <user>postgres</user>
    <password>password</password>
</CredentialEntry>' ;

```

## Related Information

[Using a Schema Alias \[page 483\]](#)

[Store Remote Data Source Credentials Securely \[page 68\]](#)

[Configuring SSL \[page 590\]](#)

## 6.2.20.3 Amazon Web Services Configuration

More configuration steps and tips for PostgreSQL on Amazon Relational Database Service (RDS).

### Procedure

1. To avoid remote access issues, in Amazon RDS ensure the database instance setting *Publicly Accessible* has been enabled.
2. Configure the PostgreSQL database for real-time replication by adding a parameter group in Amazon RDS as follows.
  - a. Create a Parameter Group.
  - b. Search for the parameter *rds.logical\_replication*. Change its *Values* default to *1*.
  - a. Associate the parameter group to the database instance.
  - b. Restart the database instance.

## Related Information

[Amazon Virtual Private Cloud \(VPCs\) and Amazon RDS](#) ➔  
[Working with DB Parameter Groups](#) ➔

### 6.2.20.4 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database (for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)  
[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)  
[Oracle Log Reader Remote Source Configuration \[page 447\]](#)  
[SAP HANA Remote Source Configuration \[page 529\]](#)  
[SAP ASE LTL Remote Source Configuration \[page 505\]](#)

## 6.2.20.5 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

### Procedure

1. Start the Data Provisioning Agent configuration tool.
2. In the *Agent Preferences* menu, choose *Set Agent Preferences*.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter , OracleLogReaderAdapter , HanaAdapter
```

### Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

### Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Agent Configuration Parameters \[page 112\]](#)

## 6.2.20.6 PostgreSQL DDL Replication

Learn how to replicate your PostgreSQL DDL.

The PostgreSQL adapter uses event triggers to capture changes to tables so that you can apply those same changes to a target.

Only 'ALTER TABLE' events are supported, and only the following triggers are supported:

- Column added
- Column deleted
- Column modified
- Column renamed

### Enabling DDL Replication

You enable DDL replication by setting the PostgreSQL *Enable DDL Replication* remote source parameter to *True*. No other configuration is necessary. The default value is *True*.

### New Repository Objects

For informational purposes, the following repository objects are created in your PostgreSQL database:

- ddl\_constraint\_keys\_shadow (table)
- ddl\_tables\_shadow (table)
- ddl\_columns\_shadow (table)
- dpagent\_\${<pds\_database\_name>}\_replication\_ddl\_trigger (function)
- dpagent\_\${<pds\_database\_name>}\_replication\_ddl\_trigger (event trigger)

### Limitations

Source transactions that contain both DDL (such as ALTER TABLE) and DML (INSERT, UPDATE, DELETE, UPSERT, etc.) within the same transaction are not supported.

### Related Information

[Event Triggers](#) 

[PostgreSQL Remote Source Configuration \[page 478\]](#)

## 6.2.20.7 Set Up Two-way SSL Certification for a Google Cloud SQL – PostgreSQL Source

If you are connecting to Google Cloud SQL – PostgreSQL, you need to configure SSL for two-way certification.

### Context

### Procedure

1. Prepare the server certificate, client certificate, and client key from the server side `server-ca.pem`, `client-cert.pem`, `client-key.pem` files.
2. Use the following command to change the client key format from `.pem` to `.pk8`:

```
openssl pkcs8 -topk8 -inform PEM -in client-key.pem -outform DER -outclient-key.pk8 -v1 PBE-MD5-DES -nocrypt
```

3. Make sure that following remote source parameters are set accordingly:

| Remote Source Parameter     | Value                                                                                                                |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------|
| Use SSL                     | True                                                                                                                 |
| Use Agent Stored Credential | False                                                                                                                |
| Skip Certificate Validation | False                                                                                                                |
| SSL Mode                    | verify-ca                                                                                                            |
| SSL Root Certificate        | The location of the <code>server-ca.pem</code> file, for example <code>/usr/sap/dpagent/ssl/server-ca.pem</code>     |
| SSL Client Certificate      | The location of the <code>client-cert.pem</code> file, for example <code>/usr/sap/dpagent/ssl/client-cert.pem</code> |
| SSL Client Key              | The location of the <code>client-key.pk8</code> file, for example <code>/usr/sap/dpagent/ssl/client-key.pk8</code>   |

### Next Steps

#### Note

- The SSL root certificate accepts only the server certificate file.
- Google Cloud SQL SSL must be set up for two-way server client certificate validation.

## 6.2.21 SAP ABAP

Use the ABAP adapter to retrieve various types of SAP data.

The ABAP adapter retrieves data from virtual tables through RFC for ABAP tables and ODP extractors. You can find more information about setting up your environment and adapter by reading the topics in the Related Information section of this topic.

### ABAP Adapter Functions

The SAP ABAP adapter is a client to functions delivered via modules that are delivered via PI\_BASIS.

Extra coding was required in order for these functions to support RAW and/or STRING data types.

#### Note

The valid PI\_BASIS releases are listed in the Support Packages and Patches section of SAP Note [2166986](#).

These functions were originally developed for SAP Data Services. Ignore references to the SAP Data Services version; all references in this SAP Note relevant to PI\_BASIS apply to all SAP HANA smart data integration versions.

### Prerequisites

The SAP ABAP adapter uses the SAP Java Connector 3.1 standalone (SAP JCo 3.1) to connect to SAP ABAP systems. Ensure that your Data Provisioning Agent host has all runtime libraries required by SAP JCo 3.1.

For more information, see SAP Note [2786882](#).

Additionally, you may need to perform extra tasks to access the data you need:

- To access the M\_MTVMA, M\_MVERA, KONV, and NWECMD\_PRPTDVS tables, via /SAPDS/RFC\_READ\_TABLES, you must apply SAP Note [2166986](#).
- To use hierarchy extraction, you must first enable flattened hierarchy loading for the ODP API. For more information, see SAP Note [2841883](#).

### Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Change data capture for ODP extractors, including delta-capable CDS views
- Calling BAPI functions as virtual procedures

- Virtual procedures


In addition, this adapter supports the following capabilities:

- SELECT, WHERE, TOP, or LIMIT

## Related Information

[Installing BW Content DataSources](#)

[Installing Application Component Hierarchies](#)

[Error opening the cursor for the remote database Error with ASSIGN ... CASTIN in program /SAPDS/SAPLRS\\_BASIS](#) 

## 6.2.21.1 Authorizations

Authorizations for accessing various SAP ABAP adapter operations.

This topic describes the authorizations that support SAP ABAP adapter operations. For improved security, avoid using wildcards, generic values, or blank values for authorization fields, especially in a production environment. Enter more specific values that are appropriate to your business applications.

### 6.2.21.1.1 S\_BTCH\_JOB: Batch Processing

The S\_BTCH\_JOB authorization checks privileges for releasing batch jobs.

**Text (Description):** Batch processing

**Class:** Basis

| Field                       | Values |
|-----------------------------|--------|
| Job operation               | RELE   |
| Summary of jobs for a group |        |

### 6.2.21.1.2 S\_DEVELOP: ABAP Workbench

The SAP ABAP adapter uses the S\_DEVELOP authorization in several ways.

**Purpose:** This implementation of S\_DEVELOP allows the SAP ABAP adapter to perform a column search.

**Text (Description):** ABAP Workbench

**Class:** Basis - Development Environment



| Field                              | Values                                                       |
|------------------------------------|--------------------------------------------------------------|
| Package                            | List of packages for tables that a user is allowed to access |
| Object type                        | TABL                                                         |
| Object name                        | List of tables that a user is allowed to access              |
| Authorization group ABAP/4 program | Not used                                                     |
| Activity                           | 03                                                           |

**Purpose:** This implementation allows the SAP ABAP adapter to import a table or to search for a table.

**Text (Description):** ABAP Workbench

**Class:** Basis - Development Environment

| Field                              | Values                                                       |
|------------------------------------|--------------------------------------------------------------|
| Package                            | List of packages for tables that a user is allowed to access |
| Object type                        | VIEW, TABL, and TTYP                                         |
| Object name                        | List of tables and views that a user is allowed to access    |
| Authorization group ABAP/4 program | Not used                                                     |
| Activity                           | 03                                                           |

### 6.2.21.1.3 S\_RFC: Authorization Check for RFC Access

The S\_RFC authorization allows users to execute remote functions on an SAP server.

**Text (Description):** Authorization check for RFC access

**Class:** Cross-application authorization object

| Field                              | Values                                                                                                                                               |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Activity                           | 16                                                                                                                                                   |
| Name of RFC to be protected        | BAPI, CADR, RFC1, SCAT, SDIF, SLST, SUNI, SUTL, SDTX, SYST, SYSU, /BODS/BODS, RFC_METADATA, RSAB, SDIFRUNTIME, and any other required function group |
| Type of RFC object to be protected | FUGR                                                                                                                                                 |

### 6.2.21.1.4 S\_RFC\_ADM: Administration for RFC Destination

The S\_RFC\_ADM authorization is required for RFC streaming.

**Text (Description):** Administration for RFC Destination

**Class:** Cross-application

| Field                                            | Values          |
|--------------------------------------------------|-----------------|
| Activity                                         | 03              |
| Type of Entry in RFCDES                          | Not used        |
| Logical Destination (Specified in Function Call) | RFC destination |
| Internet Communication Framework Values          | Not used        |

### 6.2.21.1.5 S\_RO\_OSOA: SAP DataSource Authorizations

The S\_RO\_OSOA authorization checks DataSource access privileges.

**Text (Description):** SAP DataSource Authorizations

**Class:** BW Service API

| Field                                             | Values                         |
|---------------------------------------------------|--------------------------------|
| Activity                                          | 03                             |
| DataSource (OSOA/OSOD)                            | DataSource for data extraction |
| Application Component of a DataSource (OSOA/OSOD) | Not used                       |
| Subobject for DataSource                          | DATA                           |

### 6.2.21.1.6 S\_SDSAUTH: SBOP Data Services - General Authorization

The S\_SDSAUTH authorization gives a user access to the SBOP Data Services general authorization functions.

**Text (Description):** SBOP Data Services - general authorization

**Class:** SBOP Data Services Authorization Object

| Field           | Values       |
|-----------------|--------------|
| ACTVT: Activity | 16 (Execute) |

#### Note

In some SAP NetWeaver versions, this authorization object is named ZDSAUTH or S\_DSAUTH. The objects are identical except for the name.

## 6.2.21.17 S\_SDSS: Data Services Authorization Object for Functions

The S\_SDSS authorization provides access to all /SAPDS/\* functions.

**Text (Description):** Data Services Authorization Object for functions

**Class:** SBOP Data Services Authorization Object

| Field    | Values                |
|----------|-----------------------|
| ACTVT    | Not used              |
| ZSYSTYPE | D: Development system |

### Note

ZSYSTYPE must be set to Development (D) to enable complete SAP ABAP adapter functionality, including table import.

### Note

In some SAP NetWeaver versions, this authorization object is named ZSDS or S\_SDS. The objects are identical except for the name.

## 6.2.21.18 S\_TABU\_DIS: Table Maintenance

The S\_TABU\_DIS authorization allows the SAP ABAP adapter to access table data in an SAP system.

**Text (Description):** Table Maintenance (via standard tools such as SM30)

**Class:** Basis

| Field               | Values                                        |
|---------------------|-----------------------------------------------|
| Activity            | 03                                            |
| Authorization group | Table groups that a user is allowed to access |

## 6.2.21.19 S\_TCODE: Authorization Check for Transaction Start

The SAP ABAP adapter uses the S\_TCODE authorization in several ways.

**Purpose:** This authorization grants the user access to specific transactions.

**Text (Description):** Authorization check for transaction start

**Class:** Cross-application authorization object

| Field            | Values           |
|------------------|------------------|
| Transaction code | SE37, SE38, SU53 |

**Purpose:** This authorization allows the SAP ABAP adapter to execute functions in the Data Warehousing Workbench.

**Text (Description):** Transaction Code Check at Transaction Start

**Class:** Cross-application Authorization Objects

| Field            | Values |
|------------------|--------|
| Transaction code | RSA1   |

## 6.2.21.2 Using RFC Streaming with Tables

There are advantages and disadvantages to using either RFC or non-RFC streaming.

The non-RFC streaming is done by extracting the whole target recordset as one batch. That process is anywhere between 0.1second and 10 seconds faster (depends on the SAP ECC response) than the small-batch RFC streaming. So, non-RFC streaming is noticeably faster on very small queries, especially with a slow SAP ECC system. Extracting a whole recordset at once comes with the obvious requirement to have enough memory for the whole recordset. A general rule (depending on the record length) is 1 GB of RAM on the Data Provisioning Agent machine per 1 million records, and several concurrent sessions would require further calculations. Because the non-RFC streaming mode runs in the ECC “dialog mode,” it's also subject to various limitations on the ECC side, like dialog mode timeout.

We recommend using RFC streaming based on the fact that it works for many different scenarios, such as small, large, and long queries, multiple concurrent sessions, and so on. There are tradeoffs, such as the performance cost already mentioned for small queries and the cost of requiring extra configuration, including on the ECC side.

To activate RFC streaming, you must configure the following ABAP adapter remote source parameters:

- Streaming Read: This parameter must be set to *True* to expose the following parameters.

The following parameters must be set to have RFC streaming work:

- Gateway Server
- Gateway Host
- RFC Destination

The following parameters are optional when RFC streaming is enabled:

- Batch size
- RFC Trace
- Batch receive timeout

## ECC Client and Gateway Service Configuration

- Successful registration on an SAP Gateway requires that suitable security privileges are configured. For example:

- Set up an Access Control List (ACL) that controls which host can connect to the gateway. That file should contain something similar to the following syntax: `<permit> <ip-address[/mask]> [tracelevel] [# comment]`
- You may also want to configure a `reginfo` file to control permissions to register external programs.
- The host where the Data Provisioning agent is running must have a service configured with the name matching the remote SAP gateway name.

## Related Information

[SAP ABAP Adapter Remote Source Configuration \[page 494\]](#)

[Gateway Access Control Lists](#)

### 6.2.21.3 SAP ABAP Adapter Preferences

Options to control the SAP ABAP adapter.

| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Context Allowlist | <p>The <code>Context Allowlist</code> parameter provides you the ability to restrict which objects (tables, BAPI functions, ODP extractors) are available to a user; for example, shown/imported/executed/selected from/subscribed to.</p> <p>If the property is empty, there are no restrictions; all objects that the ABAP adapter reads from an ECC system are exposed to the target SAP HANA system.</p> <p>The property value is expected to be a comma-separated list of either prefixes, such as a prefix ending with an asterisk (*), or full names of allowed objects or exact full names. For example:</p> <p>To allow all BAPI functions and ABAPTABLES and exclude all extractors:</p> <p><b><code>BAPI *, ABAPTABLES *</code></b></p> <p>To allow all BAPI functions starting either with <code>RODPS_*</code> or <code>BAPI_BANK*</code>; and only one ABAP table <code>KNB1</code></p> <p><b><code>BAPI.RODPS_*, BAPI.BAPI_BANK*, ABAPTABLES.KNB1</code></b></p> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The asterisk (*) is used only as the last character to distinguish a prefix from an exact name.</p> </div> |

## 6.2.21.4 SAP ABAP Adapter Remote Source Configuration

Remote source configuration options for the SAP ABAP adapter. Also included is sample code for creating a remote source using the SQL console.

### Note

Depending on the values you choose for the remote source configuration parameters, different parameters appear. Thus, some of the following parameters don't appear.

| Category       | Option                                                                                                                          | Description                                                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connectioninfo | Connection Type                                                                                                                 | Message Server and Custom Application Server                                                                                                                                                  |
|                | Application Server                                                                                                              | The name of the host to which you want to connect                                                                                                                                             |
|                | Message Server                                                                                                                  | The name of the message server or its IP address                                                                                                                                              |
|                | Message Server Port                                                                                                             | (Optional) If the message server isn't on the default port, enter the port to use to connect to the message server.                                                                           |
|                | Client                                                                                                                          | The SAP ECC client number                                                                                                                                                                     |
|                | Instance Number                                                                                                                 | The SAP ECC instance number                                                                                                                                                                   |
|                | System ID                                                                                                                       | Specifies the system ID of the SAP system to which you want to connect.                                                                                                                       |
|                | Server Group                                                                                                                    | The Logon group name.                                                                                                                                                                         |
|                | Language Code                                                                                                                   | Specifies the ISO 639-1 language code for non-Unicode systems.<br><br><i>EN</i> is the default value.                                                                                         |
|                | Connections Pool Size                                                                                                           | Maximum number of idle connections kept open for the remote source. The default value of 0 states that there's no connection pooling; that is, connections will be closed after each request. |
|                | Connections Limit                                                                                                               | Maximum number of active connections that can be created for a remote source simultaneously.                                                                                                  |
|                | Extractors ODP Version                                                                                                          | Specifies the ODP version to use.<br><br>ODP 2.0 is the default value.                                                                                                                        |
|                | CDC Batch Size, MB                                                                                                              | Specifies the CDC batch size in MB.<br><br>The default value is 1 MB.                                                                                                                         |
| Streaming Read | Set to <i>On</i> to expose the necessary parameters to enable RFC streaming.<br><br>Set to <i>Off</i> to use non-RFC streaming. |                                                                                                                                                                                               |

| Category | Option          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Gateway Host    | <p>The gateway host where the ABAP adapter would register an RFC server instance to receive callbacks with the table data batches. Usually, the gateway host is the same as the target ECC system host.</p> <p>When you specify multiple targets in <i>Execution Targets</i>, specify multiple gateway hosts as a comma-separated list.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>This parameter is valid and required only when <i>Streaming Read</i> is set to <i>On</i>.</p> </div>                                                                                                                                                                                   |
|          | Gateway Service | <p>The gateway service name or port where the ABAP adapter registers an RFC server instance to receive callbacks with the table data batches. Specify the gateway service as either a name or a port number.</p> <ul style="list-style-type: none"> <li>• Service name: <b>sapgw&lt;system_number&gt;</b></li> <li>• Service port: <b>33&lt;system_number&gt;</b></li> </ul> <p>When you specify multiple targets in <i>Execution Targets</i>, specify multiple gateway service names or ports as a comma-separated list.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>This parameter is valid and required only when <i>Streaming Read</i> is set to <i>On</i>.</p> </div> |
|          | RFC Destination | <p>The name of a user-defined TCP/IP connection created using transaction SM59.</p> <p>Create the connection in SM59 with "Registered Server Program" as "Activation Type". Specify "IM_HANA_ABAPADAPTER_*" as a filter for the "Program ID" field, or leave it empty.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>This parameter is valid and required only when <i>Streaming Read</i> is set to <i>On</i>.</p> </div>                                                                                                                                                                                                                                                    |
|          | RFC Unicode     | <p>(Optional) Specifies whether the source system communicates over RFC using Unicode.</p> <p>If the source system communicates over RFC with a different encoding, set to <i>False</i> and specify the encoding used in <i>RFC Character Encoding</i>.</p> <p>The default value is <i>True</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

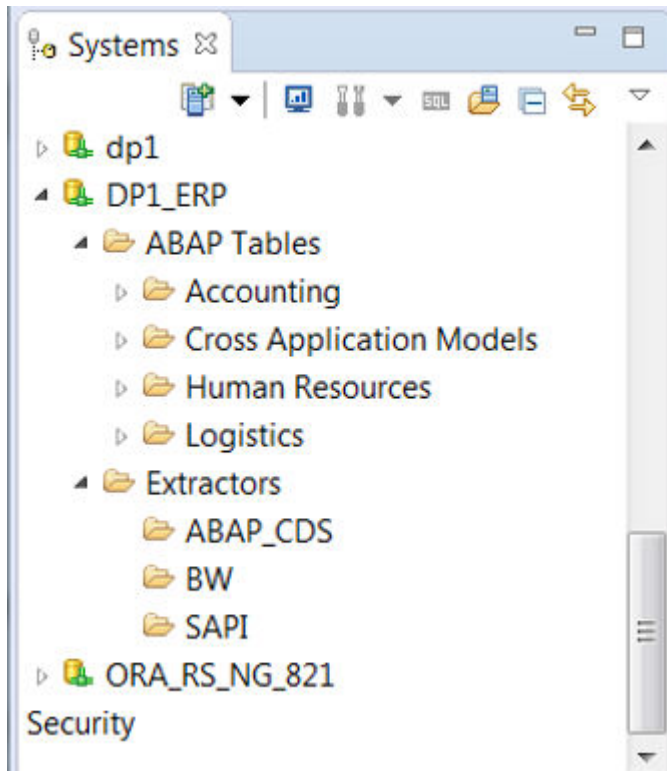
| Category | Option                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | RFC Character Encoding | <p>(Optional) Specifies the character encoding used by the source system, when not using Unicode.</p> <p>For example, SJIS.</p>                                                                                                                                                                                                                                                                                                         |
|          | RFC Serialization      | <p>(Optional) Specifies whether to use column-based or row-based serialization when transferring function module data.</p> <ul style="list-style-type: none"> <li><i>columnBased</i>: Fast column-based RFC serialization is used if the partner system supports the format.</li> <li><i>rowBased</i>: Classic or basXML serialization is used.</li> </ul> <p>The default value is <i>columnBased</i>.</p>                              |
|          | Batch Size, MB         | <p>(Optional) The size (in MB) of the data packet sent by ECC in one callback. On the Data Provisioning Agent, upon receiving, the batch is copied into a queue to be sent to the Data Provisioning server, and thus the memory requirements for that process is "2 x batchsize".</p> <p>The default value is 1 MB.</p>                                                                                                                 |
|          | RFC Trace              | <p>(Optional) Specifies whether to enable RFC tracing.</p> <p>The default value is <i>Off</i>.</p>                                                                                                                                                                                                                                                                                                                                      |
|          | Batch Receive Timeout  | <p>(Optional) The maximum time period in seconds that the adapter would be waiting for the next batch to come or to push the batch to the Data Provisioning server. It wouldn't make sense for this value to be larger than the value of the "framework.messageTimeout" parameter of the Data Provisioning server. Thus, the default value is the same as the default value of the Data Provisioning server property (600 seconds).</p> |



| Category | Option                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Execution Targets     | <p>(Optional) A comma-separated list of execution targets for streaming batch jobs.</p> <p>Each time a streaming query on an ABAP table is executed, the corresponding streaming batch job is explicitly assigned a target server chosen randomly from this list.</p> <p>If you don't specify a list of execution targets, the target servers are assigned by the source system.</p> <div style="border: 1px solid #ccc; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The values for the <i>Gateway Host</i> and <i>Gateway Service</i> parameters are positionally matched to <i>Execution Targets</i>. That is, they must contain the same number of entries as <i>Execution Targets</i>, in the corresponding order. If the number of entries doesn't match, an exception occurs.</p> <p>If either parameter is left blank, the behavior is as follows:</p> <ul style="list-style-type: none"> <li><i>Gateway Host</i> is populated with the same servers as <i>Execution Targets</i>.</li> <li><i>Gateway Service</i> is populated by a list with numbers matching the default gateway port values (33&lt;system_number&gt; ).<br/>For example, with a source system number <b>02</b> and three servers specified for <i>Execution Targets</i>, the default gateway service list is 3302 , 3302 , 3302.</li> </ul> </div> |
|          | SNC Mode              | Activate SNC by setting this parameter to <i>On</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|          | Browse cache lifetime | <p>Specifies the lifetime of the browsing cache, in seconds. A value of 0 means that no caching is performed.</p> <p>The default value is 3600 (1 hour).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|          | SNC Library           | <p>Specifies the path and file name of the external library.</p> <p>The default is the system-defined library as defined in the environment variable <code>SNC_LIB</code> .</p> <p>The destination service uses the property <code>snc/gssapi_lib</code> on SAP NetWeaver AS for Java.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|          | SNC Name of Client    | <p>Specifies the SNC name of SAP NetWeaver AS for Java.</p> <p>Although this parameter is optional, we do recommend setting it to make sure that the correct SNC name is used for the connection.</p> <p>For the Destination service, set it in the property <code>snc/identity/as</code> on SAP NetWeaver AS for Java.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Category    | Option                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | SNC Name of SAP Server    | <p>Specifies the SNC name of SAP NetWeaver Application Server for ABAP.</p> <p>This parameter is required if SNC is turned on.</p> <p>You can find the application server SNC name in the profile parameter <code>snc/identity/as</code> on SAP NetWeaver Application Server for ABAP.</p>                                                                                                                                          |
|             | SNC SSO                   | Turn on/off the SSO mechanism of SNC. If you set this parameter to <i>OFF</i> , you must provide alternative credentials.                                                                                                                                                                                                                                                                                                           |
|             | SNC Quality of Protection | <p>Specifies the level of protection to use for the connection.</p> <p>Possible values:</p> <p>1: Authentication only</p> <p>2: Integrity protection</p> <p>3: Privacy protection (default)</p> <p>8: Use the value from <code>snc/data_protection/use</code> on the application server</p> <p>9: Use the value from <code>snc/data_protection/max</code> on the application server</p> <p>Default value = 3</p>                    |
| Credentials | Credentials Mode          | <p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul> |
|             | User Name                 | The user name that is used to connect to the SAP ECC system                                                                                                                                                                                                                                                                                                                                                                         |
|             | Password                  | The user password                                                                                                                                                                                                                                                                                                                                                                                                                   |

After you've created the remote source, the directory structure will look similar to the following screenshot, depending on the structure of the source system.



## Example: Basic

### Sample Code

```
CREATE REMOTE SOURCE "MyABAPSource" ADAPTER "ABAPAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyEntry name="host" displayName="Host" isRequired="true"
isPassword="false">myhost.sap.corp</PropertyEntry>
  <PropertyEntry name="systemid" displayName="System ID" isRequired="true"
isPassword="false">01</PropertyEntry>
  <PropertyEntry name="client" displayName="Client" isRequired="true"
isPassword="false">001</PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="user">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>';
```

## Example: Multiple Execution Targets

### Sample Code

```
CREATE REMOTE SOURCE "MyABAPSource" ADAPTER "ABAPAdapter" AT LOCATION AGENT
"MyAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?'>
<ConnectionProperties>
  <PropertyEntry name="host" >myhost.sap.corp</PropertyEntry>
  <PropertyEntry name="systemnumber" >01</PropertyEntry>
  <PropertyEntry name="client" >001</PropertyEntry>
  <PropertyEntry name="gwhost" >myhost.sap.corp,myhost.sap.corp</
PropertyEntry>
  <PropertyEntry name="gwserv" >3301,3301</PropertyEntry>
  <PropertyEntry name="rfcdest" >RFC_DEST</PropertyEntry>
  <PropertyEntry name="streaming" >true</PropertyEntry>
  <PropertyEntry name="exectargets" >myhost,myhost</PropertyEntry>
  <PropertyEntry name="cachelifetime" >60</PropertyEntry>
  <PropertyEntry name="sncMode" >0</PropertyEntry>
  <PropertyEntry name="sncLib" ></PropertyEntry>
  <PropertyEntry name="sncPartnername" >s60</PropertyEntry>
  <PropertyEntry name="sncMyname" >s60</PropertyEntry>
  <PropertyEntry name="sncQop" >6</PropertyEntry>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="user">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>';
```

## Related Information

[Using RFC Streaming with Tables \[page 492\]](#)

## 6.2.22 SAP ASE LTL

The SAP ASE LTL adapter provides real-time replication and change data capture functionality to SAP HANA or back to a virtual table.

## Adapter Functionality

The SAP ASE adapter supports the following functionality:

- Virtual table as a source
- Real-time change data capture, using only Log Transferring Language (LTL)
- Virtual table as a target using a Data Sink node in a flowgraph

- Loading options for target tables
- Search for a table
- Replication monitoring and statistics
- Virtual procedures

## Real-time Replication Limitations

The following limitations exist when performing real-time replication:

- Unsupported table types:
  - Table with all LOB columns
  - Table with LOB column and no primary key or unique index
  - Table with duplicated rows and no primary key
  - Table with minimal logging option

### 6.2.22.1 Configure Your SAP ASE Database

The remote database must be set up properly when using the SAP ASE adapter.

#### Procedure

1. Connect to an SAP ASE data server using ISQL or another utility, and create a database to replicate if one does not already exist.
2. Create the primary user and grant permissions.

##### Sample Code

```
SQL> use master
SQL> go
SQL> create login <login_name> with password <password> default database
<database_name>
SQL> go
SQL> use <database_name>
SQL> go
SQL> sp_adduser <login_name>
SQL> go
SQL> sp_role 'grant', replication_role, <login_name>
SQL> go
```

3. Create the maintenance user.

##### Sample Code

```
SQL> use master
SQL> go
```

```
SQL> create login <login_name> with password <password> default database
<database_name>
SQL> go
SQL> use <database_name>
SQL> go
SQL> sp_adduser <login_name>
SQL> go
```

4. Add an entry for the SAP ASE adapter in the interface file of the SAP ASE data server. For example:

#### Sample Code

```
<entry name>
  master tcp ether <host name or IP> <port>
  query tcp ether <host name or IP> <port>
```

#### Note

- The entry name must be the same as the *Adapter Instance Name* specified when creating the remote source.
- The host name or IP must be the same IP of the computer where the SAP ASE adapter is running.
- The port must be the same as the SAP ASE Adapter Server port that you set up in the SAP ASE adapter interface file located in <DPAgent\_root>/Sybase/interfaces.

5. Reboot the SAP ASE data server.

## 6.2.22.1.1 Check the Replication Setting for the Active Database

Prevent an unrecoverable replication agent crash by disabling full database replication when schema changes aren't needed.

### Context

If full database replication is enabled, the replication agent can crash with an error such as the following:

```
RepAgent(4): Fatal error from CT-Lib. (CT-Lib command = usctresults, return
status = 4047)
```

### Procedure

1. Check whether full database replication is enabled.

### ❖ Example

```
SQL> sp_reptostandby <database_name>  
SQL> go
```

2. If necessary, disable full database replication.

### ❖ Example

```
SQL> sp_reptostandby <database_name>, 'NONE'  
SQL> go
```

## 6.2.22.2 Configuring the SAP ASE Source Database for Change Data Capture

If you are using change data capture, you must configure your SAP ASE source database.

### ⓘ Note

The values for the variables below (<adapter\_server\_name>, <agent\_host>, and <adapter\_listen\_port>) must match the values for the corresponding remote source configuration parameters.

## Linux

In the `interfaces` file, add the following lines:

```
<adapter_server_name>  
master tcp ether <agent_host> <adapter_listen_port>  
query tcp ether <agent_host> <adapter_listen_port>
```

## Windows

In the `sql.ini` file, add the following lines:

```
<adapter_server_name>  
Master=tcp,<agent_host>,<adapter_listen_port>  
Query=tcp,<agent_host>,<adapter_listen_port>
```

## Related Information

[SAP ASE LTL Remote Source Configuration \[page 505\]](#)

### 6.2.22.3 Creating SAP ASE Roles and Authorizations

Grant the right roles and authorizations for SAP ASE system.

```
SELECT for the whole ERP schema was granted

grant CREATE PROCEDURE to <SDI_user>
grant DROP ANY PROCEDURE to <SDI_user>

use model
sp_adduser <SDI_user>
grant MANAGE REPLICATION to <SDI_user>

use saptools
sp_adduser <SDI_user>
grant MANAGE REPLICATION to <SDI_user>

use sybssystemdb
sp_adduser <SDI_user>
grant MANAGE REPLICATION to <SDI_user>

use sybmgmtldb
sp_adduser <SDI_user>
grant MANAGE REPLICATION to <SDI_user>

use sybsecurity
sp_adduser <SDI_user>
grant MANAGE REPLICATION to <SDI_user>
```

## Granular Permissions

If "granular permission" is disabled in your SAP ASE environment, the **sa\_role** may always be required. To grant this role to the replication user, log in to the remote database server as a System Administrator or System Security Officer and run the following commands:

```
use <database_name>
go
sp_role "grant", sa_role, <replication_user>
go
```

If "granular permission" is enabled in your SAP ASE environment, the **manage server configuration** privilege is required for the user who will execute the **sp\_configure** stored procedure. To grant this role to the user, run the following commands:

```
use master
go
grant manage server configuration to <username>
go
```



## Related Information

[Grant SELECT Permission for Multiple Tables](#)

### 6.2.22.4 SAP ASE LTL Remote Source Configuration

Options for connecting to the remote SAP ASE data server.

| Category                  | Option                             | Description                                                                                                                                                                                                                                                                                                                  |
|---------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Server Information   | Data Server Name                   | The SAP ASE data server name.                                                                                                                                                                                                                                                                                                |
|                           | Data Server Host                   | Host name or IP address on which the remote SAP ASE data server is running.                                                                                                                                                                                                                                                  |
|                           | Data Server Port Number            | The SAP ASE data server port number.                                                                                                                                                                                                                                                                                         |
|                           | Database Name                      | The SAP ASE database name.                                                                                                                                                                                                                                                                                                   |
|                           | Allowlist Table in Remote Database | The table that contains the allowlist in the remote database.                                                                                                                                                                                                                                                                |
| Schema Alias Replacements | Schema Alias                       | Schema name to be replaced with the schema provided in <i>Schema Alias Replacement</i> . If given, accessing tables under this alias is considered to be accessing tables under the schema given in <i>Schema Alias Replacement</i> .<br><br>The value of this parameter can be changed when the remote source is suspended. |
|                           | Schema Alias Replacement           | Schema name to use to replace the schema given in <i>Schema Alias</i> .<br><br>The value of this parameter can be changed when the remote source is suspended.                                                                                                                                                               |
| Generic                   | Load and Replicate LOB Columns     | Specifies whether to include LOB columns during replication.<br><br>The default value is <i>True</i> .                                                                                                                                                                                                                       |
|                           | Use Agent Stored Credential        | Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.<br><br>The default value is <i>False</i> .                                                                                                                                                                              |

| Category             | Option                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Security             | Use SSL to connect to source ASE      | <p>Specifies whether to use SSL to connect to the source SAP ASE database when performing initial loads.</p> <ul style="list-style-type: none"> <li><b>True:</b> The adapter connects to the source database using SSL. You must import the trusted server certificate into the Data Provisioning Agent trust store or set <i>Trust all server certificates</i> to True.</li> <li><b>False:</b> The adapter connects to the source database without using SSL.</li> </ul> <p>The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|                      | Trust all server certificates         | <p>Specifies whether to trust all SSL server certificates.</p> <ul style="list-style-type: none"> <li><b>True:</b> All SSL server certificates are trusted.</li> <li><b>False:</b> Only those certificates imported into the Data Provisioning Agent trust store are trusted.</li> </ul> <p>The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                  |
| Data Type Conversion | Always Map Character Types to Unicode | <p>Determines whether a CHAR/CHARACTER/VARCHAR/CHAR/LONGVARCHAR/CLOB column in the source database is mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII.</p> <p>The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p> <p>Set this parameter to True only when the remote database is multibyte character sets such as UTF-8, GBK, JA16SJIS, and soon.</p>                                                                                                                            |
|                      | Allow Map Character Types to LOB      | <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                      | Always Trim String Data               | <p>Specifies whether to trim string data, removing any blank spaces.</p> <p>The default value is <i>False</i>.</p> <p>Set this parameter to True when replicating partitioned tables.</p>                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Adapter Properties   | Adapter Server Name                   | <p>The server name to which RepAgent connects and sends transactional log data</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Category              | Option                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | Adapter Listen Port             | The port used for TDS server to listen on, and for RepAgent to connect                                                                                                                                                                                                                                                                                                                                                       |
|                       | Maintenance User                | The maintenance user that is used by the SAP ASE LogReader Thread to filter transactions applied by this user                                                                                                                                                                                                                                                                                                                |
|                       | Allow Schema Change Replication | Specifies whether to allow schema change DDL to be replicated to the target.<br><br>The default value is <i>False</i> .<br><br>The value of this parameter can be changed when the remote source is suspended.                                                                                                                                                                                                               |
| Credential Properties | Credentials Mode                | Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials. <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul> |
|                       | User Name                       | The SAP ASE database user, which the adapter needs to log on to the SAP ASE database to configure the ASE log reader, query data for initial load, and write back data into SAP ASE. Certain permissions are required. See <a href="#">Configure Your SAP ASE Database [page 501]</a> for more information.                                                                                                                  |
|                       | Password                        | SAP ASE database user password.                                                                                                                                                                                                                                                                                                                                                                                              |

## SQL Example

```
CREATE REMOTE SOURCE "ASELTLAdapterSrc" ADAPTER "ASELTLAdapter" AT LOCATION
AGENT "asepdb1" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="UI" displayName="Configurations">
<PropertyGroup name="dataserver" displayName="Data Server Information">
  <PropertyEntry name="dataserver_name" displayName="Data Server Name"
isRequired="true">asel60pl052k</PropertyEntry>
  <PropertyEntry name="host" displayName="Data Server Host"
isRequired="true">rqa32chanal.pal.sap.corp</PropertyEntry>
  <PropertyEntry name="port" displayName="Data Server Port Number"
isRequired="true">7005</PropertyEntry>
  <PropertyEntry name="database_name" displayName="Database Name"
isRequired="true">pdb1</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="generic" displayName="Generic">
  <PropertyEntry name="lob_column_repl" displayName="Load and Replicate LOB
columns">true</PropertyEntry>
  <PropertyEntry name="pds_use_agent_stored_credential">false</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="data_type_conversion" displayName="Data Type Conversion">
```

```

    <PropertyEntry name="map_char_types_to_unicode" displayName="Always Map
Character Types to Unicode" allowAlterWhenSuspended="true">true</PropertyEntry>
    <PropertyEntry name="allow_character_to_lob" displayName="Allow Map
Character Types to Lob" allowAlterWhenSuspended="true">true</PropertyEntry>
    <PropertyEntry name="allow_trim_string" displayName="Always trim string
data" allowAlterWhenSuspended="true">>false</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="aseadapter_cdc" displayName="Adapter CDC Properties">
    <PropertyEntry name="adapter_server_name"
isRequired="true">aseadapter_llbdub0003_java</PropertyEntry>
    <PropertyEntry name="adapter_listen_port" isRequired="true">23456</
PropertyEntry>
    <PropertyEntry name="maint_user" isRequired="true">db_maint</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>' WITH CREDENTIAL TYPE 'PASSWORD' USING '<CredentialEntry
name="credential">
    <user>DPADM01</user>
    <password>Sybase123</password>
</CredentialEntry>';

```

## Related Information

[Store Remote Data Source Credentials Securely \[page 68\]](#)

[Creating an Allowlist to Limit Access to a Source Database \[page 413\]](#)

## 6.2.22.5 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database (for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

[SAP HANA Remote Source Configuration \[page 529\]](#)

[SAP ASE LTL Remote Source Configuration \[page 505\]](#)

### 6.2.22.6 Migrating from an ASE Adapter to an ASE LTL Adapter

While we recommend starting with a new ASE LTL adapter, there's a way to migrate existing ASE adapters to an ASE LTL adapter.

The migration to the ASE LTL adapter is simple. However, there are some important things to understand about what this migration supports and doesn't support.

To migrate your adapters, you need add the `adapter.ase.routeToNewAdapter` and `framework.skipValidation` framework configuration properties to the `dpagentconfig.ini` file, and set them both equal to *True*. Then, restart the Data Provisioning Agent.

```
adapter.ase.routeToNewAdapter = true
framework.skipValidation = true
```

## Notes and Limitations

- The Adapter Type is sent with the ASEAdapter as the value, and after the migration, the reply will have ASELTAdapter as the Adapter Type.
- We can't do an agent de-cluster on the ASECCAdapter after the new routing, because ASECCLTAdapter doesn't have this capability.

## Related Information

[Agent Configuration Parameters \[page 112\]](#)

## 6.2.23 SAP ECC

SAP ERP Central Component (ECC) adapters are a set of data provisioning adapters to provide access to and interaction with SAP ECC data and metadata.

All adapters designed to work with SAP ECC are built on top of Data Provisioning log reader adapters for the same database. Currently supported are the following:

- IBM DB2
- Oracle

### Note

The Oracle Log Miner maximum throughput is approximately 1 TB per day; therefore, for replication volumes greater than 1 TB per day, expect delays in replication.

- Microsoft SQL Server
- SAP ASE LTL

These adapters provide extra ECC-specific functionality: ECC metadata browsing and support for cluster tables and pooled tables in SAP ECC. See the description of Log Reader adapters for the common functionality.

### Note

For IBM DB2, Oracle, and Microsoft SQL Server, before you register the adapter with the SAP HANA system, download and install the correct JDBC libraries. See the *SAP HANA smart data integration Product Availability Matrix (PAM)*. In the `<DPAgent_root>` folder, create a `/lib`.

## Adapter Functionality

The ECC adapters support the following functionality:

- Real-time change-data capture

### Restriction

For real-time replication, you can initialize each source database by only one remote source. You can't configure two remote sources for real-time replication of the same source database, even when using a different Data Provisioning Agent or schema in the source database.

- DDL propagation (transparent tables only, not supported for SAP ASE ECC)

### Restriction

DDL propagation is not supported for DB2-based ECC adapters when operating in trigger-based mode.

- Search for tables
- Agent-stored credentials (not supported for SAP ASE ECC)
- SELECT, WHERE, JOIN, GROUP BY, DISTINCT, TOP, LIMIT

## Limitations

There's a 30,000 column limit for records.

## Related Information

[SAP ASE LTL \[page 500\]](#)

[IBM DB2 Log Reader \[page 306\]](#)

[Microsoft SQL Server Log Reader \[page 371\]](#)

[Oracle Log Reader \[page 428\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

[SAP Note 2166986](#)

## 6.2.23.1 Terminology

Setting up ECC adapters requires an understanding of certain SAP ERP and ECC concepts.

Here are some key terms and concepts that help you understand how to set up your ECC adapters.

| Term                                | Description                                                                                                                                                                                                                                                                                                   |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAP ERP                             | Enterprise Resource Planning software that allows you to leverage role-based access to critical data, applications, and analytical tools – and streamline your processes across procurement, manufacturing, service, sales, finance, and HR.                                                                  |
| SAP ECC (SAP ERP Central Component) | The central technical component of SAP ERP system.                                                                                                                                                                                                                                                            |
| Cluster table                       | A logical table type, where the data of several such tables are stored together as a table cluster in the database. The intersection of the key fields of the cluster tables forms the primary key of the table cluster. Therefore, a cluster table is known in the ABAP Dictionary, but not in the database. |
| Pooled table                        | A logical table type, where the data of several such tables are stored together as a table pool in the database. Therefore, a pooled table is known in the ABAP Dictionary, but not in the database.                                                                                                          |

## Related Information

[Loading Metadata for Cluster and Pooled Tables \[page 526\]](#)

## 6.2.23.2 Installation and Setup

Refer to the Log Reader and SAP ASE LTL adapters for installation and setup information.

Because the SAP ECC adapters are built on top of existing Data Provisioning adapters, you must use the procedures of those adapters to build your SAP ECC adapters.

### Related Information

[SAP ASE LTL \[page 500\]](#)

[Oracle Log Reader \[page 428\]](#)

[Microsoft SQL Server Log Reader \[page 371\]](#)

[IBM DB2 Log Reader \[page 306\]](#)

## 6.2.23.3 SAP ECC Adapter Preferences

Access adapter settings specific to your source.

You can adjust adapter settings specific to your source in the Data Provisioning Agent configuration tool.

Use these settings to tune performance, enhance security, and so on.

### Related Information

[Configure Adapter Preferences \[page 587\]](#)

### 6.2.23.3.1 DB2ECCAdapter Preferences

Configuration parameters for the DB2 ECC adapter.

#### Note

Log Reader and ECC adapter preferences, except for *Number of wrapped log files*, *Enable verbose trace*, and *Maximum log file size*, are no longer set in the Data Provisioning Agent Configuration Tool. They are now moved to the remote source configuration options in SAP HANA. If you have upgraded from a previous version, then the settings you find in the Agent Configuration Tool are your previous settings, displayed for your reference.



| Parameter                                                 | Description                                                                                                                                                                | Default value |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Maximum operation queue size                              | The maximum number of operations permitted in the log reader operation queue during replication.                                                                           | 1000          |
| Maximum scan queue size                                   | The maximum number of log records permitted in the log reader log scan queue during replication.                                                                           | 1000          |
| Ignore log record processing errors                       | Determines whether to ignore log record processing errors.                                                                                                                 | false         |
| Replicate LOB columns                                     | Determines whether the agent applies each individual LOB change.                                                                                                           | true          |
| Database connection pool size                             | Maximum number of connections allowed in the connection pool on a secondary node.                                                                                          | 15            |
| Number of times to retry to connect if a connection fails | Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times. | 5             |
| Timeout in seconds to retry connecting                    | The number of seconds the agent waits between retry attempts to connect to the primary database.                                                                           | 10            |
| Number of wrapped log files                               | The maximum size, in 1-K blocks, of the LogReader system log file before wrapping.                                                                                         | 3             |
| Enable verbose trace                                      | Enables or disables extra diagnostic information in the agent system log files.                                                                                            | false         |
| Maximum log file size                                     | Limit the size of the message log to conserve disk space.                                                                                                                  | 1000          |
| Turn on asynchronous logging mode                         | Specifies whether or not LogReader should turn on a-synchronized logging mode. (TRUE, FALSE)                                                                               | TRUE          |
| Maximum size of work queue for asynchronous logging       | The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1 to 2147483647)                                                      | 1000          |

| Parameter                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Default value |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Discard policy for asynchronous logging file handler | <p>Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>• BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>• DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>• DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried, which can fail again, causing this process to be repeated.</li> </ul> | BLOCKING      |

## 6.2.23.3.2 MssqlECCAdapter Preferences

Configuration parameters for the MS SQL ECC adapter.

### Note

Log Reader and ECC adapter preferences, except for *Number of wrapped log files*, *Enable verbose trace*, and *Maximum log file size*, are no longer set in the Data Provisioning Agent Configuration Tool. They are now moved to the remote source configuration options in SAP HANA. If you have upgraded from a previous version, then the settings you find in the Agent Configuration Tool are your previous settings, displayed for your reference.

| Parameter                    | Description                                                                                      | Default value |
|------------------------------|--------------------------------------------------------------------------------------------------|---------------|
| Maximum operation queue size | The maximum number of operations permitted in the log reader operation queue during replication. | 1000          |
| Maximum scan queue size      | The maximum number of log records permitted in the log reader log scan queue during replication. | 1000          |

| Parameter                               | Description                                                         | Default value |
|-----------------------------------------|---------------------------------------------------------------------|---------------|
| Maximum wait interval between log scans | The maximum wait interval between Log Reader transaction log scans. | 60            |

**Note**

- The value of the parameter is the maximum number of seconds that can elapse before the Log Reader component scans the transaction log for a transaction to be replicated, after a previous scan yields no such transaction.
- For reduced replication latency in an infrequently updated database, we recommend lower number settings for the parameter.
- If the primary database is continuously updated, the value of the parameter is not significant to performance.

| Parameter                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Default value |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Seconds to add to each log scan wait interval             | <p>The number of seconds to add to each wait interval before scanning the transaction log, after a previous scan yields no transaction to be replicated.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>The value of the parameter is the number of seconds added to each wait interval before the LogReader component scans the log for a transaction to be replicated, after a previous scan yields no such transaction.</li> <li>The number of seconds specified by the parameter is added to each wait interval, until the wait interval reaches the value specified by the "Maximum wait interval between log scans" parameter.</li> <li>For optimum performance, the value of the parameter should be balanced with the average number of operations in the primary database over a period of time. In general, better performance results from reading more operations from the transaction log during each LogReader scan.</li> <li>With a primary database that is less frequently updated, increasing the value of the parameter may improve overall performance.</li> <li>If the database is continuously updated, the value of the parameter may not be significant to performance.</li> </ul> </div> | 5             |
| Replicate LOB columns                                     | Determines whether the agent applies each individual LOB change.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | true          |
| Database connection pool size                             | Maximum number of connections allowed in the connection pool on a secondary node.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 15            |
| Number of times to retry to connect if a connection fails | Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5             |

| Parameter                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Default value |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Timeout in seconds to retry connecting               | The number of seconds the agent waits between retry attempts to connect to the primary database.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10            |
| Number of wrapped log files                          | The maximum size, in 1 K blocks, of the agent system log file before wrapping.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 3             |
| Enable verbose trace                                 | Enables or disables extra diagnostic information in the agent system log files.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | false         |
| Maximum log file size                                | Limit the size of the message log to conserve disk space.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1000          |
| Turn on asynchronous logging mode                    | Specifies whether or not LogReader should turn on a-synchronized logging mode. (TRUE, FALSE)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TRUE          |
| Maximum size of work queue for asynchronous logging  | The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1 to 2147483647)                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1000          |
| Discard policy for asynchronous logging file handler | Specifies the discard policy for asynchronous logging file handler when the work queue is saturated. <ul style="list-style-type: none"> <li>BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried (which can fail again, causing this process to be repeated.).</li> </ul> | BLOCKING      |

### 6.2.23.3.3 OracleECCAdapter Preferences

Configuration parameters for the Oracle ECC adapter.

#### Note

Log Reader and ECC adapter preferences, except for *Number of wrapped log files*, *Enable verbose trace*, and *Maximum log file size*, are no longer set in the Data Provisioning Agent Configuration Tool. They are now moved to the remote source configuration options in SAP HANA. If you have upgraded from a previous version, then the settings you find in the Agent Configuration Tool are your previous settings, displayed for your reference.

| Parameter                                                  | Description                                                                                                                                                                                                                                                                                                                                                                         | Default value |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Distinguished Name (DN) in Certificate                     | <p>The distinguished name (DN) of the primary data server certificate.</p> <ul style="list-style-type: none"> <li>This parameter is only valid if <i>Use SSL</i> is set to "true".</li> <li>If this parameter is set, the DN field in the server certificate is verified to match this parameter. If it does not match, the connection to the primary data server fails.</li> </ul> |               |
| Oracle supplemental logging level                          | <p>Specifies the level of supplemental logging.</p> <ul style="list-style-type: none"> <li>Table: Table level turns on supplemental logging for subscribed tables and some required system tables.</li> <li>Database: Database level turns on supplemental logging for all tables, including system tables.</li> </ul>                                                              | table         |
| Maximum operation queue size                               | Specifies the maximum number of operations permitted in the log reader operation queue during replication.                                                                                                                                                                                                                                                                          | 1000          |
| Maximum scan queue size                                    | The maximum number of log records permitted in the log reader log scan queue during replication.                                                                                                                                                                                                                                                                                    | 1000          |
| Maximum session cache size                                 | The maximum number of Oracle sessions to be cached in memory during replication                                                                                                                                                                                                                                                                                                     | 1000          |
| Enable parallel scanning                                   | <p>Specifies whether to turn on parallel scanning.</p> <p>To achieve better performance for high-volume log throughput, set the parameter to <b>true</b> to enable parallel scanning.</p>                                                                                                                                                                                           | false         |
| Queue size of parallel scan tasks                          | Specifies the number of tasks in the queue.                                                                                                                                                                                                                                                                                                                                         | 0             |
| Parallel scan SCN range                                    | The maximum number of system change numbers (SCN) processed by each Oracle LogMiner scanner, when parallel scan is enabled, that is, when <i>lr_parallel_scan</i> is true.                                                                                                                                                                                                          | 1024          |
| Number of parallel scanners                                | Specifies the number of parallel scanners.                                                                                                                                                                                                                                                                                                                                          | 4             |
| Number of log record rows fetched by the scanner at a time | Specifies the number of log record rows fetched by the scanner.                                                                                                                                                                                                                                                                                                                     | 1             |
| Ignore log record processing errors                        | Determines whether to ignore log record processing errors.                                                                                                                                                                                                                                                                                                                          | false         |

| Parameter                                                 | Description                                                                                                                                                                                          | Default value |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Replicate LOB columns                                     | Oracle logs all LOB data (except for BFILE datatypes) in the Oracle redo log. This action allows the agent to apply each individual LOB change. However, for BFILE data, the same technique is used. | true          |
| Ignore data of unsupported types stored in ANYDATA        | Specifies whether you want to ignore data with unsupported types housed in ANYDATA wrapper.                                                                                                          | false         |
| Database connection pool size                             | Maximum number of connections allowed in the connection pool on a secondary node.                                                                                                                    | 15            |
| Number of times to retry to connect if a connection fails | Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times.                           | 5             |
| Timeout in seconds to retry connecting                    | The number of seconds the agent waits between retry attempts to connect to the primary database.                                                                                                     | 10            |
| Number of wrapped log files                               | The maximum size, in 1-K blocks, of the agent system log file before wrapping.                                                                                                                       | 3             |
| Enable verbose trace                                      | Enables or disables extra diagnostic information in the agent system log files.                                                                                                                      | false         |
| Maximum log file size                                     | Limit the size of the message log to conserve disk space.                                                                                                                                            | 1000          |
| Turn on asynchronous logging mode                         | Specifies whether or not LogReader should turn on asynchronous logging mode. (TRUE, FALSE)                                                                                                           | TRUE          |
| Maximum size of work queue for asynchronous logging       | The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1 to 2147483647)                                                                                | 1000          |

| Parameter                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Default value |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Discard policy for asynchronous logging file handler | <p>Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>• BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>• DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>• DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried (which can fail again, causing this process to be repeated.).</li> </ul> | BLOCKING      |

## Related Information

[Oracle Database Permissions \[page 430\]](#)

[Oracle Supplemental Logging \[page 438\]](#)

### 6.2.23.3.4 SAP ASE LTL ECC Adapter Preferences

Options to control the SAP ASE LTL ECC adapter.

| Parameter                     | Description                                                                                     |
|-------------------------------|-------------------------------------------------------------------------------------------------|
| Adapter Server Name           | The name of the SAP ASE adapter server that receives data changes from the SAP ASE data server. |
| Adapter Server Port           | The port number for the SAP ASE adapter server.                                                 |
| Enable SSL for Adapter Server | Specifies whether to use SSL for the adapter server.                                            |
| SSL Certificate File Path     | Location of the SSL certificate file.                                                           |
| SSL Certificate File Password | The password for accessing the SSL certificate file.                                            |



## 6.2.23.4 Permissions for ECC Dictionary Tables

To replicate SAP ECC dictionary tables, you need specific permissions, depending on the database you are using.

Table 62:

| Database | Permissions or instructions                                                                                                                                                                                                                                                                 |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DB2      | GRANT DBADM, CREATETAB, BINDADD, CONNECT, CREATE_NOT_FENCED_ROUTINE, IMPLICIT_SCHEMA, LOAD, CREATE_EXTERNAL_ROUTINE, QUIESCE_CONNECT ON DATABASE TO USER DPADM                                                                                                                              |
| Oracle   | Permissions are granted when setting up your adapter by running the script found in the <code>oracle_init_example.sql</code> file, which is located in the <code>Scripts</code> folder of the Data Provisioning Agent installation ( <code>&lt;DPAgent_root&gt;\LogReader\Scripts</code> ). |

### Related Information

[Remote Database Setup for Oracle Real-time Replication \[page 437\]](#)

[Remote Database Setup for DB2 Real-time Replication \[page 309\]](#)

## 6.2.23.5 Create an ECC Remote Source

Create a remote source for your ECC adapter.

### Context

The following is an example of creating an ECC Adapter remote source in SAP HANA studio.

### Procedure

1. In the Systems view, open **Provisioning > Remote Sources**.
2. Right-click **Remote Sources**, and select **New Remote Source**.
3. Enter the required information for your particular database and ECC information.
4. Click the **Save** icon in the upper right-hand corner of the screen.

## Related Information

[SAP ECC Remote Source Configuration \[page 522\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

[Creating Secondary User Credentials](#)

[SAP ASE LTL Remote Source Configuration \[page 505\]](#)

### 6.2.23.6 SAP ECC Remote Source Configuration

Configuration settings for accessing ECC remote sources. Also included are sample codes for creating remote sources using the SQL console.

The following ECC-specific parameter is for creating a remote source. You can find information about database-specific parameter information in the remote source parameter topics for Log Reader adapters.

| ERP Additional Info Options                             | Description                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Owner/Schema                                            | The source database owner/schema for all ECC tables. Typically, this value is "SAPSR3".                                                                                                                                                                                                                                   |
| Dictionary Schema                                       | If you want to use pool or cluster tables, you have to replicate a set of DD* tables into SAP HANA. The Dictionary Schema must be the schema name where those tables are replicated.<br><br><b>Note</b><br>This parameter is available only with the SAP ASE ECC adapter.                                                 |
| Use empty string for values only containing white space | Set this parameter to <i>True</i> so that any column value containing only white space is converted to an empty string; otherwise, the white space remains. The default value is <i>False</i> .<br><br>The value of this parameter may not be changed when the remote source is suspended.                                |
| Trim the trailing spaces                                | Set this parameter to <i>True</i> to trim trailing spaces from strings for both primary key and non-primary key columns. The default value is <i>False</i> .<br><br>For example, " A 1 " is trimmed to " A 1", and " " is trimmed to "".<br><br><b>Note</b><br>For transparent tables, only fully-empty space is trimmed. |

## Example: IBM DB2 ECC Adapter

### Sample Code

```
CREATE REMOTE SOURCE "MyDB2Source" ADAPTER "DB2ECCAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="pds_host_name" displayName="Host">myhost.sap.corp</
PropertyEntry>
<PropertyEntry name="pds_port_number" displayName="Port Number">50000</
PropertyEntry>
<PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
<PropertyEntry name="pds_datasource_name" displayName="Database
SourceName">mydb</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="erpadditionalinfo" displayName="ERP Additional Info">
<PropertyEntry name="schema" displayName="Owner/Schema">SAPSR3</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

## Example: Microsoft SQL Server ECC Adapter

### Sample Code

```
CREATE REMOTE SOURCE "MySQLServerSource" ADAPTER "MssqlECCAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="data_type_conversion" displayName="Data Type Conversion">
<PropertyEntry name="map_char_types_to_unicode" displayName="Always Map
Character Types to Unicode">false</PropertyEntry>
<PropertyEntry name="map_time_to_timestamp" displayName="Map SQL Server Data
Type Time to Timestamp">true</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="pds_server_name" displayName="Host">myserver.sap.corp</
PropertyEntry>
<PropertyEntry name="pds_port_number" displayName="Port Number">1433</
PropertyEntry>
<PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
<PropertyEntry name="pdb_dcmode" displayName="Database Data Capture
Mode">MSCDC</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc" displayName="CDC Properties">
<PropertyGroup name="logreader" displayName="LogReader">
<PropertyEntry name="skip_lr_errors" displayName="Ignore log record decluster
errors">false</PropertyEntry>
</PropertyGroup>
```

```

</PropertyGroup>
<PropertyGroup name="erpadditionalinfo" displayName="ERP Additional Info">
<PropertyEntry name="schema" displayName="Owner/Schema">SAPSR3</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>'

```

## Example: Oracle ECC Adapter

### Sample Code

```

CREATE REMOTE SOURCE "MyOracleSource" ADAPTER "OracleECCAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="pds_host_name" displayName="Host">myhost.sap.corp</
PropertyEntry>
<PropertyEntry name="pds_port_number" displayName="Port Number">1521</
PropertyEntry>
<PropertyEntry name="pds_database_name" displayName="Database Name">myoradb</
PropertyEntry>
</PropertyGroup>
<PropertyGroup name="erpadditionalinfo" displayName="ERP Additional Info">
<PropertyEntry name="schema" displayName="Owner/Schema">SAPSR3</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>' ;

```

## 6.2.23.7 Creating an Allowlist to Limit Access to a Source Database

There are times when you might want to limit access to all of the tables in a source database. For data provisioning log reader adapters as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create an allowlist.

Restricting access to only those tables that are to be replicated is done by creating an allowlist of source database objects in a separate table.

### Note

The allowlist impacts only the virtual table created and the replications created after the allowlist was created.

You can use SQL to create the allowlist table.

#### Note

- The allowlist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and ALLOWLIST.
- The allowlist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of an allowlist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of allowlisted tables for a single remote source.

## Microsoft SQL Server Example

```
create table allowlist(REMOTE_SOURCE_NAME varchar(128), ALLOWLIST varchar(4000));
```

To add an allowlist for the remote source called "localmssqldb", insert a row into the allowlist table:

```
insert into allowlist values('localmssqldb', 'object.A, object.B*');  
insert into allowlist values('localmssqldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source "localmssqldb".

## SAP HANA Example

```
create schema SAP_RESTRICTIONS;  
create table ALLOW_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, ALLOWLIST  
varchar(4000));
```

To add an allowlist for the remote source called "localhadp", insert a row into the allowlist table:

```
insert into ALLOW_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT, APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source localhadp.

## 6.2.23.8 SQL Pushdown for Pooled and Cluster Tables

There are limitations for SQL pushdown operations to SAP ECC pooled and cluster tables.

There is no SQL pushdown for pool tables. For cluster tables, there is limited SQL pushdown.

If SQL pushdown is not available for a given SQL statement, then the SQL is performed within the SAP HANA system. Pushing down the SQL results in better performance.

Keep the following in mind when using pushdown for cluster tables:

- The SELECT statement's WHERE clause must contain only fields that are keys in both the parent table cluster and the contained cluster table.
- The SELECT clause is limited to field names from the cluster table or \*.

For example, the cluster table KONV is contained within the table cluster KOCLU. The table cluster KOCLU has three keys MANDT, KNUMV, and PAGENO. The cluster table KONV has keys MANDT, KNUMV, KPOSN, STUNR, ZAEHK. The only keys which they have in common are MANDT and KNUMV. So, the WHERE clause cannot refer to any fields other than MANDT and KNUMV.

If VT\_KONV is a virtual table to the KONV cluster table, then:

```
SELECT * FROM VT_KONV WHERE MANDT='001' AND KNUMV='321'
```

can be pushed down, because both MANDT and KNUMV are keys in both the KONV cluster table and the parent KOCLU table cluster.

However,

```
SELECT COUNT(*) FROM VT_KONV WHERE MANDT='001' AND KNUMV='321'
```

cannot be pushed down, because the SELECT clause contains something other than KONV field names or \*.

## 6.2.23.9 Loading Metadata for Cluster and Pooled Tables

Load cluster and pooled table metadata. This only applies to the SAP ASE ECC adapter.

Before working with SAP ASE ECC cluster or pooled tables, their metadata must be loaded into SAP HANA into a schema specified by the `dictionarySchema` attribute. To do this, execute the `replicate_dictionary.sql` script, and then create and execute the stored procedures that are listed below.

### Note

We previously created remote subscriptions for the dictionary tables (DD\* tables). Because these tables are typically static, it suffices to materialize these tables once. If there are changes to the contents of the dictionary tables, you will need to truncate and reload these dictionary tables again by running Step 3.

### Note

Beginning with the ABAP Platform 1808/1809 release, cluster and pooled tables are not supported in SAP S/4 HANA.

1. In SAP HANA studio, choose **File > Open** and navigate to `<DPAgent_root>/LogReader/scripts`.
2. Select `replicate_dictionary.sql`
3. Right click on the text screen, and click **Choose Connection**. Select your connection, and click **OK**.
4. Click **Execute**.
5. Call this stored procedure with the following parameters, after making appropriate replacements for `<HANA_SCHEMA>` and `<remote_source_name>` in `replicate_dictionary.sql`:

### Note

<HANA\_SCHEMA> should be replaced with the name of the schema where you would replicate the DD\* tables. This schema is also specified as the Dictionary Schema while configuring the remote source. The source (virtual tables) and target tables must also reside in the same schema as the Dictionary Schema.

- call `materialize_dictionary_table('<HANA_SCHEMA>', '<remote_source_name>', 'DD02L');`
- call `materialize_dictionary_table('<HANA_SCHEMA>', '<remote_source_name>', 'DD03L');`

### Note

Use this procedure to initial load the DD03L table if your SAP HANA system has plenty of free memory.

- call `materialize_dictionary_table('<HANA_SCHEMA>', '<remote_source_name>', 'DD16S');`
- call `materialize_dictionary_table('<HANA_SCHEMA>', '<remote_source_name>', 'DDNTT');`
- call `materialize_dictionary_table('<HANA_SCHEMA>', '<remote_source_name>', 'DDNTF');`
- call `materialize_dictionary_table_dd03l('<HANA_SCHEMA>', '<remote_source_name>', '<remote_source_table>');`

### Note

This procedure initial loads specific rows for the cluster/pooled table in DD03L if free memory in your SAP HANA target is limited. Be sure that this procedure is run prior to creating a replication task or flowgraph for this cluster/pooled table.

## 6.2.24 SAP HANA

The SAP HANA adapter provides real-time change data capture capability in order to replicate data from a remote SAP HANA database to a target SAP HANA database.

Unlike Log Reader adapters, which read a remote database log to get changed data, the SAP HANA adapter is trigger-based: triggers capture changed data, and the adapter continuously queries the source database to get the changed data. When a table is subscribed to replicate, the adapter creates three triggers (INSERT, UPDATE, and DELETE) on the table for capturing data.

The adapter also creates a shadow table for the subscribed table. Except for a few extra columns for supporting replication, the shadow table has the same columns as its replicated table. Triggers record changed data in shadow tables. For each adapter instance (remote source), the adapter creates a Trigger Queue table to mimic a queue. Each row in shadow tables has a corresponding element (or placeholder) in the queue. The adapter continuously scans the queue elements and corresponding shadow table rows to get changed data and replicate them to the target SAP HANA database.

## Adapter Functionality

This adapter supports the following functionality:

- Source support for ECC on SAP HANA
- Virtual table as a source
- Virtual table as a target using a Data Sink in a flowgraph
- Search for tables in a remote source
- DDL propagation. This adapter supports the ADD COLUMN, and DROP COLUMN operations.
- Real-time change data capture

### ⚠ Restriction

The TRUNCATE TABLE operation is not supported.

- Replication monitoring and statistics
- Virtual procedures

In addition, this adapter supports the following capabilities:

Table 63: Global Settings

| Functionality                                | Supported? |
|----------------------------------------------|------------|
| SELECT from a virtual table                  | Yes        |
| INSERT into a virtual table                  | Yes        |
| Execute UPDATE statements on a virtual table | Yes        |
| Execute DELETE statements on a virtual table | Yes        |
| Different capabilities per table             | No         |
| Different capabilities per table column      | No         |
| Real-time                                    | Yes        |

Table 64: Select Options

| Functionality                               | Supported? |
|---------------------------------------------|------------|
| Select individual columns                   | Yes        |
| Add a WHERE clause                          | Yes        |
| JOIN multiple tables                        | Yes        |
| Aggregate data via a GROUP BY clause        | Yes        |
| Support a DISTINCT clause in the select     | Yes        |
| Support a TOP or LIMIT clause in the select | Yes        |
| ORDER BY                                    | Yes        |
| GROUP BY                                    | Yes        |



## 6.2.24.1 User Permissions

Configure the necessary permissions for SAP HANA adapters.

Ensure that you configure the following permissions:

- For real-time change data capture: TRIGGER on source tables or schema of source tables
- For SAP HANA virtual tables used as a source: SELECT
- For SAP HANA virtual tables used as a target (Data Sink) in an `.hdbflowgraph`: INSERT, UPDATE, and DELETE
- If the `Database > Schema` and `Credentials > User` remote source configuration parameters are both defined with different values: GRANT CREATE ANY ON SCHEMA `<schema_name>` TO `<user_name>` WITH GRANT OPTION

## 6.2.24.2 SAP HANA Adapter Preferences

Set the thread pool size when executing jobs of querying shadow tables to get change data.

| Parameter        | Description                                                                                                                                                                                                                                                                                                                            |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Thread Pool Size | <p>The size of the SAPHANA adapter global thread pool. SAP HANA adapter remote sources shares the thread pool. The thread pool is used to execute jobs of querying shadow tables to get change data.</p> <p>We recommend that you configure the thread pool size to the number of available processors in the system, if possible.</p> |

## 6.2.24.3 SAP HANA Remote Source Configuration

Use the SAP HANA adapter to move data from one SAP HANA instance to another. Review sample code for creating a remote source using the SQL console.

### Privileges

For the schemas containing tables you want to access, you must grant the following schema privileges to the user on the remote SAP HANA database:

Table 65: Required Schema Privileges

| Purpose                                  | Required Privilege                                  |
|------------------------------------------|-----------------------------------------------------|
| Real-time change data capture.           | TRIGGER on source tables or schema of source tables |
| Use SAP HANA virtual tables as a source. | SELECT                                              |

| Purpose                                                                                                                   | Required Privilege                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Use SAP HANA virtual tables as a target (Data Sink) in an <code>.hdbflowgraph</code> .                                    | INSERT, UPDATE, and DELETE                                                                                      |
| Use different values for <code>Database</code> , <code>Schema</code> , and <code>Credentials</code> , <code>User</code> . | GRANT CREATE ANY ON SCHEMA <code>&lt;schema_name&gt;</code> TO <code>&lt;user_name&gt;</code> WITH GRANT OPTION |

## Remote Source Parameters

| Category | Option                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Database | Host Auto Fail-over            | <p>Enable auto failover for scale-out SAP HANA.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|          | Host                           | <p>The host name or IP address on which the remote SAP HANA server is running.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|          | Port Number                    | <p>The port number of the remote SAP HANA server.</p> <p>If the remote SAP HANA server is a single-container system, the port number is <code>3&lt;instance&gt;15</code>, and the <i>Database Name</i> parameter must be empty.</p> <p>If the remote SAP HANA server is a multiple-container system, the port number is <code>3&lt;instance&gt;13</code>, and the tenant database name must be specified in the <i>Database Name</i> parameter.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>Use an arbitrary port like 1234. Don't put 1433 or 1434 as the instance number.</p> </div> <p>Execute the following query to obtain the system database SQL port:</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <pre>SELECT DATABASE_NAME, SQL_PORT FROM SYS_DATABASES.M_SERVICES WHERE DATABASE_NAME= 'SYSTEMDB' and SERVICE_NAME= 'nameserver' and COORDINATOR_TYPE= 'MASTER' ;</pre> </div> |
|          | Auto-Failover Hosts Connection | <p>The connection string for scale-out SAP HANA auto failover.</p> <p>Specify the connection string as a series of host and port pairs. For example:</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <pre>host1:port1;host2:port2;host3:port3</pre> </div> <p>This parameter is configurable only if <i>Host Auto-Failover</i> is <i>True</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                        |

| Category | Option                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Allowlist Table in Remote Database                     | Enter the name of the table that contains the allowlist in the remote database.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|          | Database Name                                          | Specifies the database name if the remote database is a tenant database. Leave this parameter empty if the remote database isn't a tenant database.                                                                                                                                                                                                                                                                                                                                                                            |
|          | Schema (Case Sensitive)                                | If this parameter and <b>Credentials &gt; User</b> are both defined with different values, the SAP HANA adapter creates a series of system objects under this schema, instead of <code>&lt;user&gt;</code> .                                                                                                                                                                                                                                                                                                                   |
|          |                                                        | <p><b>Note</b></p> <p>This option is no longer required. It's visible solely for backward compatibility purposes. It was used in previous versions to restrict the viewing of tables to those tables under the given schema. Now, you can view all tables, regardless of the schema they're located under. For those remote sources that were created in a previous version, this value must remain unchanged.</p>                                                                                                             |
|          | JDBC Connection Properties                             | <p>Extra SAP HANA-supported JDBC connection properties.</p> <p>Separate each property definition with an ampersand (&amp;). For example:</p> <pre>distribution=OFF&amp;autocommit=true</pre> <p>For a complete list of supported properties, see "JDBC Connection Properties" in the <i>SAP HANA Client Interface Programming Reference</i>.</p>                                                                                                                                                                               |
|          | Retrieve Last Modified Dates for Objects in Dictionary | <p>The process of creating a table dictionary queries metadataLastModifiedTimestamp from the source database, which can take considerable time.</p> <ul style="list-style-type: none"> <li><b>True:</b> Keeps the current behavior of querying metadataLastModifiedTimestamp.</li> <li><b>False:</b> Disables the current behavior.</li> </ul> <p>If you don't need the data from metadataLastModifiedTimestamp, set this parameter to false. Doing so can help with performance.</p> <p>The default value is <b>True</b>.</p> |
|          | Use Proxy                                              | <p>Set to <b>True</b> to connect to the SAP HANA system through a SOCKS5 or HTTP proxy server.</p> <p>The default value is <b>False</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                   |
|          | Enable HTTP Proxy Authentication                       | <p>Specifies whether to use HTTP authentication when connecting through a proxy.</p> <p><b>Note</b></p> <p>This option is valid only when <b>Use Proxy</b> is set to <b>True</b>.</p>                                                                                                                                                                                                                                                                                                                                          |
|          | Proxy Host Name                                        | <p>Enter the hostname of the proxy server used to connect to the SAP HANA system.</p> <p><b>Note</b></p> <p>This option is valid only when <b>Use Proxy</b> is set to <b>True</b>.</p>                                                                                                                                                                                                                                                                                                                                         |

| Category                  | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | Proxy Port                               | Enter the port of the proxy server used to connect to the SAP HANA system.<br><br><div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>This option is valid only when <i>Use Proxy</i> is set to <i>True</i>.</p> </div>                                                                                                                                                                                                |
| Schema Alias Replacements | Schema Alias                             | Schema name to be replaced with the schema specified in Schema Alias Replacement.<br><br>If specified, accessing tables under it is considered to be accessing tables under the schema specified in Schema Alias Replacement.<br><br><div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                    |
|                           | Schema Alias Replacement                 | Schema name to be used to replace the schema specified in Schema Alias.<br><br><div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>If the schema alias isn't configured, leave this blank.</p> </div> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px; margin-top: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
| CDC Properties            | System Object Prefix                     | Case-insensitive naming prefix for adapter-related system objects created by the adapter in the source SAP HANA database.<br><br>The default value is <b>HADP_</b> (recommended).                                                                                                                                                                                                                                                                                       |
|                           | Enable ABAP Manageable Trigger Namespace | <ul style="list-style-type: none"> <li><i>False</i></li> <li><i>True</i>: If the source is an ABAP system, triggers created by SAP HANA smart data integration match the name pattern of the ABAP system so that the system can manage triggers if there's an upgrade, for example. Set the name pattern in the parameter <i>ABAP Manageable Trigger Namespace</i>.</li> </ul> <p>The default value is <i>False</i>.</p>                                                |
|                           | ABAP Manageable Trigger Namespace        | Configurable only when <i>Enable ABAP Manageable Trigger Namespace</i> is set to <i>True</i> . This parameter is case-insensitive.<br><br>The default value is <b>/1DI/</b> .                                                                                                                                                                                                                                                                                           |
|                           | In-Memory Sequences                      | Specifies whether the SAP HANA adapter creates sequence objects with the statement <code>CREATE SEQUENCE ... RESET BY ...</code> .<br><br>The default value is <i>True</i> .                                                                                                                                                                                                                                                                                            |

| Category | Option                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Sequence Cache Size              | <p>Specifies the cache size to append to <code>CREATE SEQUENCE</code> statements.</p> <ul style="list-style-type: none"> <li>For values greater than 1, the adapter creates sequence objects with statement <code>CREATE SEQUENCE ... CACHE &lt;cache size&gt; ...</code>, where <code>&lt;cache size&gt;</code> equals the value of the <i>Sequence Cache Size</i> parameter.</li> <li>For values less than or equal to 1, no <code>CACHE</code> parameter is appended in the <code>CREATE SEQUENCE</code> statement.</li> </ul> <p>The default value is <b>1000</b>. The valid range is 0–30000.</p>                                      |
|          | Reserve System Sequences         | <p>Specifies whether the adapter reserves the <code>scan_seq</code> and <code>trigger_seq</code> system sequences, even though all of the subscriptions are dropped or reset.</p> <p>If you don't want to use this remote source, and you want to remove the environment, first, set this parameter to <i>False</i>, then drop the subscription and drop the remote source.</p> <p>The default value is <i>True</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Connection Pool Size             | <p>Maximum number of connections allowed in the connection pool.</p> <p>The default value is <b>8</b>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                               |
|          | Minimum Scan Interval in Seconds | <p>The minimum interval in seconds that the adapter scans the Trigger Queue table to get change data.</p> <p>The default value is <b>0</b>, which means there's no waiting time before the next scan.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                |
|          | Maximum Scan Interval in Seconds | <p>The maximum interval in seconds that the adapter scans the Trigger Queue table to get change data.</p> <p>If the adapter scans the queue and finds that the queue is empty, it gradually increases the scan interval from the minimum scan interval to the maximum scan interval.</p> <p>The default value is <b>10</b>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                          |

| Category | Option                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | DDL Scan Interval in Minutes             | <p>The interval in minutes for detecting DDL changes in the source.</p> <p>A zero or negative integer disables this parameter.</p> <p>The default value is <b>10</b>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|          | Maximum Batch Size                       | <p>The maximum number of consecutive change data on the same table that is batched to process and send to Data Provisioning Server together.</p> <p>The default value is <b>128</b>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|          | Batch Queue Size                         | <p>The internal batch queue size. The batch queue size determines the maximum number of batches of change data that are queued in memory.</p> <p>The default value is <b>64</b>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|          | Maximum Transaction Count in Scan        | <p>The maximum number of transactions being processed in a scan of the remote source database.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|          | Maximum Scan Size                        | <p>The maximum number of rows being fetched from the trigger queue table in one scan and assigned to batch jobs for further processing.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|          | Maintenance User Filter (Case Sensitive) | <p>Optional. Enter one or more user names. Source database transactions (INSERT, UPDATE, and DELETE) conducted by this user is filtered out (ignored) and not propagated to the SAP HANA target. For example, if you log in to the source database with a maintenance user and delete a row from a source table that is subscribed for replication, this row isn't deleted from the target table.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>Don't use the same name as the SAP HANA database username.</p> </div> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended. However, the changed value takes effect only on newly created remote subscriptions afterward. The existing subscriptions are still using the old value.</p> </div> <p>Specify multiple user names by separating them with a backslash (\). For example, for maintenance users named <b>MAINT_USER</b> and <b>APP_USER</b>:</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px; margin-top: 5px;"> <pre>MAINT_USER \ APP_USER</pre> </div> |

| Category | Option                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Filter Maintenance Transactions by | <p>Select a user by which to filter maintenance transactions:</p> <ul style="list-style-type: none"> <li>• Session User (default)</li> <li>• Application User</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|          | Archive User (Case Sensitive)      | <p>Optional. Enter a user name. Changes made by the archive user are marked as archived in the SAP HANA target in three ways:</p> <ul style="list-style-type: none"> <li>• Existing actual table. SQL syntax: <pre>CREATE REMOTE SUBSCRIPTION ... TARGET TABLE &lt;table&gt; CHANGE TYPE COLUMN &lt;column&gt; CHANGE TIME COLUMN &lt;column&gt; UPSERT</pre> </li> <li>• Existing history table. SQL syntax: <pre>CREATE REMOTE SUBSCRIPTION ... TARGET TABLE &lt;table&gt; CHANGE TYPE COLUMN &lt;column&gt; CHANGE TIME COLUMN &lt;column&gt; INSERT</pre> </li> <li>• New actual table: Modify <code>indexserver.ini</code> on your SAP HANA instance, and create an actual table: <pre>ALTER SYSTEM ALTER CONFIGURATION ('indexserver.ini', 'SYSTEM') SET ('smart_data_integration', 'applier_target_preserve_archive') = 'true' WITH RECONFIGURE; CREATE REMOTE SUBSCRIPTION ... TARGET TABLE &lt;table&gt; CHANGE TYPE COLUMN &lt;column&gt; CHANGE TIME COLUMN &lt;column&gt; UPSERT</pre> </li> </ul> |
|          | Archive User Type                  | <p>Select a user by which to filter archived transactions:</p> <ul style="list-style-type: none"> <li>• Session User (default)</li> <li>• Application User</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|          | Manage System Objects Life-Cycle   | <ul style="list-style-type: none"> <li>• <i>Create and Clear Normally</i>: Normal behavior in system objects life-cycle (Default). Support for dropping and creating system objects.</li> <li>• <i>Clear Only</i>: Support for dropping system objects, if they exist. This setting is normally used in unsubscribing tables and cleaning up the environment.</li> <li>• <i>Create and Reuse</i>: Support for creating system objects, if they don't exist. For the existing objects, the adapter reuses them.</li> <li>• <i>Reuse Only</i>: No support for dropping or creating system objects. For the existing objects, the adapter reuses them. This setting is normally used in a shadow remote source that wants to retrieve the subscription in a remote source and replicate continuously.</li> </ul>                                                                                                                                                                                                  |

| Category | Option                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Last Committed Sequence Id            | <p>Required only when <i>Manage System Objects Life-Cycle</i> is set to <i>Reuse Only</i>.</p> <p>If you set this parameter to <b>0</b>, the adapter scans new cached data without rescanning.</p> <p>You can get its value by executing the following SQL statement in your target system:</p> <pre>SELECT MAX(LAST_PROCESSED_COMMIT_SEQUENCE_ID) FROM M_REMOTE_SUBSCRIPTIONS WHERE SUBSCRIPTION_NAME IN ( SELECT SUBSCRIPTION_NAME FROM "PUBLIC"."REMOTE_SUBSCRIPTIONS" WHERE REMOTE_SOURCE_NAME = 'normal_rs' )</pre> |
|          | Enable Statement-level Trigger        | <p>Using statement-level triggers can improve performance when inserting, updating, or deleting in bulk. However, the performance isn't as good as row-level triggers when inserting rows one by one.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can't be changed when the remote source is suspended.</p> </div>                                                                                            |
|          | Create Statement-level Insert Trigger | <p>Select <i>True</i> to create statement-level insert triggers.</p> <p>This parameter is configurable only when <i>Enable Statement-level Trigger</i> is set to <i>True</i>.</p> <p>The default value is <i>True</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                             |
|          | Create Statement-level Delete Trigger | <p>Select <i>True</i> to create statement-level delete triggers.</p> <p>This parameter is configurable only when <i>Enable Statement-level Trigger</i> is set to <i>True</i>.</p> <p>The default value is <i>True</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                             |
|          | Create Statement-level Update Trigger | <p>Select <i>True</i> to create statement-level update triggers.</p> <p>This parameter is configurable only when <i>Enable Statement-level Trigger</i> is set to <i>True</i>.</p> <p>The default value is <i>True</i>.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                             |



| Category | Option                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|          | Triggers Record PK Only                 | <p>Set to <i>True</i> to have the triggers record only the primary keys of changed data during CDC processing. This action might improve the DML performance in the source database.</p> <p>The SAP HANA adapter doesn't support UPDATE primary key value in this mode by default. To enable this functionality, set <i>Capture Before and After Images</i> to <i>True</i>.</p> <p>There are side effects to using this parameter; for example, a drop in replication performance is expected. This side effect is a compromise to achieve better trigger/DML performance on the source database.</p> |
|          | Enable Upsert Trigger                   | <p>This option is valid only when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <ul style="list-style-type: none"> <li>• <i>True</i>: A trigger captures change data from the remote table into shadow table through an UPSERT operation.</li> <li>• <i>False</i>: A trigger captures change data from the remote table into shadow table through an INSERT operation.</li> </ul> <p>The default value is <i>False</i>.</p>                                                                                                                                                               |
|          | Capture Before and After Images         | <p>This option is available only when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <ul style="list-style-type: none"> <li>• <i>True</i>: A trigger captures both before and after images of UPDATE operations on the remote table.</li> <li>• <i>False</i>: A trigger captures only the after image of UPDATE operations on the remote table.</li> </ul> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                       |
|          | Capture Full Before Images              | <p>This option is available only when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <ul style="list-style-type: none"> <li>• <i>True</i>: A trigger captures full before images for DELETE operations on the remote table.</li> <li>• <i>False</i>: A trigger doesn't capture before images for DELETE operations on the remote table.</li> </ul> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                               |
|          | Statement Hint Table in Remote Database | <p>Query statement with hint.</p> <p>This option is available only when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <p>In the remote database, create a table with REMOTE_SOURCE_NAME, TABLE_NAME (qualified), and STATEMENT_HINT columns, and insert each statement hint per row for the required table. Set this qualified table name in this property, for example, "SYSTEM" . "EXAMPLE_TABLE".</p>                                                                                                                                                                                  |

| Category | Option                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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|          | Enable Filter in Triggers | <p><b>⚠ Restriction</b></p> <p>This option is available only for remote sources using the <i>HANA Adapter V2</i> adapter.</p> <p>Enables trigger-level value filtering to restrict the number of records added to shadow tables and replicated to the target. Trigger-level filters can improve process efficiency and optimize high-volume data replication.</p> <ul style="list-style-type: none"> <li><i>True</i>: Only records that meet the filter conditions defined in the replication task are recorded into the shadow table.<br/>For example, if you define the filter <code>col2_varchar like '%AAA%'</code> in your replication task, only records that contain the value <b>AAA</b> in the <code>col2_varchar</code> column are recorded into the shadow table.</li> <li><i>False</i>: All triggered records are recorded into the shadow table.</li> </ul> <p>The default value is <i>False</i>.</p> <p><b>📌 Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> |
|          | Shadow Table Type         | <p>Configures the type of shadow table.</p> <p>This option is valid only when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <p>The default value is <i>COLUMN</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|          | Trigger Queue Table Type  | <p>Configures the type of trigger queue table.</p> <p>This option is valid only when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <p>The default value is <i>COLUMN</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Category | Option                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Source Data Pattern Analysis  | <p>Records the scan history in the framework log directory in files with the following naming scheme:</p> <pre>&lt;DPAgent_root&gt;/log/ &lt;remote_source_name&gt;_&lt;system_object_prefix&gt;_&lt;timestamp&gt;/ &lt;sequence&gt;</pre> <p>The generated CSV file contains the following columns:</p> <ul style="list-style-type: none"> <li>• SCAN_NUMBER</li> <li>• START_PROCESS_TIME</li> <li>• END_PROCESS_TIME</li> <li>• TRANSACTION_ID</li> <li>• COMMIT_TIME</li> <li>• TABLE_NAME</li> <li>• INSERT_COUNT</li> <li>• BEFORE_IMAGE_COUNT</li> <li>• AFTER_IMAGE_COUNT</li> <li>• DELETE_COUNT</li> </ul> <p>Control the number and size of these files by tuning the following Agent Adapter Framework Preferences logging parameters:</p> <ul style="list-style-type: none"> <li>• <a href="#">Log max backup</a></li> <li>• <a href="#">Log file max file size</a></li> </ul> <p>The default value is <i>True</i>.</p> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Transmit Data in Compact Mode | <p>Specifies whether to transmit data in compact mode.</p> <p>When set to <i>True</i>, the adapter packs and sends out the data of one table together with other tables, which could speed up applying data in DP Server. However, doing so breaks referential integrity among tables.</p> <p>For <i>HanaAdapter</i>, the default value is <i>False</i>.</p> <p>For <i>HanaAdapterV2</i>, the default value is <i>True</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          | Enable Transaction Merge      | <p>Specifies whether to merge transactions and replicate them to the target in a single transaction.</p> <ul style="list-style-type: none"> <li>• <i>True</i>: Transactions on same remote table are grouped and replicated to the target.</li> <li>• <i>False</i>: Transactions are replicated as-is.</li> </ul> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Category            | Option                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| Connection Security | Enable SSL Encryption           | <p>Specifies whether to enable SSL encryption on connections to a remote SAP HANA database.</p> <p>To use SSL encryption with a remote SAP HANA database, the Data Provisioning Agent must already be correctly configured for SSL support:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configure SSL for SAP HANA On-Premise [Manual Steps] [page 601]</a></li> </ul> <p>The default value is <i>False</i>.</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                     | Validate Server Certificate     | <p>Specifies whether to validate the certificate of a remote SAP HANA server.</p> <p>This configuration is meaningful only if <i>Enable SSL Encryption</i> is set to <i>True</i>.</p> <p>The default value is <i>False</i>.</p> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                     | Host Name in Server Certificate | <p>Controls the verification of the host name field of the server certificate.</p> <ul style="list-style-type: none"> <li>• If not set, the host name used for the connection is used for verification.</li> </ul> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>Because SSL is name-based, connecting to an IP address or to "localhost" is unlikely to work.</p> </div> <ul style="list-style-type: none"> <li>• If set to a string, the following rules apply: <ul style="list-style-type: none"> <li>• If the string is "*", any name matches.</li> <li>• If the string starts with "CN=", it's treated as a common name, and the textual representation of the common name entry in the certificate must be exactly the same.</li> <li>• Enable SSL. Otherwise, the host name in the server certificate must match this string (case insensitive).</li> </ul> </li> </ul> <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|                     | Authentication Mechanism        | <p>The authentication mechanism to use when connecting to the SAP HANA remote source.</p> <ul style="list-style-type: none"> <li>• <i>User Name and Password</i>: Connect using basic user name and password authentication.</li> <li>• <i>X.509 Client Certificate</i>: Connect using an X.509 certificate, identity provider, and user mapping that you've configured on the remote SAP HANA system.</li> </ul> <p>For more information, see <a href="#">X.509 Certificate-Based User Authentication</a> in the <i>SAP HANA Security Guide</i>.</p> <p>The default value is <i>User Name and Password</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Category    | Option                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | Use Agent Stored Credential | <p>Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage. The default value is <i>False</i>.</p> <p><b>Note</b><br/>This option is valid only when <i>Authentication Mechanism</i> is set to <i>User Name and Password</i>.</p> <p><b>Note</b><br/>When you use credentials stored in the agent's secure storage, you must still specify the user name in <b>Credentials &gt; User</b>. Additionally, the <i>Credential Mode</i> must not be <i>None</i> or empty.</p> |
| Credentials | Credentials Mode            | <p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>                                                                                  |
|             | User                        | <p>For basic username and password authentication, the database user name (case sensitive).</p> <p><b>Note</b><br/>This option is valid only when <i>Authentication Mechanism</i> is set to <i>User Name and Password</i>.</p> <p><b>Note</b><br/>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                |
|             | Password                    | <p>For basic username and password authentication, the password for the database user.</p> <p><b>Note</b><br/>This option is valid only when <i>Authentication Mechanism</i> is set to <i>User Name and Password</i>.</p> <p><b>Note</b><br/>The value of this parameter can be changed when the remote source is suspended.</p>                                                                                                                                                                                     |
|             | Proxy User Name             | <p>Enter the user name for the proxy server used to connect to the SAP HANA system.</p> <p><b>Note</b><br/>This option is valid only when <i>Use Proxy</i> is set to <i>True</i>.</p>                                                                                                                                                                                                                                                                                                                                |

| Category | Option                            | Description                                                                                                                         |
|----------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|          | Proxy Password                    | Enter the password for the proxy server used to connect to the SAP HANA system.                                                     |
|          |                                   | <p><b>Note</b></p> <p>This option is valid only when <i>Use Proxy</i> is set to <i>True</i>.</p>                                    |
|          | X.509 Client Certificate          | The X.509 client certificate to use when authenticating with the SAP HANA remote source.                                            |
|          |                                   | <p><b>Note</b></p> <p>This option is valid only when <i>Authentication Mechanism</i> is set to <i>X.509 Client Certificate</i>.</p> |
|          | X.509 Client Private Key          | Optional. The X.509 client private key to use when authenticating with the SAP HANA remote source.                                  |
|          |                                   | <p><b>Note</b></p> <p>This option is valid only when <i>Authentication Mechanism</i> is set to <i>X.509 Client Certificate</i>.</p> |
|          | X.509 Client Private Key Password | Optional. The password to use when authenticating with an encrypted X.509 client private key.                                       |
|          |                                   | <p><b>Note</b></p> <p>This option is valid only when <i>Authentication Mechanism</i> is set to <i>X.509 Client Certificate</i>.</p> |

## Example: Basic

Create a basic remote source using the SQL console.

### Sample Code

```
CREATE REMOTE SOURCE "MyHanaSource" ADAPTER "HanaAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="host" displayName="Host">myhost.sap.corp</PropertyEntry>
<PropertyEntry name="port" displayName="Port Number">30115</PropertyEntry>
<PropertyEntry name="schema" displayName="Schema">myschema</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc_properties" displayName="CDC Properties">
<PropertyEntry name="prefix" displayName="System Object Prefix">HADP_</
PropertyEntry>
<PropertyEntry name="conn_pool_size" displayName="Connection Pool Size">8</
PropertyEntry>
<PropertyEntry name="min_scan_interval" displayName="Minimum Scan Interval in
Seconds">0</PropertyEntry>
<PropertyEntry name="max_scan_interval" displayName="Maximum Scan Interval in
Seconds">10</PropertyEntry>
```

```

<PropertyEntry name="max_batch_size" displayName="Maximum Batch Size">128</
PropertyEntry>
<PropertyEntry name="batch_queue_size" displayName="Batch Queue Size">64</
PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>' ;

```

## Example: DDL Scan Enabled

Create a DDL scan enabled remote source using the SQL console.

### Sample Code

```

CREATE REMOTE SOURCE "MyHanaSource" ADAPTER "HanaAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="host" displayName="Host">myhost.sap.corp</PropertyEntry>
<PropertyEntry name="port" displayName="Port Number">30115</PropertyEntry>
<PropertyEntry name="schema" displayName="Schema">myschema</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc_properties" displayName="CDC Properties">
<PropertyEntry name="prefix" displayName="System Object Prefix">HADP_</
PropertyEntry>
<PropertyEntry name="ddl_scan_interval" displayName="DDL Scan Interval in
Minutes">1</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>' ;

```

## Related Information

[SAP HANA DDL Propagation \[page 544\]](#)

[Using a Schema Alias \[page 347\]](#)

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

[Use a Shadow Remote Source \[page 545\]](#)

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

[Creating an Allowlist to Limit Access to a Source Database \[page 546\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 91\]](#)

[Store Remote Data Source Credentials Securely \[page 68\]](#)

[JDBC Connection Properties \(SAP HANA Client Interface Programming Reference\)](#)

[Agent Configuration Parameters \[page 112\]](#)

[X.509 Certificate-Based User Authentication \(SAP HANA Security Guide\)](#)

## 6.2.24.4 SAP HANA DDL Propagation

With the SAP HANA adapter, enabling DDL propagation can impact the performance of the source SAP HANA database.

### DDL Scan Interval

From the time the DDL changes occur on the source database to the time the DDL changes are propagated to the target SAP HANA database, no DML changes on the tables are allowed. At an interval you configure in *DDL Scan Interval in Minutes*, which is 10 minutes by default, the SAP HANA adapter queries the metadata of all subscribed tables from the source SAP HANA database and determines if changes to the DDL have occurred. If changes are detected, the adapter propagates the DDL changes to the target database through the Data Provisioning Server.

Because the SAP HANA adapter detects DDL changes by querying source SAP HANA system tables, the source database might be burdened if you configure a small value for the *DDL Scan Interval in Minutes* option. However, configuring a large value would increase the latency of DDL propagation. Therefore, experiment to figure out what value works best for your scenario. If changes to the DDL are rare, you can disable DDL propagation by setting the value of the *DDL Scan Interval in Minutes* option to zero, which prevents the SAP HANA adapter from periodically querying metadata from the source database.

### Limitation

Remember that during the time period between when DDL changes occur on the source database and when they are replicated to the target SAP HANA database, there must be no DML changes on the subscribed source tables. Replicating DDL changes triggers the SAP HANA adapter to update triggers and shadow tables on the changed source tables by dropping and then re-creating them. Errors might result if any data is inserted, updated, or deleted on the source tables during this time period.

### Related Information

[SAP HANA Remote Source Configuration \[page 529\]](#)



## 6.2.24.5 Use a Shadow Remote Source

Use a shadow remote source to reduce maintenance while performing real-time replication.

### Context

During real-time replication, if there are exceptions that prevent replicating under a current remote source, and these exceptions cannot be ignored, you can only drop and re-create the replication tasks. This limitation can be very cumbersome in production environments. In this scenario, you can create a shadow remote source to mitigate this problem.

The SAP HANA adapter is based on triggers, and it creates system objects when setting up the environment, such as triggers, shadow tables, and trigger\_queue tables. Every remote source has a trigger\_queue table, and every table has a relevant shadow table. A shadow remote source continues to replicate, so all the subscriptions under it reuse those system objects.

### Procedure

1. Suspend the normal remote source (referred to as "normal\_rs" in this example).
2. Create a shadow remote source (referred to as "shadow\_rs" in this example).

For the *Manage System Objects Life-Cycle* parameter, choose *Reuse Only*, and for the *Last Committed Sequence Id* parameter, type in the ID. The *Schema* and *System Object Prefix* parameters must be the same as the normal\_rs remote source.

3. Create virtual tables at shadow\_rs and create subscriptions (for example, subs1\_shadow, subs2\_shadow, subs3\_shadow...)
4. QUEUE and DISTRIBUTE your remote subscriptions.

When retrieving existing subscriptions, the HANA adapter checks to see if the subscribed tables are legal. If a user subscribes the wrong table, the following exception occurs: "Add the subscription for table [`<table_name>`] is prohibited when Manage System Objects Life-Cycle is Reuse Only! Please check `dpagent_framework.trc` for the recovery steps".

5. After shadow\_rs is working, if you want to subscribe other tables,
  - a. Suspend shadow\_rs.
  - b. Change *Manage System Objects Life-Cycle* to *Create and Reuse*.
  - c. Resume shadow\_rs.
  - d. Create and start subscriptions.
6. If you want to reset/drop subscriptions under shadow\_rs,
  - a. Suspend shadow\_rs.
  - b. Change *Manage System Objects Life-Cycle* to *Clear Only*.
  - c. Resume shadow\_rs.
  - d. Reset/drop subscriptions.
7. When cleaning up the environment, do not forget to resume normal\_rs, through reset/drop subscriptions.

## Related Information

[SAP HANA Remote Source Configuration \[page 529\]](#)

### 6.2.24.6 Creating an Allowlist to Limit Access to a Source Database

There are times when you might want to limit access to all of the tables in a source database. For data provisioning log reader adapters as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create an allowlist.

Restricting access to only those tables that are to be replicated is done by creating an allowlist of source database objects in a separate table.

#### Note

The allowlist impacts only the virtual table created and the replications created after the allowlist was created.

You can use SQL to create the allowlist table.

#### Note

- The allowlist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and ALLOWLIST.
- The allowlist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of an allowlist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of allowlisted tables for a single remote source.

### Microsoft SQL Server Example

```
create table allowlist(REMOTE_SOURCE_NAME varchar(128), ALLOWLIST varchar(4000));
```

To add an allowlist for the remote source called "localmssqldb", insert a row into the allowlist table:

```
insert into allowlist values('localmssqldb', 'object.A, object.B*');  
insert into allowlist values('localmssqldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source "localmssqldb".

## SAP HANA Example

```
create schema SAP_RESTRICTIONS;  
create table ALLOW_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, ALLOWLIST  
varchar(4000));
```

To add an allowlist for the remote source called "localhadp", insert a row into the allowlist table:

```
insert into ALLOW_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT,APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source localhadp.

## 6.2.24.7 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. In the *Agent Preferences* menu, choose *Set Agent Preferences*.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Agent Configuration Parameters \[page 112\]](#)

### 6.2.25 SDI DB2 LTL Mainframe

The SDI DB2 LTL Mainframe adapter is designed to replicate transactional operations from IBM DB2 UDB on z/OS to SAP HANA.

The adapter extracts data from IBM DB2 UDB on z/OS databases as initial load and real-time change data capture.

#### Note

The SDI DB2 LTL Mainframe adapter doesn't come preinstalled with the Data Provisioning Agent; you must install it separately. Before installing the SDI DB2 LTL Mainframe adapter, you must install the Data Provisioning Agent.

This adapter is supported on Linux only.

## Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source

#### Note

INSERT, UPDATE, and DELETE on a virtual table aren't supported.

- Initial load
- Real-time change data capture

#### Note

DDLs aren't supported. Also, transactional operations include only INSERT, UPDATE, and DELETE.

Encoding schemes supported on the source system: ASCII, EBCDIC, and Unicode

- Replication Monitoring and Statistics
- Search for Tables

In addition, this adapter supports the following capabilities:

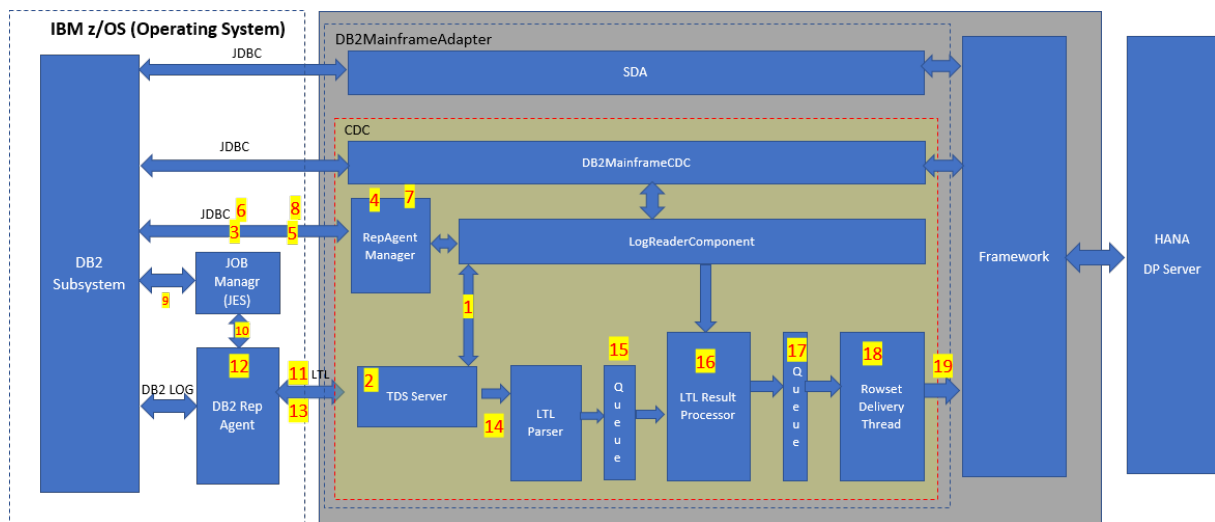
- SELECT (WHERE, JOIN, GROUP BY, DISTINCT, TOP or LIMIT, ORDER BY)

## Related Information

[SAP HANA Smart Data Integration and Smart Data Quality Product Availability Matrix](#)  
[Replication Agent Overview](#)

### 6.2.25.1 SDI DB2 LTL Mainframe Adapter Architecture

As you work with the SDI DB2 LTL Mainframe adapter, it's helpful to know how the adapter interacts with the various SAP HANA and IBM DB2 components.



The following leads you through a workflow of events that take place after the first subscription is enabled. The Data Provisioning Agent routes this request to the SDI DB2 LTL Mainframe adapter.

#### Note

This workflow applies to both Auto and Manual modes, except for 4-11, which apply to only Auto mode.

1. Start TDS listener.
2. The TDS server listens on a predefined port. Configure this port number while creating the remote source.
3. Replication Agent Manager downloads the Replication Agent Configuration file over JDBC connection via DB2 stored procedure.
4. Replication Agent Manager customizes the Replication Agent Configuration File based on remote source definition. The TDS server listener port number is also written into the Replication Agent Configuration File.

5. Replication Agent Manager uploads the modified Replication Agent Configuration File through JDBC connection.
6. Replication Agent Manager downloads the STARTRA JCL template through JDBC connection.
7. Replication Agent Manager customizes the STARTRA JCL script based on remote source definition.
8. Replication Agent Manager submits the STARTRA JCL through the JDBC connection.
9. DB2 submits the STARTRA JCL to JOB Manager (JES2)
10. After receiving the Job, JOB Manager (JES2) starts the Replication Agent.
11. Once Replication Agent is started, it connects to TDS server automatically based on the server and port information specified in the Replication Agent Configuration File.
12. DML's on the subscribed table is identified by the Replication Agent via the DB2 logs.
13. Replication Agent sends the changes to TDS server with LTL protocol.
14. LTL Parser and LTL translator parse the LTL data and translate them into interpretable data.
15. The translated data is put into the queue.
16. Rowset assembler thread reads the data from the queue and assembles them into SAP HANA format rowset.
17. Rowset is put into a queue.
18. Rowset delivery thread decides when to send the rowsets in the queue based on different delivery strategy.
19. Rowsets are sent to DPServer by the Rowset delivery thread, and then DPserver applies them to the SAP HANA tables.

## Related Information

[Architecture and Connections \[page 8\]](#)

### 6.2.25.2 Mandatory Changes on Mainframe Systems

Ensure that you have made the necessary changes to your mainframe system.

- Ensure that Replication Agent link libraries are APF authorized.
- Ensure that replication user has read access to the replication agent install libraries, HLQ.LLQ.VER.\*, and update access to the HLQ.LLQ.VER.JCL dataset.
- When replication agent is started in auto mode, SAP HANA needs exclusive access for Replication Agent installation dataset HLQ.LLQ.VER.JCL. Keeping it open in view/edit mode during Replication Agent startup results in errors.
- The replication TSO user should have the following permissions:
  - TRACE authority to issue the START TRACE command.
  - DISPLAY authority to issue a DISPLAY TRACE to determine if the MONITOR TRACE is already active.
  - MONITOR2 authority to issue the READS request to get the log data that includes the changes to capture.
- For manual mode, the following stored procedures need to be installed on DB2:
  - ADMIN\_DS\_BROWSE
  - ADMIN\_DS\_SEARCH

- For auto mode, the following stored procedures must be installed on DB2:
  - ADMIN\_DS\_BROWSE
  - ADMIN\_DS\_SEARCH
  - ADMIN\_DS\_WRITE
  - ADMIN\_JOB\_CANCEL
  - ADMIN\_JOB\_QUERY
  - ADMIN\_JOB\_SUBMIT

#### Note

Be sure to grant permissions for these stored permissions to the replication TSO user.

- In auto mode, the TSO user creates `<QUALIFIER>.LTMOBJECTS`, `<QUALIFIER>.LTMMARKER` and `<QUALIFIER>.TRACE_MARKER` tables (where QUALIFIER is Creator parameter in the configuration file in HLQ.LLQ.VER.JCL dataset) in the source system. The TSO user should have create table access in the source database. In case of any security restriction in the mainframe system, the mainframe administrator can create these tables manually and bypass the automatic process. Refer to the *Replication Agent for SDI DB2 LTL Mainframe Adapter User Guide* for more details.

## 6.2.25.3 Preparing JDBC JAR Files

Prepare the IBM DB2 JDBC JAR files to use one of the DB2 Mainframe adapters.

To use one of the DB2 Mainframe adapters, you are required to copy the following IBM DB2 JDBC JAR files to the `/lib` folder of the Data Provisioning Agent installation directory (`<DPAgent_root>\lib`).

- `db2jcc4.jar` (Required)  
You can download this file here: <http://www-01.ibm.com/support/docview.wss?uid=swg21363866> .  
Download the JDBC JAR file according to your DB2 database version.
- `db2jcc_license_cisuz.jar` (Required)  
You can find information about this file here: <http://www-01.ibm.com/support/docview.wss?uid=swg21191319> .

You can find these JAR files in the following ways:

- These JAR files are available in the installation directory after you installed the IBM DB2 client. For example, on a Windows system, the JAR files are located in `C:\Program Files\IBM\SQLLIB\java`.
- Download them from the IBM Support and Download Center.

#### Note

If the source z/OS DB2 system contains a non-English CCSID table space, you are required to update the JVM to an internationalized version. At a minimum, the `charsets.jar` file within the current JVM should contain the required `CharToByteCP<XXX>.class`, where `<XXX>` corresponds to the source system's language locale.

## 6.2.25.4 Install the SDI DB2 LTL Mainframe Adapter

You can use either the command-line utility or the GUI mode to install the adapter.

### Prerequisites

Before installing the adapter, prepare the JDBC JAR files.

### Context

Install the SDI DB2 LTL Mainframe adapter separately; it is not included in the Data Provisioning Agent.

### Procedure

1. Download the *SDI DB2 MAINFRAME ADAPTER 2.x.x* component TGZ file.  
Find this file in the software download area where you commonly find the download for the Data Provisioning Agent and other components.
2. Extract the TGZ file.
3. To use command line, execute the following command. To use the GUI installer, skip to the next step.

```
cd HANA_SDI_DB2MainframeAdapter_20_LIN_X86_64
./hdbinst --silent --batch --path=<dpagent installation path>
```

4. Execute the following command to begin the GUI-based installer:

```
cd HANA_SDI_DB2MainframeAdapter_20_LIN_X86_64
./hdbsetup
```

The installation GUI appears.

5. Provide the Data Provisioning Agent installation path in the *Install new SAP HANA SDI DB2 Mainframe Adapter* box, and then click *Next*.
6. Confirm the installation path, and click *Next*.
7. Click *Install*.
8. When you receive a message that the installation is successful, click *Finish*.
9. Verify that the following file is installed in the desired location:
  - `<DPAgent_root>/plugins/com.sap.hana.dp.db2mainframeltladapter-n.n.n.jar`
10. Restart the Data Provisioning Agent.



## Next Steps

After Data Provisioning Agent is started, you should be able to see the following messages in

`<DPAgent_root>/log/framework.trc`:

```
2021-11-11 23:49:47,295 [INFO ] DPFramework | AdapterTracker.addingService -  
Adapter Type: DB2LTLAdapter is added to framework  
2021-11-11 23:49:47,307 [INFO ] DPFramework | AdapterManager.setSDKVersion -  
DB2LTLAdapter Version: 2.n.n with SDKVersion: 10 (2.n.n) registered.  
2021-11-11 23:49:47,309 [INFO ] Activator | Activator.start - Adapter  
DB2LTLAdapter started
```

## Related Information

[Preparing JDBC JAR Files \[page 551\]](#)

## 6.2.25.5 SDI DB2 LTL Mainframe Adapter Preferences

Configuration parameters for the SDI DB2 LTL Mainframe adapter in the Data Provisioning Agent.

| Parameter                                               | Description                                                                                                                    | Default Value |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------|
| Time to wait for Replication Agent to connect (Seconds) | Max time the SDI DB2 LTL Mainframe adapter waits for Replication Agent to start and send the first transaction to the adapter. | 60            |

**Note**

Ensure the value of this parameter is set to double or more than the retry parameter value in the mainframe configuration file.

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

## 6.2.25.6 Install Replication Agent for SDI DB2 LTL Mainframe Adapter

Install the Replication Agent to work with the SDI DB2 LTL Mainframe adapter.

### Context

The GUI installer walks you through the installation process. Provide information about your DB2 system, OCS Server, logon credentials, and so on.

### Procedure

1. Download the *SDI DB2 MF ADAPT REP AGENT 2.0* component (`REPAGENTSDI*.EXE`), and execute the file.  
The graphical interface installer launches.
2. Review the information on the first screen, and click *Next*.
3. Provide the following information, and click *Next*

| Parameter              | Notes                                                                                                                                                                           |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| JCL Line 1             | Add the job card details.<br><br>For example, if the mainframe ID is "MDAWAR", change the <i>JCL Line 1</i> text box to <b>MDAWARAB JOB class="A",NOTIFY=&amp;SYSUID</b>        |
| JCL Line 2             |                                                                                                                                                                                 |
| JCL Line 3             |                                                                                                                                                                                 |
| High Level Qualifier   | You can find all of your Replication Agent JCLs under the PDS whose qualifier starts with HLQ.* (For example, "MDAWAR.*")<br><br>This value should not exceed eight characters. |
| Volume                 |                                                                                                                                                                                 |
| Unit                   |                                                                                                                                                                                 |
| Work Unit              |                                                                                                                                                                                 |
| TCP Address Space Name |                                                                                                                                                                                 |

4. Provide the following information, and click *Next*

| Parameter     | Notes                   |
|---------------|-------------------------|
| DB2 DSN Name  | DB2 subsystem ID (SSID) |
| DB2 Version   |                         |
| DB2 Plan Name |                         |

| Parameter                          | Notes                                                              |
|------------------------------------|--------------------------------------------------------------------|
| DB2 System Loadlib                 |                                                                    |
| RepAgent System table creator name | Qualifier of LTMMARKER, LTMOBJECTS, and TRACE_MARKER system tables |
| Data Sharing                       |                                                                    |

5. Provide the following information, and click [Next](#)

Values for these parameters must be specified only when Replication Agent is started in manual mode; otherwise the parameters can be left unaltered. In auto mode, these parameters are populated automatically during run-time.

| Parameter            | Notes                                                                                                                                                                                               |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OCSServer Name       | SDI DB2 Mainframe adapter server name as updated in NOTIFY=&SYSUID <DPAgent_root>/configuration/com.sap.hana.dp.adapterframework/DB2MainframeLogReaderAdapter/DB2MainframeLogReaderAdapter.ini file |
| OCSServer IP Address | SDI DB2 LTL Mainframe adapter server's address                                                                                                                                                      |
| Listener Port        | SDI DB2 LTL Mainframe adapter's port as provided in the remote source                                                                                                                               |
| Source Data Server   | DB2 data server name                                                                                                                                                                                |
| Source Database      | DB2 database name                                                                                                                                                                                   |

6. Provide the following information, and click [Next](#)

| Parameter                  | Notes                                                                                                                                                                                                                                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| User ID                    | Your mainframe user ID to be used for FTPing product libraries to the mainframe.                                                                                                                                                                                                                      |
| Password                   | Your mainframe password                                                                                                                                                                                                                                                                               |
| NOTIFY=Mainframe Host Name | Mainframe server that you are using (either Hostname or IP address)                                                                                                                                                                                                                                   |
| FTP Port Number            | 21                                                                                                                                                                                                                                                                                                    |
| VOL/UNIT Assignment        |                                                                                                                                                                                                                                                                                                       |
| Log FTP Session?           | Provide a file name for a file that is created and used for capturing log information during FTP. This file will help you analyze issues that might occur during dataset upload.<br><br>The file name specified here has to be a location on the local machine where the installer is being executed. |

7. Click [Install](#).
8. Click [Installation Complete](#).
9. Log on to the mainframe, and go to PDS with the High Level Qualifier used in Step 3.
10. From the above list, open PDS with low-level qualifier as .JCL.
11. Run the following JCLs in HLQ . \* . JCL in order:

- RECEIVE: This job runs the IKJEFT01 program to use TSO Receive Command to build and populate the product libraries
- ALLOC: This job creates TRUNC point Dataset and Generations Data Group (GDG)

12. Execute the following SQL statements:

- GRANT: To give authorization for BIND and EXECUTE on the plan used
- SQLINT: To create LTMOBJECTS, LTMMARKER, and TRACE\_MARKER tables

13. Execute LTMBIND job from HLQ.\*.JCL PDS

This job binds the DB2 LOG Extract Plan.

#### Note

If you get an authorization error, issue the GRANT command for the BIND privilege.

## Results

Before starting Replication Agent, be sure that the following pre-requisites are established:

- Link libraries must be APF authorized. Contact your mainframe team for APF authorization.
- Tables to be replicated through Replication Agent must be created with the "DATA CAPTURE CHANGES" option specified.
- The LTMOBJECT, LTMMARKER, and TRACE\_MARKER tables owner name must match the creator parameter value assigned in the mainframe configuration file.

## Related Information

[Replication Agent Overview](#)

### 6.2.25.7 Update Replication Agent for SDI DB2 LTL Mainframe Adapter

Update the Replication Agent to work with the SDI DB2 LTL Mainframe adapter.

## Prerequisites

Before performing the Replication Agent upgrade, stop the RepAgent and Data Provisioning Agent.

- If the remote source is configured in manual mode, stop the RepAgent and Data Provisioning Agent manually.

- If the remote source is configured in Auto mode, stop the Data Provisioning Agent. This action automatically stops the RepAgent as well.

## Context

The GUI installer walks you through the installation process. Provide information about your DB2 system, OCS Server, logon credentials, and so on.

## Procedure

1. Download the *SDI DB2 MF ADAPT REP AGENT 2.0* component (REPAGENTSDI\*.EXE), and execute the file.
2. Review the information on the first screen, and click *Next*.
3. Provide the following information, and click *Next*.

| Parameter              | Notes                                                                                                                                                                      |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| JCL Line 1             | Add the job card details.<br><br>For example, if the mainframe ID is "USERID", change the <i>JCL Line 1</i> text box to <b>USERID JOB class="A",NOTIFY=&amp;SYSUID</b>     |
| JCL Line 2             |                                                                                                                                                                            |
| JCL Line 3             |                                                                                                                                                                            |
| High-Level Qualifier   | You can find all of your Replication Agent JCLs under the PDS whose qualifier starts with HLQ.* (For example, "USERID.*")<br><br>This value can't exceed eight characters. |
| Volume                 |                                                                                                                                                                            |
| Unit                   |                                                                                                                                                                            |
| Work Unit              |                                                                                                                                                                            |
| TCP Address Space Name |                                                                                                                                                                            |

4. Click *Next*. When you upgrade, this window is populated with values from the previous installation.
5. Click *Next*. When you upgrade, this window is populated with values from the previous installation.
6. Provide the following information, and click *Next*.

| Parameter                  | Notes                                                                            |
|----------------------------|----------------------------------------------------------------------------------|
| User ID                    | Your mainframe user ID to be used for FTPing product libraries to the mainframe. |
| Password                   | Your mainframe password                                                          |
| NOTIFY=Mainframe Host Name | Mainframe server that you're using (either Hostname or IP address)               |

| Parameter           | Notes                                                                                                                                                                                                                                                                                                  |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FTP Port Number     |                                                                                                                                                                                                                                                                                                        |
| VOL/UNIT Assignment |                                                                                                                                                                                                                                                                                                        |
| Log FTP Session?    | <p>Provide a file name for a file that is created and used for capturing log information during FTP. This file helps you analyze issues that can occur during dataset upload.</p> <p>The file name specified here has to be a location on the local machine where the installer is being executed.</p> |

7. Click *Install*.
8. Click *Installation Complete*.
9. Log in to the mainframe, and search for PDS with the High-Level Qualifier used in Step 3.

For example, PDS is named HLQ.SDI.RA250.XMIT.\*, where '250' stands for the Replication Agent version. This number changes with every release.

10. From the previous list, open PDS with low-level qualifier as .JCL.
11. Run the following JCLs:

- RECEIVE: This job runs the IKJEFT01 program to use TSO Receive Command to build and populate the product libraries.

INDATASET points to the currently installed library. Don't modify this value.

DATASET points to your existing RepAgent libraries. Update this value as necessary.

```

000001, //USERRA JOB NOTIFY=&SYSUID
000002, //* JCL LINE 2
000003, //* JCL LINE 3
000004, //RECV EXEC PGM=IKJEFT01, DYNAMNBR=20
000005, //SYSTSPT DD SYSOUT=*
000006, //SYSTSIN DD *
000007, RECEIVE INDATASET( 'HLQ.LLQ.SDI.RAXXX.XMIT.LINKLIB' )
000008, DATASET( 'HLQ.LLQ.SDI.RAXXX.LINKLIB' ) +
000009, UNIT(SYSDA)
000010, RECEIVE INDATASET( 'HLQ.LLQ.SDI.RAXXX.XMIT.DBRM' )
000011, DATASET( 'HLQ.LLQ.SDI.RAXXX.DBRM' ) +
000012, UNIT(SYSDA)
000013, RECEIVE INDATASET( 'HLQ.LLQ.SDI.RAXXX.XMIT.MACLIB' )
000014, DATASET( 'HLQ.LLQ.SDI.RAXXX.MACLIB' ) +
000015, UNIT(SYSDA)
000016, RECEIVE INDATASET( 'HLQ.LLQ.SDI.RAXXX.XMIT.LTMLOC' )
000017, DATASET( 'HLQ.LLQ.SDI.RAXXX.LTMLOC' ) +
000018, UNIT(SYSDA)
000019, /*

```

12. Go to your existing RepAgent installation directory and execute LTMBIND job.

### Note

If you get an authorization error, issue the GRANT command for the BIND privilege. BIND JCL should be executed from the existing running REPAGENT setup.

## Next Steps

Consider the following before restarting the RepAgent.

- If the remote source is configured in manual mode, restart the RepAgent and the Data Provisioning Agent manually.
- If the remote source is configured in Auto mode, restart the Data Provisioning Agent. This action automatically restarts the RepAgent as well.

To make sure that the upgrade is successful, verify the RepAgent version string on the RepAgent job log. If the version string hasn't changed, contact SAP Support team.

## 6.2.25.8 Replication Agent for SDI DB2 LTL Mainframe Adapter Configuration

Set up the configuration file for Replication Agent for the SDI DB2 LTL Mainframe adapter.

Update some of the parameters in the configuration file to work with the SDI DB2 LTL Mainframe adapter.

### Note

In manual mode, the configuration file must be updated manually. When using auto mode, most adapter-related configuration parameters are updated automatically.

| Section                          | Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DB2MFAdapterOCSServer Parameters | <p>The following parameters are auto-populated in auto mode; there's no need to update them manually. However, in manual mode, these parameters must match the remote source configuration and Data Provisioning Agent configuration.</p> <ul style="list-style-type: none"><li>• DP=&lt;host name of DPAgent to connect to&gt;</li><li>• DP_source_ds=&lt;DB2 server name&gt;</li><li>• DP_source-db=&lt;Database containing system tables&gt;</li><li>• *DPHost=&lt;Host name of DPAgent to connect to&gt;</li><li>• DPIPAddress=&lt;IP address of DP Agent&gt;</li><li>• DPPort=&lt;Listener port number&gt;</li></ul> <p>Update the following parameters manually:</p> <ul style="list-style-type: none"><li>• DP_ccid=&lt;HANA CCID&gt;</li><li>• DPCsetname=&lt;HANA Code Setname&gt;</li></ul> |
| LTM Parameters                   | <ul style="list-style-type: none"><li>• Minimal_cols=Y</li><li>• Timestamp_in_char=Y</li><li>• Date_in_char=Y</li><li>• Time_in_char=Y</li><li>• Javaadapter=Y</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Log Extract Parameters           | Creator=<Userid>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Section       | Parameters                                                                                                        |
|---------------|-------------------------------------------------------------------------------------------------------------------|
| Trace Configs | The trace configurations are helpful during troubleshooting; however, they're optional during a normal execution. |

### Note

Remember to turn off trace functions after you obtain the necessary information. If you allow trace functions to continue, the trace output files can fill and consume disk space, causing abends or impaired LTM for MVS performance.

## Example: Sample LTMCFG File

```
*-----RS configs-----
* Parameter names are not case sensitive.
*
*
*----- DB2MFAdapterOCSServer Parameters ( Auto Populated )-----
*----- (DO NOT UPDATE MANUALLY)-----
*
DP=DB2MFAdapterOCSServer
DP_source_ds=DSNDB2D
DP_source_db=LTMDB1
DP_ccsid=819          update manually
DPCsetname=iso_1     update manually
*DPHost=
DPIPAddress=10.56.179.10
DPPort=45500
*
*
*-- LTM Parameters -----
TCPName=TCPIP          name of the TCPIP address space
Communications_Protocol=IBMTCP    The only supported protocol
Packet_size=32k       Size of OC buffer to be sent
Maximum_connect_retries=10
API_QID_request_interval=1000    How often the API requests a QID
batch_ltl_cmds=on     on or off, Y or N
Minimal_cols=Y        Y or N
Stop_on_error=N       Y or N
Javaadapter=Y         Y or N
Suppress_col_names=N Y or N
Support_DB2_comp_rec=Y Y or N
Minimum_year=0000     1949, 1998, etc. must be 4 digits
Long_varchar=Y        Y or N < 256 or up to cc 32K
Low_activity_latency=10 To send last Buffer when not full
Timestamp_in_char=Y   Y or N
Date_in_char=Y        Y or N
Time_in_char=Y        Y or N
Ltl_table_col_case=asis asis, upper, lower
DateTime_conv_err=Default
Date_conv_default=1900-01-01    1998-12-25
Time_conv_default=00:00:00      11:22:33
Graphictype=binary
API_com_test=N        Y or N
LTL_test_only=N       Y or N
*User_exit=
*
*
*-- Log Extract Parameters -----
```



```

Log_extractor=LTMEXTX          Use LTMEXTX- DB2v11 LTMEXTC- DB2v12
Log_identifier=DB2D           DB2 SSID
DataSharingOption=None
*DataSharingMember=          Used for DataSharingOption=Single
*BSDS=
DetectDataCapture=Y          Yes for DC changes/none
LogTrace=no                   yes or no
GenID=1                       The QID Generation ID
CIMax=20                      Maximum CI's for the Log Reader
LogExtractError=Msg          Term or Msg
Buffers=25                    Max Buffers for the Log Reader
PollInterval=0.0.20.0        How often to check for new data
LTMPlan=RAPLAN76             Log extract plan
SetTruncPoint=10             Trunc point request interval
Creator=TABOWN               update manually it should be Table owner name.
retry=10
tablehandler=LTMINFOX        Use LTMINFOX for DB2 Version 11+
datahandler=LTMIFIX          Use LTMIFIX for DB2 Version 11
ExtendedRba=Y                Use Y for DB2 Version 11
Codepage=500,force           DB2 base Code page
*-----Trace configs-----
*trace=Calls
*trace=General
*trace=QIDs
*trace=TruncPoint
*trace=LTLlebcdic
*trace=LTLascii
*trace=Connections
*-----

```

## 6.2.25.9 SDI DB2 LTL Mainframe Remote Source Configuration

Options for connecting to the remote mainframe data server. Also included is sample code for creating a remote source using the SQL console.

| Category | Option        | Description                                                                            |
|----------|---------------|----------------------------------------------------------------------------------------|
| Database | Host          | Mainframe host name or IP address on which the remote DB2 data server is running.      |
|          | Port Number   | The DB2 data server port number.                                                       |
|          | Database Name | The DB2 database name where the LTMOBJECTS, LTMMARKER, and TRACE_MARKER tables reside. |

| Category | Option                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Database Source Name     | <p>The DB2 instance name.</p> <p>The name of the DB2 subsystem can be found by running the following command on SPUFI:</p> <pre> . . . . . . . . . . . . . . . ''' DB2 COMMANDS SSID: P8L0      , , , . . ,==&gt; ,  . . .      '''  . . . ,Position cursor on the command line you want to execute and press ENTER      , , , . . .  . . . ,Cmd 1,==&gt;,-DIS DDF  DSNL080I  -P8L0 DSNLTDDF DISPLAY DDF REPORT FOLLOWS: DSNL081I  STATUS=STARTD, DSNL082I  LOCATION LUNAME      GENERICLU, DSNL083I  DDFP8L0 DESAPW00.DB2P8L0  -NONE, DSNL084I  TCPRT=9023 SECPRT=0    RESRT=9024  IPNAME=- NONE, DSNL085I  IPADDR=:10.17.200.30, DSNL086I  SQL DOMAIN=ihsapke.wdf.sap.corp, DSNL105I  CURRENT DDF OPTIONS ARE: , DSNL106I  PKGREL = COMMIT, DSNL099I  DSNLTDDF DISPLAY DDF REPORT COMPLETE, ***, </pre> |
|          | Database Tablespace Name | The DB2 database tablespace name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Category                  | Option                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| z/OS DB2 Additional Info  | Bind Packages                   | <p>When this option is set to <i>Yes</i>, the DB2 mainframe adapter automatically checks and binds all of the required missing JAR files.</p> <p>We recommend that you set this option to <i>Yes</i> the first time you attempt to establish a connection, then set this option to <i>No</i> for subsequent attempts.</p> <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>If any necessary packages are missing, an error occurs.</p> </div> <p>Setting this option for subsequent attempts help improve performance by eliminating the need for redundant checks for the necessary JDBC packages.</p> |
|                           | Use Auto Mode                   | <p>If you set this parameter to <i>True</i>, the replication agent starts automatically.</p> <p>If you set the parameter to <i>False</i>, you must start the replication agent manually and create the LTMMARKER, LTMOBJECTS, and TRACE_MARKER tables manually on the mainframe.</p> <p>The default value is <i>True</i>.</p>                                                                                                                                                                                                                                                                                                                                                 |
|                           | LTM Configuration File Location | The Replication Agent's configuration file location.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                           | LTM Configuration File Name     | The Replication Agent's configuration file name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Schema Alias Replacements | Alias Name                      | The name of the schema in the original system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                           | Alias Replacements              | The name of the schema in the current system that replaces the Schema Alias name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Security Properties       | Use SSL                         | <p>Specifies whether you're using SSL.</p> <p>The default value is <i>False</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Adapter CDC Properties    | Adapter Listener Port           | The port used for TDS server to listen on, and for Replication Agent to connect.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Credential Properties     | Credentials Mode                | <p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li>• <i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li>• <i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>                                                                                                                                                                                                                                       |

| Category | Option    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | User Name | The TSO user that would be used to start the replication agent job in mainframe.                                                                                                                                                                                                                                                                                                                                                                           |
|          |           | <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px;"> <p><b>Note</b></p> <p>This user name is only used as an owner of replication agent start job. The qualifier of system tables (LTMOBJECTS, LTMMARKER, and TRACE_MARKER) must match the creator parameter in the configuration file. The creator parameter in the configuration file doesn't need to be the same as the user name parameter in the remote source.</p> </div> |
|          | Password  | The mainframe TSO user password.                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Example

```
CREATE REMOTE SOURCE "MyDB2MainframeSource" ADAPTER "DB2LTLAdapter" AT LOCATION
AGENT "DB2MFAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="database" displayName="DATABASE">
    <PropertyEntry name="pds_host_name" displayName="Host"> <Mainframe Host
Name></PropertyEntry>
    <PropertyEntry name="pds_port_number" displayName="Port Number">9023</
PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database
Name">LTMDB1</PropertyEntry>
    <PropertyEntry name="pds_datasource_name" displayName="Database
SourceName">DDFP8L0</PropertyEntry>
    <PropertyEntry name="pds_tablespace_name" displayName="Database
Tablespace Name">LTMTS1</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="zodb2sadditionalinfo" displayName="z/OS DB2 Additional
Info">
    <PropertyEntry name="bind_packages" displayName="Bind Packages">Yes</
PropertyEntry>
    <PropertyEntry name="auto_mode" displayName="Use auto mode"true</
PropertyEntry>
    <PropertyEntry name="ltm_cfg_file_loc" displayName="LTM Configuration
File Location">SYREP.SP09.RA150.JCL</PropertyEntry>
    <PropertyEntry name="ltm_cfg_file_name" displayName="LTM Configuration
File Name">LTMCFG</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="schema alias replacements" displayName="Schema Alias
Replacements">
    <PropertyEntry name="schema_alias" displayName="Alias name">Schema name</
PropertyEntry>
    <PropertyEntry name="schema_alias_replacement" displayName="Alias
replacement">Replacement schema name</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="security" displayName="Security Properties">
    <PropertyEntry name="pds_use_ssl" displayName="Use SSL">>false</
PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="adapter_cdc" displayName="Adapter CDC Properties">
```

```

        <PropertyEntry name="adapter_listen_port" displayName="Adapter Listen
Port">17000</PropertyEntry>
    </PropertyGroup>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="credential">
    <user><TSO username></user>
    <password><TSO password></password>
  </CredentialEntry>'
;

```

## 6.2.25.10 Migrate from an SDI DB2 Mainframe Adapter to an SDI DB2 LTL Mainframe Adapter

While we recommend starting with a new SDI DB2 LTL Mainframe adapter, there's a way to migrate existing SDI DB2 Mainframe adapters to an SDI DB2 LTL Mainframe adapter.

### Context

#### 📌 Note

Migrating to the SDI DB2 LTL Mainframe adapter is simple. However, there are some important things to understand about what the migration supports and doesn't support.

- Before migration, the Adapter Type sent is DB2MainframeLogreaderAdapter. After the migration, the reply has DB2LTLAdapter as the Adapter Type.
- Following migration, the DB2LTLAdapter runs on port 17000 and this port number can't be configured manually.
- Multiple remote sources running the DB2MainframeLogreaderAdapter can't be migrated to the DB2LTLAdapter. For these scenarios, a fresh start with the DB2LTLAdapter is required.

### Procedure

1. In `dpagentconfig.ini`, add the following framework configuration parameters:

```

adapter.db2.routeToNewAdapter = true
framework.skipValidation = true

```

2. In `<DPAgent_root>/adapter/cppframework.props`, add the following property:

```

CppFramework.list=DB2MainframeLogReaderAdapter

```

3. In the mainframe Replication Agent Configuration file (LTMCFG), add the following line:

```

Javaadapter=Y

```

4. Restart the Data Provisioning Agent.
5. If you're replicating in manual mode, restart the Replication Agent.

## Related Information

[Agent Configuration Parameters \[page 112\]](#)

## 6.2.26 SOAP

The SOAP adapter provides access to SOAP Web Services via HANA SQL.

The SOAP adapter is a SOAP web services client that can talk to a web service using the HTTP protocol to download the data. The SOAP adapter uses virtual functions instead of virtual tables to expose server-side operations.

The SOAP adapter supports the following functionality:

- Virtual function as a source

## Related Information

[CREATE VIRTUAL FUNCTION](#)

### 6.2.26.1 SOAP Adapter Remote Source Configuration

Configuration settings for creating a SOAP adapter remote source. Also included is sample code for creating a remote source using the SQL console.

| Category   | Option                        | Description                                                                                                                                                                                                                                                                                                                                                                                |
|------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connection | WSDL File                     | The location of the WSDL file. Enter a URL or a path to the local WSDL file where the Data Provisioning Agent is installed.                                                                                                                                                                                                                                                                |
|            | Use System Proxy              | If set to <b>Yes</b> , the adapter uses the proxy information saved in the <code>dpagentconfig.ini</code> file ( <code>http.proxyHost</code> , <code>http.proxyPort</code> ) or that is set up in the DP Agent Configuration Tool.<br><br>If <code>http.proxyHost</code> and <code>http.proxyPort</code> properties are not in the <code>dpagentconfig.ini</code> file, you must add them. |
|            | Socket Timeout (milliseconds) | The time to establish the connection with the remote host. The default value is 6000 ms.                                                                                                                                                                                                                                                                                                   |

| Category             | Option                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | Connection Timeout (milliseconds)             | The time waiting for data after the connection was established (maximum time of inactivity between two data packets). The default value is 6000 ms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                      | Treat WebServiceError (SOAP Fault) as failure | <p>If set to <b>Yes</b>, fail the web services call if there is a failure. The default value is <b>No</b>.</p> <p>By default, the SOAP Adapter writes the fault to one of the output columns if the call fails. In certain scenarios, you may want to fail the call itself. For example, the proxy was incorrectly configured.</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;"> <p><b>Sample Code</b></p> <pre>Select * from getWeatherByZip(...94403...)</pre> </div> <ul style="list-style-type: none"> <li>If set to <b>No</b>, the select call is a success and the actual error is populated in the SOAP_FAULT column.</li> <li>If set to <b>Yes</b>, the select call fails itself and writes the error to a caller.</li> </ul> |
|                      | WS-Security Password Type                     | <ul style="list-style-type: none"> <li><b>None</b>: Choose this option if you do not want to use WS-Security.</li> <li><b>plainText</b>: Choose this option if you intend to use WS-Security with a plaintext password.</li> <li><b>Digest</b>: Choose this option if you intend to use WS-Security with an encrypted password.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Credentials          | Credentials Mode                              | <p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><b>Technical User</b>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><b>Secondary User</b>: A unique access credential on the remote source assigned to a specific user.</li> </ul>                                                                                                                                                                                                                                                                                                                         |
| Basic Authentication | User                                          | The user name, which is case sensitive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                      | Password                                      | The password corresponding to the user.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| WS-Security          | WS-Security User-name                         | The WS-Security user ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                      | WS-Security Password                          | The WS-Security password                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## SQL Example

```
CREATE REMOTE SOURCE "soapSalesDemo4" ADAPTER "SOAPAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION '<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="Configuration">
  <PropertyEntry name="wsdl">https://xxxxxxx.successfactors.com/sfapi/v1/
soap?wsdl</PropertyEntry>
  <PropertyEntry name="axisFault">no</PropertyEntry>
```

```

        <PropertyEntry name="useProxy">no</PropertyEntry>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialProperties name="Credential">
<CredentialEntry name="basicAuth">
    <user>xxxxx</user>
    <password>Password1</password>
</CredentialEntry>
<CredentialEntry name="WSSAuth">
    <user>xxxxxx</user>
    <password>Password2</password>
</CredentialEntry>
</CredentialProperties>';

```

## 6.2.26.2 Setting up the SOAP Adapter: SQL Example

SQL example for setting up the SOAP adapter to use a remote web service.

The following is an example of how to set up the SOAP adapter to use a remote web service (<http://www.webservices.net/stockquote.asmx?WSDL>). You can use the Web-based Development Workbench to complete some of these tasks (for example, creating a virtual function).

### Sample Code

```

drop agent "agent_local" cascade;
CREATE AGENT "agent_local" PROTOCOL 'TCP' HOST '<hostname.domain.com>' PORT
5050;
drop adapter "SOAPAdapter" cascade;
CREATE ADAPTER "SOAPAdapter" at location agent "agent_local";
drop remote source "WebServiceRS" cascade;
CREATE REMOTE SOURCE "WebServiceRS" ADAPTER "SOAPAdapter" AT LOCATION AGENT
"agent_local" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8"?>
<ConnectionProperties name="connection">
    <PropertyEntry name="wsdl">http://www.webservices.net/stockquote.asmx?
WSDL</PropertyEntry>
    <PropertyEntry name="useProxy">Yes</PropertyEntry>
    <PropertyEntry name="axisFault">No</PropertyEntry>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="webservice_credential"><user></user><password></
password></CredentialEntry>';
--Get the function definition from adapter
CALL "PUBLIC"."GET_REMOTE_SOURCE_FUNCTION_DEFINITION"
('WebServiceRS', '{"serviceName": "StockQuote", "portName": "StockQuoteSoap",
"operationName": "GetQuote", "nodeType": "OPERATION"}', '?', '?', '?');
--Using the json configuration we can now create a virtual function.
drop FUNCTION getStockQuote;
CREATE VIRTUAL FUNCTION getStockQuote(SOAP_REQUEST Nvarchar(5000))
RETURNS TABLE (SOAP_HEADERS Nvarchar(5000), SOAP_FAULT NVARCHAR(5000),
SOAP_BODY NCLOB)
CONFIGURATION 'use the json data returned from
GET_REMOTE_SOURCE_FUNCTION_DEFINITION' AT "WebServiceRS";
--Invoking the SOAP Request is as below.

select * from getStockQuote(
'<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:web="http://www.webserviceX.NET/">
    <soapenv:Header/>
    <soapenv:Body>
        <web:GetQuote xmlns:web="http://www.webserviceX.NET/">
            <!--Optional:-->

```



```

        <web:symbol>NASDAQ</web:symbol>
      </web:GetQuote>
    </soapenv:Body>
  </soapenv:Envelope> ' );

```

## 6.2.27 Teradata

The Teradata adapter can be used to connect to a Teradata remote source and create a virtual table to read from and write to.

### Note

Before you register the adapter with the SAP HANA system, ensure that you've downloaded and installed the correct JDBC libraries. Place the files in the `<DPAgent_root>/lib` folder.

For more information about the supported JDBC libraries, see the *Product Availability Matrix (PAM)*.

## Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Real-time change data capture
- Search for tables
- Loading options for target tables
- DDL propagation
- Replication monitoring and statistics
- Access to multiple schemas

In addition, this adapter supports the following capabilities:

Table 66: Global Settings

| Functionality                                | Supported? |
|----------------------------------------------|------------|
| SELECT from a virtual table                  | Yes        |
| INSERT into a virtual table                  | Yes        |
| Execute UPDATE statements on a virtual table | Yes        |
| Execute DELETE statements on a virtual table | Yes        |
| Different capabilities per table             | No         |
| Different capabilities per table column      | No         |

| Functionality | Supported? |
|---------------|------------|
| Real-time     | Yes        |

Table 67: Select Options

| Functionality                               | Supported? |
|---------------------------------------------|------------|
| Select individual columns                   | Yes        |
| Add a WHERE clause                          | Yes        |
| JOIN multiple tables                        | Yes        |
| Aggregate data via a GROUP BY clause        | Yes        |
| Support a DISTINCT clause in the select     | Yes        |
| Support a TOP or LIMIT clause in the select | Yes        |
| ORDER BY                                    | Yes        |
| GROUP BY                                    | Yes        |

## Related Information

[Permissions for Accessing Multiple Schemas \[page 577\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)

### 6.2.27.1 Authentication and User Privileges

Authentication and user privileges requirements for connecting to a Teradata remote source.

#### Authentication

You can set up authentication by using TD2, LDAP, or Kerberos.

If you are using LDAP, provide a user name and password when setting up your remote source.

If you are using Kerberos, the adapter uses the default Kerberos settings of the computer on which it is deployed. If the Kerberos configuration file (`krb5.conf`) is in a nonstandard location, the path must be specified via the `java.security.krb5.conf` system property by adding it to `dpagent.ini` file. The Realm

and KDC connection parameters in the remote source are optional. Both must be specified in order to override the computer's default `krb5.conf` settings. To use Kerberos, use the Kerberos principal name for the user name with the corresponding password.

## Privileges

The following database user privileges are required for accessing databases, tables, and so on, so that the adapter can read metadata. You need SELECT access on the following DBC tables:

- "DBC"."UDTInfo"
- "DBC"."DBase"
- "DBC"."AccessRights"
- "DBC"."TVM"
- "DBC"."TVFields"

The following privileges are required to support real-time replication (CDC):

- CREATE TABLE
- DROP TABLE
- CREATE TRIGGER
- DROP TRIGGER
- CREATE PROCEDURE
- DROP PROCEDURE

## 6.2.27.2 Teradata Adapter Preferences

Options for controlling the Teradata adapter.

| Parameter        | Description                                                                                                                                                                               |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Thread Pool Size | The size of the Teradata global thread pool. Teradata adapter remote sources share the thread pool. The thread pool is used to execute jobs of querying shadow tables to get change data. |

## 6.2.27.3 Teradata Remote Source Configuration

Options for setting up the connection to the remote Teradata data server. Also included is sample code for creating a remote source using the SQL console.

### Configuration Parameters

| Category   | Option          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connection | Host            | Host name or IP address on which the remote Teradata data server is running                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|            | Port Number     | The Teradata data server port number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|            | Encoding        | Session encoding between the adapter and Teradata. <ul style="list-style-type: none"><li>• UTF-8</li><li>• UTF-16</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|            | Encrypt traffic | <p>Specifies whether the traffic between the adapter and the database is encrypted.</p> <p>If turned off, data exchanged between the adapter and the database is unencrypted, and anyone with access to the network may be able to read the data. This setting doesn't affect logon data, because this data is always sent encrypted by the Teradata JDBC driver.</p>                                                                                                                                                                                                                                  |
|            | Logon mechanism | <p>Specifies the authentication (+authorization) method used, and which username and password values to enter in the credentials fields.</p> <ul style="list-style-type: none"><li>• <i>TD2 (Teradata Method 2)</i>: Use the database username and password.</li><li>• <i>LDAP</i>: Directory authentication. Use credentials of users defined and configured via LDAP (Database has to be configured to use external LDAP authentication)</li><li>• <i>Kerberos (KRB5)</i>: Use Kerberos principal and its username (Database has to be configured to use Kerberos external authentication)</li></ul> |

#### Note

Some restrictions apply to UTF-8. For example, character columns with Graphic encoding aren't supported.

| Category                                                                                                                                                                                         | Option                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                  | Realm                            | (Optional when using Kerberos) authenticate using a principal from this realm (instead of the systems default realm). The Realm option must be used together with KDC.                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                  | KDC                              | (Optional when using Kerberos) address of KDC (Key Distribution Center) to be used with the specified Realm (has to be used together with Realm)                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                  | JDBC FastExport                  | Speeds up retrieving large amounts of data from Teradata (disabled when using Kerberos authentication)                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                  | Transaction Mode                 | Specifies the transaction mode for the connection. <ul style="list-style-type: none"> <li><b>ANSI</b>: Uses American National Standards Institute (ANSI) transaction semantics. This mode is recommended. <b>ANSI</b> is the default value.</li> <li><b>TERA</b>: Uses legacy Teradata transaction semantics. This mode is only recommended for legacy applications that require Teradata transaction semantics.</li> <li><b>DEFAULT</b>: Uses the default transaction mode configured for the Teradata Database, either ANSI or TERA mode.</li> </ul> |
|                                                                                                                                                                                                  | Additional Connection Parameters | Extra Teradata JDBC connection options. The parameters must be specified in the following format: key=value,key=value,...<br><br><a href="http://developer.teradata.com/doc/connectivity/jdbc/reference/current/frameset.html">http://developer.teradata.com/doc/connectivity/jdbc/reference/current/frameset.html</a>                                                                                                                                                                                                                                 |
| <div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| CDC Properties                                                                                                                                                                                   | Database                         | Name of the database.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                  | System Object Prefix             | The name prefix of Teradata adapter system objects created in the source database by the adapter.<br><br>We recommend that you keep the default value of TADP_.                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                  | Shadow Table Prefix              | The name prefix of Teradata adapter shadow tables created in the source database by the adapter.<br><br>The default value is <b>SHADOW_</b>                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                  | Stored Procedure Suffix          | The name suffix of Teradata adapter stored procedures created in the source database by the adapter.<br><br>The default value is <b>PROC</b>                                                                                                                                                                                                                                                                                                                                                                                                           |

| Category | Option                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Trigger Suffix                   | <p>The name suffix of Teradata adapter triggers created in the source database by the adapter.</p> <p>The default value is <i>TRIG</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|          | Connection Pool Size             | <p>Maximum number of connections allowed in the connection pool on a secondary node. The default value is 8.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                                                                                                                                                                                                                    |
|          | Minimum Scan Interval in Seconds | <p>The minimum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default minimum scan interval is 3 seconds to avoid putting excessive load on the database with frequent repeat scans.</p> <p>If the adapter scans the queue and finds that the queue is empty, it gradually increases the scan interval from the minimum scan interval to the maximum scan interval.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div> |
|          | Maximum Scan Interval in Seconds | <p>The maximum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 10 (seconds).</p> <p>If the adapter scans the queue and finds that the queue is empty, it gradually increases the scan interval from the minimum scan interval to the maximum scan interval.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                         |

| Category            | Option                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     | DDL Scan Interval in Minutes    | <p>The interval for detecting DDL changes in the source.</p> <p>A zero or negative integer disables this parameter.</p> <p>The default value is 10 (minutes).</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                    |
|                     |                                 | <p>When querying the trigger queue table, the scanner may encounter a “deadlock exception”. Use this option to set the maximum number of retries before failing (if the retries don't succeed).</p> <p>The default value is 0, which means the adapter doesn't retry any scans when it encounters deadlock exceptions.</p>                                                                                                              |
|                     | Scan Retry Wait Time in Seconds | <p>The number of seconds for the scanner to wait before trying again to query the trigger queue table. A retry occurs only when you encounter a “deadlock exception”. The default value is 30 seconds.</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>           |
| Connection Security | Use Agent Stored Credential     | Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.                                                                                                                                                                                                                                                                                                                                                   |
| Credentials         | Credentials Mode                | <p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li>• <i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li>• <i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul> |
|                     | Username                        | <p>Database user name (or LDAP username/Kerberos principal name when using logon mechanisms other than TD2)</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>                                                                                                      |

| Category | Option   | Description                            |
|----------|----------|----------------------------------------|
|          | Password | The appropriate corresponding password |

**Note**

The value of this parameter can be changed when the remote source is suspended.

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyTeradataSource" ADAPTER "TeradataAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configuration" displayName="Configurations">
  <PropertyGroup name="connectionInfo">
    <PropertyEntry name="host" displayName="Host">myhost.sap.corp</
PropertyEntry>
    <PropertyEntry name="database" displayName="Database Name">mydb</
PropertyEntry>
    <PropertyEntry name="port" displayName="Port Number">1025</
PropertyEntry>
    <PropertyEntry name="encoding">UTF8</PropertyEntry>
    <PropertyEntry name="encrypt">ON</PropertyEntry>
    <PropertyEntry name="logmech">TD2</PropertyEntry>
    <PropertyEntry name="logdata"></PropertyEntry>
    <PropertyEntry name="fast_export">OFF</PropertyEntry>
    <PropertyEntry name="additional"></PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="cdc_properties">
    <PropertyEntry name="prefix">TADP_</PropertyEntry>
    <PropertyEntry name="conn_pool_size">10</PropertyEntry>
    <PropertyEntry name="min_scan_interval">2</PropertyEntry>
    <PropertyEntry name="max_scan_interval">10</PropertyEntry>
    <PropertyEntry name="scan_retry_max_attempts">3</PropertyEntry>
    <PropertyEntry name="scan_retry_wait_time">10</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
  </CredentialEntry>';
```

## Related Information

[Store Remote Data Source Credentials Securely \[page 68\]](#)



## 6.2.27.3.1 Using Prefix and Suffix Options to Manage System Object Name Lengths

The Teradata adapter creates a number of system objects on the source database in order for it to manage real-time replication. These objects include shadow tables, triggers, and stored procedures. If your Teradata database has a 30-character name limit, the default remote source settings can lead to Teradata adapter system objects with names greater than 30 characters. By default, the Teradata adapter's system object prefixes and suffixes add up to 12 extra characters, which means that only tables with names of 18 characters (or less) are supported.

To maximize the number of table name characters supported, edit the four system object prefix and suffix properties to one character each (they cannot be empty). Doing so ensures that the Teradata adapter uses at most five extra characters when creating its system objects, meaning that table names of up to 25 characters can be supported when the 30-character database limit is in place. The following options are available to configure:

- System Object Prefix
- Shadow Table Prefix
- Stored Procedure Prefix
- Trigger Suffix

### Note

When upgrading, if the Teradata adapter tries to read those properties and they are not present (for example, they are not part of the previous remote source before the upgrade), then the adapter uses the default values. When the user edits the remote source after the upgrade, they will see those default values in the remote source description.

## Related Information

[Teradata Remote Source Configuration \[page 572\]](#)

## 6.2.27.3.2 Permissions for Accessing Multiple Schemas

Grant the necessary permissions before accessing multiple schemas in a Teradata source.

To access multiple schemas, you need the following permissions assigned to you. In the following example, you are USER2, and you are accessing tables, creating procedures, executing procedures, and so on, belonging to USER1.

```
GRANT CREATE TABLE ON USER1 TO USER2
GRANT DROP TABLE ON USER1 TO USER2
GRANT ALL ON USER1.<table_name> TO USER2
GRANT CREATE PROCEDURE ON USER1 TO USER2
GRANT DROP PROCEDURE ON USER1 TO USER2
GRANT CREATE TRIGGER ON USER1 TO USER2
GRANT DROP TRIGGER ON USER1 TO USER2
```

```
GRANT EXECUTE PROCEDURE ON USER2 TO USER1
```

#### Note

The EXECUTE PROCEDURE permission allows USER1 to execute the procedures in database USER2.

### 6.2.27.3 Teradata DDL Propagation Scan Interval

The DDL Scan Interval in Minutes Adapter Preference option is important to review when setting up DDL propagation.

Enabling DDL propagation can impact the performance of the source Teradata database. Setting an appropriate value for the remote source option *DDL Scan Interval in Minutes* matters.

From the time the DDL changes occurs on the source database to the time the DDL changes are propagated to the target Teradata database, no DML changes on the tables are allowed. At configured intervals (*DDL Scan Interval in Minutes*, by default, 10 minutes), the Teradata adapter queries the metadata of all subscribed tables from the source Teradata database, and it determines if changes to the DDL have occurred. If changes are detected, it propagates the DDL changes to the target database through the Data Provisioning Server.

Because the Teradata adapter detects DDL changes by querying source Teradata system tables, the source database might be burdened if you configure a small value for the *DDL Scan Interval in Minutes* option. However, configuring a large value would increase the latency of DDL propagation. Therefore, you should experiment to figure out what value works best for you. If changes to the DDL are rare, you might even want to disable DDL propagation by setting the value of the *DDL Scan Interval in Minutes* option to zero. This prevents the Teradata adapter from querying metadata from the source database periodically.

#### Related Information

[Teradata Remote Source Configuration \[page 572\]](#)

### 6.2.27.4 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

#### Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. In the *Agent Preferences* menu, choose *Set Agent Preferences*.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Agent Configuration Parameters \[page 112\]](#)

## 6.2.28 Twitter

The Twitter adapter provides access to Twitter data via the Data Provisioning Agent.

Twitter is a social media Web site that hosts millions of tweets every day. The Twitter platform provides access to this corpus of data. Twitter has exposed all its data via RESTful API so that it can be consumed with any HTTP client. Twitter APIs allow you to consume tweets in different ways: getting tweets from a specific user, performing a public search, subscribing to real-time feeds for specific users or the entire Twitter community, and so on.

## Adapter Functionality

The Twitter adapter supports the following functionality:

- Virtual table or function as a source
- Real-time change data capture (flowgraph and replication task)

In addition, this adapter supports the following capabilities:

- SELECT, WHERE

## Twitter Adapter

The Twitter adapter is a streaming data provisioning adapter written in Java, and uses the Adapter SDK to provide access to Twitter data via SAP HANA SQL (with or without Data Provisioning parameters) or via virtual functions.

Using the Adapter SDK and the Twitter4j library, the Twitter adapter consumes the tweets from Twitter and converts to AdapterRow objects to send to the SAP HANA server. The tweet is exposed to SAP HANA via virtual tables. Each Status table is a map of JSON data returned from Twitter to tabular form. Currently we expose the following columns in all Status tables.

| Column name         | SQL Data Type | Dimension |
|---------------------|---------------|-----------|
| Id                  | BIGINT        |           |
| ScreenName          | NVARCHAR      | 256       |
| Tweet               | NVARCHAR      | 280       |
| Source              | NVARCHAR      | 256       |
| Truncated           | TINYINT       |           |
| InReplyToStatusId   | BIGINT        |           |
| InReplyToUserId     | BIGINT        |           |
| InReplyToScreenName | NVARCHAR      | 256       |
| Favorited           | TINYINT       |           |
| Retweeted           | TINYINT       |           |
| FavoriteCount       | INTEGER       |           |
| Retweet             | TINYINT       |           |
| RetweetCount        | INTEGER       |           |

### ⚠ Restriction

While Twitter supports tweets of up to 4,000 characters, the Twitter adapter supports a maximum of 280 characters and longer tweets are truncated.

| Column name          | SQL Data Type | Dimension |
|----------------------|---------------|-----------|
| RetweedByMe          | TINYINT       |           |
| PossiblySensitive    | TINYINT       |           |
| isoLanguageCode      | NVARCHAR      | 256       |
| CreatedAt            | DATE          |           |
| Latitude             | DOUBLE        |           |
| Longitude            | DOUBLE        |           |
| Country              | NVARCHAR      | 256       |
| Place_name           | NVARCHAR      | 256       |
| Place_type           | NVARCHAR      | 256       |
| UserId               | BIGINT        |           |
| UserName             | NVARCHAR      | 256       |
| UserUrl              | NVARCHAR      | 256       |
| CurrentUserRetweetId | BIGINT        |           |

## 6.2.28.1 Installation and Deployment

Configure your Data Provisioning agent and SAP HANA server to use the Twitter adapter.

Though the Twitter adapter is installed with the Data Provisioning agent, you must configure your agent to communicate with the SAP HANA server. In addition, you must configure your SAP HANA server and create a remote source.

### Configure the `dpagentconfig.ini` file

Configure proxy settings in the `dpagentconfig.ini` file by adding the following to the file:

- `proxyHost=<<proxy host name>>`
- `proxyPort=<<proxy port number>>`

## 6.2.28.1.1 Set Up a Twitter Account

Follow these steps to set up a Twitter account.

### Procedure

1. Create a Twitter developer account at <https://dev.twitter.com/user/login?destination=home> .
2. Create an application in Twitter.
3. Obtain the following:
  - API Key
  - API Secret
  - Access Token
  - Access Token Secret

See <https://dev.twitter.com/docs/auth/oauth/faq> to get more insight on how to set up authentication.

## 6.2.28.1.2 Create a Twitter Remote Source

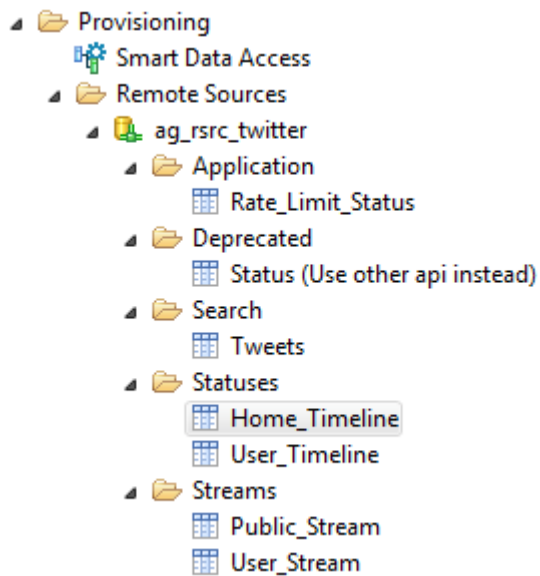
Follow these steps to create a Twitter remote source.

### Procedure

1. In the Systems view, open **Provisioning > Remote Sources** .
2. Select an agent under *Source Location*.
3. Right-click *Remote Sources*, and select *New Remote Source*.
4. Enter the required remote source configuration information.
5. Set the *Credentials Mode* parameter to “technical user”.
6. Click the *Save the Editor* icon in the upper right-hand corner of the screen.

### Results

The following directory structure is created, allowing you to create virtual tables or virtual functions as needed.



## Related Information

[Twitter Remote Source Configuration \[page 584\]](#)

[Creating Secondary User Credentials](#)

### 6.2.28.1.3 Twitter Adapter Capabilities

The Twitter adapter supports the following capabilities.

#### NAME

---

CAP\_NON\_TRANSACTIONAL\_CDC

---

CAP\_WHERE

---

CAP\_LIKE

---

CAP\_SIMPLE\_EXPR\_IN\_WHERE

---

CAP\_OR

---

CAP\_SELECT

---

CAP\_BIGINT\_BIND

---

CAP\_TABLE\_CAP

---

CAP\_COLUMN\_CAP

---

CAP\_METADATA\_ATTRIBUTE

See the description of these capabilities in the Javadoc documentation, which can be found in [<DPAgent\\_root>/doc/javadoc](#).

## 6.2.28.2 Twitter Remote Source Configuration

Remote source configuration options for the Twitter adapter. Also included is sample code for creating a remote source using the SQL console.

| Option              | Description     |
|---------------------|-----------------|
| API Key             | Consumer Key    |
| API Secret          | Consumer Secret |
| Access Token        | Oauth Token     |
| Access Token Secret | Oauth Secret    |

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyTwitterSource" ADAPTER "TwitterAdapter" AT LOCATION
AGENT "MyAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configuration">
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="consumerKey" displayName="API Key (Consumer Key)">
<password>myapikey</password>
</CredentialEntry>
<CredentialEntry name="consumerSecret" displayName="API Secret (Consumer
Secret)">
<password>myapisecret</password>
</CredentialEntry>
<CredentialEntry name="oauthToken" displayName="Access Token (Oauth Token)">
<password>myaccesstoken</password>
</CredentialEntry>
<CredentialEntry name="oauthSecret" displayName="Access Token Secret (Oauth
Secret)">
<password>myaccesstokensecret</password>
</CredentialEntry>';
```

## 6.3 Creating and Using Custom Adapters

You can create your own custom adapters with the Data Provisioning Adapter SDK.

The adapters delivered with the Data Provisioning Agent and described in this document were created using the Adapter SDK.

You can use the Adapter SDK to create your own custom adapters to connect to virtually any source. An administrator then registers the custom adapter on the appropriate agent.



## Related Information

[Data Provisioning Adapter SDK Guide](#)  
[Register Data Provisioning Adapters \[page 142\]](#)

## 6.4 Configure HTTPS Proxy Authentication for Adapters

Configure HTTPS proxy connection information and store authentication credentials in the Data Provisioning Agent secure storage.

### Context

If your adapter requires HTTPS proxy authentication, but your agent is configured to connect to SAP HANA over a non-HTTP protocol such as JDBC, you can configure the proxy connection and authentication with the Data Provisioning Agent configuration tool.

When you configure the proxy, you must specify the proxy hostname and port, as well as the username and password for authentication.

### Procedure

1. Start the agent configuration tool.
2. Choose *Configure DPAgent HTTP(S) Proxy Authentication*.
3. If the proxy requires an HTTPS connection, enter **true** for *Use HTTPS*.
4. Specify the proxy hostname and port.
5. Specify any non-proxy hosts.

Connections to these hosts aren't passed through the proxy.

Separate multiple hostnames by pipe characters:

```
hostname1 | hostname2 | hostname3
```

6. If the proxy requires authentication, enter **true** for *Use HTTP(S) Proxy Authentication*.
  - a. Specify the proxy username and password.
  - b. Confirm the proxy password.
7. In `<DPAgent_root>/dpagentconfig.ini`, add the following parameter:

```
jdk.http.auth.tunneling.disabledSchemes=
```

8. Restart the Data Provisioning Agent.

## Results

The proxy connection information is saved and the authentication credentials are stored in the Data Provisioning Agent secure storage. Adapters can use the stored credentials to connect to the proxy.

## Related Information

[Connect to Microsoft Azure Data Explorer \[page 416\]](#)

## 6.5 Store Remote Data Source Credentials Securely

If you don't want to store credentials for your adapter-based data sources in SAP HANA, you can store them in the Data Provisioning Agent secure storage. This method of storing credentials also provides management flexibility by allowing you to edit and delete credentials whenever you want.

## Context

You need three components to store credentials in the Data Provisioning Agent: remote source name, user name, and password.

## Procedure

1. Start the agent configuration tool.
2. Choose *Remote Source Credentials*.
3. Choose *Add a new credential* to add credentials for your remote source database.
4. Enter the remote source name, user name, and password (and confirmation), and press Enter.

## Results

You can now access these credentials to connect to a remote source through the *Use Agent Stored Credential* remote source configuration parameter for your adapter. You can also use this editor to view, delete, and edit credentials.

## Related Information

[SAP HANA Remote Source Configuration \[page 529\]](#)

[IBM DB2 Mainframe Remote Source Configuration \[page 355\]](#)

[DB2 Log Reader Remote Source Configuration \[page 328\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 395\]](#)

[Oracle Log Reader Remote Source Configuration \[page 447\]](#)

## 6.6 Configure Adapter Preferences

Use the `configAdapters` function of the Data Provisioning Agent configuration tool to adjust adapter settings specific to your sources.

### Procedure

1. Navigate to `<DPAgent_root>/bin` and start the configuration tool with the `configAdapters` parameter.

| Platform | Command                                    |
|----------|--------------------------------------------|
| Windows  | <code>agentcli.bat --configAdapters</code> |
| Linux    | <code>agentcli.sh --configAdapters</code>  |

2. Choose *Login* to establish the secure connection to the agent.
3. Specify the administrator username and password as prompted.

#### Note

For more information about configuring the agent administrator user, see [Manage Credentials for the Agent Configuration Tool \[page 67\]](#).

4. Choose *Set Adapter Preferences*.

#### Note

Choose *Display Adapter Preferences* if you want to display the current preferences instead of changing the configured values.

5. Select the entry for the adapter that you want to configure.
6. Specify values for the preferences for your adapter.

## 6.6.1 Configure Adapter Preferences with Discrete Commands

Use the `configAdapters` function of the Data Provisioning Agent configuration tool to adjust adapter settings specific to your sources.

Specify the adapter configuration function and one or more adapter preferences as additional `function` parameters.

For example, the following commands configure various adapter preferences for the File Adapter:

```
./agentcli.sh --configAdapters --function setFileAdapter
-DAdapterHashedToken.password=<password_file>
./agentcli.sh --configAdapters --function
setFileAdapter -DUI.config.rootdir=<root_directory>
-DUI.config.fileformatdir=<file_format_directory>
-DAdapterHashedToken.password=<password_file>
```

### Note

For security, you must use a password file to set passwords in discrete command mode. Save the password in a file and specify the location of the file as the value for the password preference.

## Available Adapter Functions and Preferences

- To display a list of available adapter configuration functions, use the `help` function:

```
./agentcli.sh --configAdapters --help
```

The configuration tool displays the configuration function for each available adapter.

- To display a list of available preferences for an adapter, specify the adapter function name with the `help` parameter:

```
./agentcli.sh --configAdapters --function <adapter_function> --help
```

The configuration tool displays the available configuration preferences, prerequisites, and a configuration example for the specified adapter.

# 7 Security

SAP HANA smart data integration adds database objects and communication channels to the SAP HANA security landscape.

Some aspects of SAP HANA smart data integration require specific security-related considerations such as the communication channel between SAP HANA and the Data Provisioning Agent. However, in general, SAP HANA smart data integration follows standard SAP HANA security concepts. For complete information, refer to the *SAP HANA Security Guide*.

## Related Information

[Authentication \[page 589\]](#)

[Configuring SSL \[page 590\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

[Authorizations \[page 613\]](#)

[Communication Channel Security \[page 615\]](#)

[Auditing Activity on SAP HANA Smart Data Integration Objects \[page 616\]](#)

[Data Protection and Privacy in SAP HANA Smart Data Integration and SAP HANA Smart Data Quality \[page 617\]](#)

[SAP HANA Security Guide](#)

## 7.1 Authentication

Authentication is the process of verifying the identity of database users accessing SAP HANA . SAP HANA supports several authentication mechanisms, several of which can be used for the integration of SAP HANA into single sign-on environments (SSO).

For complete information about authentication and single sign-on within SAP HANA, refer to the *SAP HANA Security Guide*.

### Authentication with Remote Source Systems

For remote source systems accessed by Data Provisioning adapters, user name and password authentication is supported. That is, users authenticate themselves by entering their user name and password for the remote source.

For custom adapters, the developer is free to implement any type of authentication.

## Kerberos Limitation for Some Data Provisioning Adapters

Some Data Provisioning adapters, such as Hive, Teradata, and Impala, support Kerberos authentication. When using Kerberos authentication, only encryption types whose key length is fewer than 256 characters are supported.

This limitation comes from the SAP JVM packaged with the DP Agent. If you need to use strong encryption, replace the SAP JCE policy files.

## Related Information

[SAP HANA Security Guide](#)

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

## 7.2 Configuring SSL

Learn an overview of how to configure SSL connections in SAP HANA smart data integration.

You can configure SSL connections from the Data Provisioning Agent to SAP HANA server and, depending on the adapter you are using, from Data Provisioning Agent to your remote database.

### Note

To configure SSL for the Odata adapter, which does not use the Data Provisioning Agent, refer to [Consume HTTPS OData Services \(On Premise\) \[page 425\]](#)

Successful configuration of SSL in SAP HANA smart data integration requires that the following be performed:

### Connecting from Data Provisioning Agent to SAP HANA server

1. Enable and configure SAP HANA server for SSL.  
For more information, see [Secure Communication Between SAP HANA and JDBC/ODBC Clients](#) and subsequent topics.
2. Create a keystore/truststore on the SAP HANA system and the Data Provisioning Agent, and then obtain SSL certificates and import them into your SAP HANA system and the Data Provisioning Agent.  
There are different methods to accomplish these steps.
  - Command line batch  
See [Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#) for more information.
  - Command line interactive  
For more information, see [Configure SSL for SAP HANA \(CA\) \[page 592\]](#) or [Configure SSL for SAP HANA \(Self-Signed\) \[page 597\]](#).

3. Connect to SAP HANA with SSL.

Once you have configured your certificates for the Data Provisioning Agent and SAP HANA Server, you need to enable SSL on the Data Provisioning Agent. To do this, you can use the agent command-line interface (agentcli). See [Register a New SSL-Enabled Data Provisioning Agent \[page 604\]](#) for more information.

## Connecting from Data Provisioning Agent to Your Remote Source

1. Create the Data Provisioning Agent keystore and truststore to house the remote source certificates. To use the agent command-line interface (agentcli), see [Register a New SSL-Enabled Data Provisioning Agent \[page 604\]](#).
2. Configure your source database. Configure your source database for SSL. This includes creating CA certificates and importing them into Data Provisioning Agent.
3. Configure SSL on the remote source that you are creating. Adapters that support SSL may have different configuration requirements. At a minimum, you need to enable SSL in the remote source configuration. Other remote source parameters may also need to be configured, depending on the adapter that you are using and your preferences.

## Encryption Strength

If you require stronger encryption than 128 bit key length, update the existing JCE policy files.

## Related Information

[Configure SSL for SAP HANA \(CA\) \[page 592\]](#)

[Configure SSL for SAP HANA \(Self-Signed\) \[page 597\]](#)

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

[Register a New SSL-Enabled Data Provisioning Agent \[page 604\]](#)

[Enable SSL on an Existing Data Provisioning Agent \[page 606\]](#)

[Disable SSL on an Existing Data Provisioning Agent \[page 607\]](#)

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

[Enable Data Provisioning Agent Support for SAP HANA Property sslEnforce=true \[page 609\]](#)

[Troubleshoot the SSL Configuration \[page 611\]](#)

[Disable Revealing Certificate Information When Using an OpenSSL Client \[page 612\]](#)

[Configure SSL for the DB2 Log Reader Adapter \[page 348\]](#)

[Configure SSL for the Microsoft SQL Server Log Reader Adapter \[page 411\]](#)

[Configure SSL for the Oracle Log Reader Adapter \[page 471\]](#)

[Cassandra SSL Configuration \[page 205\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

## 7.2.1 Configure SSL for SAP HANA (CA)

Use the Data Provisioning Agent Keystore Configuration utility to configure and set up SSL for SAP HANA by getting a certificate from a certificate authority (CA). This secures connectivity from the SAP HANA database to the SAP HANA Data Provisioning Agent via SSL.

### Prerequisites

You must have the following before configuring SSL:

- Command-line access to SAP HANA Server using the HANA adm user account
- Command-line access to the Data Provisioning Agent using the DPAgent user account
- Make sure that dpserver is started. If not already started, then perform the following:  
In HANA Studio, logged into SYSTEMDB, run: `ALTER DATABASE <your SAPSYSTEMNAME> ADD 'dpserver' ;`
- Back up the following files from the Data Provisioning Agent installation directory:
  - `sec` and `secure_storage` (encrypted files to store keystore passwords)
  - `dpagentconfig.ini` (configuration file to tell the Data Provisioning Agent to use SSL)
  - `ssl/cacerts` (Java keystore to store server and agent certificates)
- Set the PATH variable to include the Data Provisioning agent `sapvm/bin` subdirectory so `agentcli` can find the keytool executable.  
Example: `export PATH=/usr/sap/dataprovagent/sapjvm/bin:$PATH`
- Set the DPA\_INSTANCE variable to the directory where the Data Provisioning agent is installed.  
Example: `export DPA_INSTANCE=/usr/sap/dataprovagent`

### Context

The Data Provisioning Agent Keystore Configuration utility is a guided interactive tool used to configure SSL for SAP HANA. Perform the following steps to get a certificate from a certificate authority (CA).

### Procedure

1. Start the Data Provisioning Agent Keystore Configuration utility from the terminal by entering `./agentcli.sh`. If using Windows, use `./agentcli.bat`.

#### Note

Don't exit the tool when setting up SSL, even when copying certificates between agent and HANA hosts.

```
dpagent@vm:/usr/sap/dpagent/bin> ./agentcli.sh
Environment variable DPA_INSTANCE not found
```



```
Environment variable DPA_INSTANCE must point to DPAgent's installation root
directory
Example:: export DPA_INSTANCE=/usr/sap/dataprovagent/ then try again
```

2. If you get an error message stating that the environment variable isn't found, run the following command to set it up. After a successful execution, it displays a list of available commands.

```
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> export DPA_INSTANCE=/hana1/bin/dpagent
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> ./agentcli.sh
Using the following installation location
/hana1/bin/dpagent
--createFullSystemDump    Gathers all related log files and ini settings and
creates an archive
--setSecureProperty       Secure Storage Utility
--configAgent             DPAgent Configuration Tool
--configAgentKeystore     DPAgent Keystore Configuration Utility
<operation> --help       To print help for the given operation
```

3. To view a list of available options, enter the command `./agentcli.sh --configAgentKeystore`.

```
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> ./agentcli.sh --configAgentKeystore
*****
DPAgent Keystore Configuration Utility
*****
1. Configure SSL for TCP (HANA on-premise) (interactive only)
2. List Agent Certificate
3. List All Certificate
4. List Certificate (by alias)
5. Export Agent Certificate
6. Export Certificate (Base64-Encoded)
7. Import Certificate
8. Delete Certificate
9. Change keystore password
q. Quit
b. Back
*****
```

4. In the DPAgent Keystore Configuration Utility, use option 1 to configure SSL for TCP (HANA on-premise).

```
*****
Configure SSL for TCP (HANA on-premise) (interactive only)
*****
Enter Store Password: (*****) [The default password is changeit]
Enter Register Agent on HANA after SSL Configuration(true): Valid options:
true|false [You should always do this to ensure the setup is correct]
true
Enter Agent name to register with(ProductionAgent): [Agent name that you want
to register in HANA with]
SSLAgent
Enter Hana Server Host name(localhost): [This is hana server name and not
the dpagent server name]
mo-1a6803cc5.mo.sap.corp
Enter Hana Server Port Number(30015): [Hana port usually 3xx15 where xx is
your instance id]
30215
Enter Agent Admin HANA User: [HANA user that have AGENT ADMIN privilege]
system
Enter Password for Agent Admin HANA User:
Enter Password for Agent Admin HANA User: (confirm)
```

5. The following section defines the Data Provisioning Agent certificate and runs the following command. Use the same key\_password as the store\_password.

```
Enter The name of your organizational unit(Test Product):
SAP Tools
```

```

Enter The name of your organizational(Test Organization):
SAP
Enter The name of your City or Locality(Palo Alto):
Enter The name of your State or Province(CA):
Enter The two-letter country code for this unit(US):

```

6. Create a certificate signing request, so that the certificate can be signed by a certificate authority, by selecting *false*.

```

Enter Use self-signed certificates for DPAgent?(false): Valid options: true|
false
false
Calling Configure SSL for TCP (HANA on-premise) (interactive only)
(configureKeystore)
*** Executing configureKeystore
*****
                Configuring DPAgent Keystore
*****
                Checking existing cacerts for dpagent private key
                Using DPAgent hostname = mo-1a6803cc5.mo.sap.corp and Alias =
dataprovisioningagent
                cacerts does not have dpagent certificate
                Creating a backup of existing keystore /hana1/bin/dpagent/ssl/cacerts.bak

```

7. The fully qualified domain name (FQDN) must match the Data Provisioning Agent host name and the SAP HANA Server must be able to ping this machine. The HANA Server validates the Data Provisioning Agent host name and requires it to match what is set up in the AGENTS table.

```

Server does a host-name validation. Ensure the following FQDN is correct.
Enter dpagent machine host name? (mo-1a6803cc5.mo.sap.corp)
    Creating dpagent keystore with Certificate:
CN=mo-1a6803cc5.mo.sap.corp,OU=Test Product,O=Test Organization,L=Palo
Alto,S=CA,C=US
    Executing ->[keytool, -genkeypair, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -alias, dataprovisioningagent, -keyalg, RSA, -keysize, 2048, -dname,
CNrganization,L=Palo Alto,S=CA,C=US, -v]
    Generating 2,048 bit RSA key pair and self-signed certificate
(SHA256withRSA) with a validity of 3,650 days
    for: CN=mo-1a6803cc5.mo.sap.corp, OU=Test Product, O=Test
Organization, L=Palo Alto, ST=CA, C=US
    [Storing /hana1/bin/dpagent/ssl/cacerts]
    DPAgent keystore created successfully.
    Generating Certificate Sign Request at /hana1/bin/dpagent/ssl/
dpagent_CSR.cer
    Executing ->[keytool, -certreq, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -alias, dataprovisioningagent, -file, /hana1/bin/dpagent/ssl/
dpagent_CSR.c
    DPAgent CSR created at /hana1/bin/dpagent/ssl/cacerts
    *) Please request the CA authority to sign the Certificate
Request.
    *) Get the CA root certificate as a cer file and import it
here (ex. CA_Root.cer )
    *) Get the signed DPAgent Certificate response from the CA.
(ex. CA_DPAgent_Signed.cer
Enter path to CA Root certificate? (/hana1/bin/dpagent/ssl/CA_Root.cer)

```

The utility creates a Data Provisioning Agent keystore and creates the certificate signing request, `dpagent_CSR.cer`. Provide the content of this file to your certificate authority (CA). The CA signs this certificate, and then provides a signed certificate response. In the response, some certificate authorities may provide the root, interim, and response all in one file or in multiple files.

- The Java keystore requires the root to be imported after a response. Using the utility, you must strip the root certificate from the rest of the chain and import only the root at the first prompt. Save the root CA in the same folder.

```
Enter path to CA Root certificate? (/hana1/bin/dpagent/ssl/CA_Root.cer)
  Executing ->[keytool, -importcert, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -file, /hana1/bin/dpagent/ssl/CA_Root.cer, -alias, dpagentrootca,
-v, -
  Certificate was added to keystore
  [Storing /hana1/bin/dpagent/ssl/cacerts]
Successfully imported certificate as dpagentrootca
Enter path to signed certificate response for DPAgent? (/hana1/bin/
dpagent/ssl/CA_DPAgent_Signed.cer)
```

- After you import the root, you can import the remaining chain or just the agent.

```
  Executing ->[keytool, -importcert, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -file, /hana1/bin/dpagent/ssl/CA_DPAgent_Signed.cer, -alias,
dataproviss
  Certificate reply was installed in keystore
  [Storing /hana1/bin/dpagent/ssl/cacerts]
Successfully imported certificate as dataprovisioningagent
  Executing ->[keytool, -exportcert, -keystore, /hana1/bin/
dpagent/ssl/cacerts, -file, /hana1/bin/dpagent/ssl/dpagent.cer, -alias,
dataprovisioningagen
  Certificate stored in file </hana1/bin/dpagent/ssl/dpagent.cer>
```

The Data Provisioning Agent keystore now has the Data Provisioning Agent certificate and exports the certificate to the SSL folder. Now, copy the certificate to the SAP HANA machine.

- On the SAP HANA Server, create the SAP HANA keystore, get the certificate signed, and import the signed response.

```
*****
                HANA Configuration
*****
Now for the HANA side setup you need to have HANA Shell Access.
  * Once you have access please navigate to
  =>cd $SECUDIR
  *)If sapcli.pse exists there, the server certificate is created
already. If not, create sapcli.pse via the following
  => sapgenpse get_pse -p sapcli.pse "CN=hostname.fully.qualified,
OU=Support, O=SAP, C=CA"
  *) Please request the CA authority to sign the Certificate
Request.
  *) Get the CA root certificate as a cer file and save it here
(ex. CA_Root.cer)
  *) Get the signed DPAgent Certificate response from the CA.
(ex. CA_Signed_Server.cer)
  *) Once you have all certificate import the CA Response along
with Optional Root Certificates.
  => sapgenpse import_own_cert -c CA_Signed_Server.cer -p
sapcli.pse <-r optional_CA_Root>
  *) Import DPAgent Certificate /hana1/bin/dpagent/ssl/dpagent.cer,
which is required by Client Authentication.
-----BEGIN CERTIFICATE-----
MIIDqzCCApOgAwIBAgIJA0dNZo6S7awNMA0GCSqGSIb3DQEBBQUAMCgx CzAJBgNV
BAYTAlVTMQswCQYDVQQIDAJDQTEEMMAoGAlUECgwDU0FQMB4XDTE3MDgyMjIwMjMx
OFoXDTE3MDgyMjIwMjMxOFowYQYDZDQTEEMMAoGAlUECgwDU0FQMB4XDTE3MDgy
MBAGAlUEBxMjUGFsbyBBbHRvMR0wGAYDVQQKExFUZXN0IE9yZ2FuaXphdGlvbjEVE
MBMGA1UECzMVGVzdCBQcm9kdWN0MSEwHwYDVQQDExhtby0xYTY4MDNjYzUubW8u
c2FwLmNvcnAwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQCRI9kfAGLq
baTSttC2I3GrbH4FF95/wJ+aMNPVe9quS3qH4cMpN+Bqh2YYq1qucRzjwOiWH8rN
t3eNd4lYw7HvDEN4u/3uhtHClE2tmoOHVdesGZ8Ui2250RXBBEhY2ug48uyFShp2
60y0NQBLGfSDdV+8ZqGJZ0zZrxHMW9J5DsKB8Yblp5aC8TZHp5JP6nC2rVM/BmB
```

```

LGX1YkTYMaHkzZaRnglWBwaK913x3qNOOiDgSFOxJGPrHBuWDM0LQJOQwibpFu6K
RlTlOV8wTYois/ETRzEQ2vcHT998uzqKRuaeKAtnMGq+CDHSRSYDb/Q152sJoMmK
GtOvoZZ2vE1hAgMBAAGjezB5MAkGAlUdEwQCMAAwLAYJYIZIAYb4QgENBB8WHU9w
ZW5TU0wgR2VuZXJhdGVkIEN1cnRpZmljYXR1MB0GAlUdDgQWBQ6lejpKojc4I1r
DUmw+ade6pXewTAFBgNVHSMEGDAWgBSjkBEgkX3wJIWR8Ms1LHm+GSlswzANBgkq
hkiG9w0BAQUFAAOCAQEANv1NoddAZVWxB8H02lpT3IYb38jpPqPp7wX0xlSPfhQJ
5mg+5U4igB6qg9cIvbWxwpD2CmMQUH1J7iuPTNdnncYvJYkJ5ZTQ216L90y24gRo
4khwEBLc9d3V+mF5+ZJspJJey+176TVu9tve3/GEOSQDqQB1xQd/VJ5j53Ik4mxB
OeFp70AvFt251QsqGIU8K81A+6ocB1mYTFkmVVz1f2/5AhdHMMOeQDKKEVIjWrz3J
9NtjWXezf1zRiLdT0E9yz10LaEZ53jC/6ZJv8Ia9L8I8OfBJaumW2477nNXgnvhX
dojFRbepmPQGSj/Z2HozcCfYQCNT0Q63ECNOPuf9+g==
-----END CERTIFICATE-----

```

```

*) You can save the above certificate to a file dpagent.cer in the
serverside and import it to sapcli.pse
=> sapgenpse maintain_pk -a dpagent.cer -p sapcli.pse
*)If SSO has not yet been enabled for this keystore, you can do it
with
=> sapgenpse seclogin -lps -p sapcli.pse -O <Instance_Name>adm
*)Export the HANA Server certificate and save it in dpagent machine
=> sapgenpse export_own_cert -o hana_server.cer -p sapcli.pse
Press Enter to continue...

```

11. After you create the SAP HANA keystore, add the agent certificate, and then export the SAP HANA certificate and import the SAP HANA certificate into the Data Provisioning Agent.

After exporting the HANA certificate with `sapgenpse`, copy the HANA certificate `hana_server.cer` back to the Data Provisioning Agent host, and put the certificate in the Data Provisioning Agent `/ssl` subdirectory (for example, `/usr/sap/dataprovagent/ssl`). If the Data Provisioning Agent keystore has a previous alias called `hanaserverrootca`, delete this alias, because the `agentcli` imports the HANA certificate using this alias name.

### Note

The following may not apply, depending on the root CA.

```

*****
Post HANA Configuration.
*****
Enter path to Server certificate or CA Root certificate path? ( )
/hanal/bin/dpagent/ssl/hana_server.cer
Executing ->[keytool, -importcert, -keystore, /hanal/bin/
dpagent/ssl/cacerts, -file, /hanal/bin/dpagent/ssl/hana_server.cer, -alias,
hanaserverrootca
Certificate was added to keystore
[Storing /hanal/bin/dpagent/ssl/cacerts]
Successfully imported certificate as hanaserverrootca

```

After configuration, the command-line tool updates.

1. It connects to SAP HANA to validate the connection.
  2. It registers the agent without SSL to test the SAP HANA connection to the Data Provisioning Agent.
  3. If the previous steps are successful, it updates the `dpagentconfig.ini` and `secure_storage`, and persists all of the provided information.
12. Restart the Data Provisioning Agent.
  13. Reregister the agent with the SSL flag.

```

Connecting to HANA Server at pall00553681a.amer.global.corp.sap
Registering agent as ProductionAgent with SSL=false
Enabling SSL on DPAGENT TCP Sockets.
Successfully switched dpagent to use SSL.
Press Enter to continue...

```

## 7.2.2 Configure SSL for SAP HANA (Self-Signed)

Use the Data Provisioning Agent Keystore Configuration utility to configure and set up SSL for SAP HANA by creating a self-signed certificate. This secures connectivity from the SAP HANA database to the SAP HANA Data Provisioning Agent via SSL.

### Prerequisites

You must have the following before configuring SSL:

- Command-line access to SAP HANA Server using the HANA adm user account
- Command-line access to the Data Provisioning Agent using the DPAgent user account
- Make sure that dpserver is started. If not already started, then perform the following:  
In HANA Studio, logged into SYSTEMDB, run: `ALTER DATABASE <your SAPSYSTEMNAME> ADD 'dpserver' ;`
- Back up the following files from the Data Provisioning Agent installation directory:
  - `sec` and `secure_storage` (encrypted files to store keystore passwords)
  - `dpagentconfig.ini` (configuration file to tell the Data Provisioning Agent to use SSL)
  - `ssl/cacerts` (Java keystore to store server and agent certificates)
- Set the PATH variable to include the Data Provisioning agent `sapvim/bin` subdirectory so `agentcli` can find the keytool executable.  
Example: `export PATH=/usr/sap/dataprovagent/sapjvm/bin:$PATH`
- Set the DPA\_INSTANCE variable to the directory where the Data Provisioning agent is installed.  
Example: `export DPA_INSTANCE=/usr/sap/dataprovagent`

### Context

The Data Provisioning Agent Keystore Configuration utility is a guided interactive tool used to configure SSL for SAP HANA. Perform the following steps to create a self-signed certificate.

### Procedure

1. To start the Data Provisioning Agent Keystore Configuration utility from the terminal, enter `./agentcli.sh`. If using Windows, use `./agentcli.bat`.

#### Note

Don't exit the tool when setting up SSL, even when copying certificates between agent and HANA hosts.

```
dpagent@vm:/usr/sap/dataprovagent/bin> ./agentcli.sh
Environment variable DPA_INSTANCE not found
```

```
Environment variable DPA_INSTANCE must point to DPAgent's installation root directory
Example:: export DPA_INSTANCE=/usr/sap/dataprovagent/ then try again
```

2. If you get an error message stating that the environment variable is not found, run the following command to set it up. After a successful execution, it displays a list of available commands.

```
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> export DPA_INSTANCE=/usr/sap/
dataprovagent/
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> ./agentcli.sh
Using the following installation location
/hana1/bin/dpagent
--createFullSystemDump    Gathers all related log files and ini settings and
creates an archive
--setSecureProperty       Secure Storage Utility
--configAgent             DPAgent Configuration Tool
--configAgentKeystore     DPAgent Keystore Configuration Utility
<operation> --help       To print help for the given operation
```

3. To view a list of available options, enter the command `./agentcli.sh --configAgentKeystore`.

```
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> ./agentcli.sh --configAgentKeystore
*****
DPAgent Keystore Configuration Utility
*****
1. Configure SSL for TCP (HANA on-premise) (interactive only)
2. List Agent Certificate
3. List All Certificate
4. List Certificate (by alias)
5. Export Agent Certificate
6. Export Certificate (Base64-Encoded)
7. Import Certificate
8. Delete Certificate
9. Change keystore password
q. Quit
b. Back
*****
```

4. In the DPAgent Keystore Configuration Utility, use option 1 to configure SSL for TCP (HANA on-premise).

```
*****
Configure SSL for TCP (HANA on-premise) (interactive only)
*****
Enter Store Password: (*****) [The default password is changeit]
Enter Register Agent on HANA after SSL Configuration(true): Valid options:
true|false [You should always do this to ensure the setup is correct]
true
Enter Agent name to register with(ProductionAgent): [Agent name that you want
to register in HANA with]
SSLAgent
Enter Hana Server Host name(localhost): [This is hana server name and not
the dpagent server name]
mo-1a6803cc5.mo.sap.corp
Enter Hana Server Port Number(30015): [Hana port usually 3xx15 where xx is
your instance id]
30215
Enter Agent Admin HANA User: [HANA user that have AGENT ADMIN privilege]
system
Enter Password for Agent Admin HANA User:
Enter Password for Agent Admin HANA User: (confirm)
```

5. The following section defines the Data Provisioning Agent certificate and runs the following command. Use the same `key_password` as the `store_password`.

```
Enter The name of your organizational unit(Test Product):
```

```
SAP Tools
Enter The name of your organizational(Test Organization):
SAP
Enter The name of your City or Locality(Palo Alto):
Enter The name of your State or Province(CA):
Enter The two-letter country code for this unit(US):
```

- For a self-signed certificate, select true.

```
Enter Use self-signed certificates for DPAgent?(false): Valid options: true|
false [We are going to use self-signed certificate here.]
true
Calling Configure SSL for TCP (HANA on-premise) (interactive only)
(configureKeystore)
*** Executing configureKeystore
*****
                Configuring DPAgent Keystore
*****
                Checking existing cacerts for dpagent private key
                Using DPAgent hostname = mo-1a6803cc5.mo.sap.corp and Alias =
dataprovisioningagent
                cacerts does not have dpagent certificate
                Creating a backup of existing keystore /hana1/bin/dpagent/ssl/cacerts.bak
```

- The fully qualified domain name (FQDN) must match the Data Provisioning Agent host name, and the SAP HANA Server must be able to ping this machine. The HANA Server validates the Data Provisioning Agent host name and requires it to match what is set up in the AGENTS table.

```
Server does a host-name validation. Ensure the following FQDN is correct.
Enter dpagent machine host name? (mo-1a6803cc5.mo.sap.corp)
Creating dpagent keystore with Certificate:
CN=mo-1a6803cc5.mo.sap.corp,OU=SAP Tools,O=SAP,L=Palo Alto,S=CA,C=US
Executing ->[keytool, -genkeypair, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -alias, dataprovisioningagent, -keyalg, RSA, -keysize, 2048, -dname,
CN=mo-1a6803cc5.mo.sap.corp,OU=SAP Tools,O=SAP,L=Palo Alto,S=CA,C=US, -v]
Generating 2,048 bit RSA key pair and self-signed certificate
(SHA256withRSA) with a validity of 3,650 days
for: CN=mo-1a6803cc5.mo.sap.corp, OU=SAP Tools, O=SAP, L=Palo
Alto, ST=CA, C=US
[Storing /hana1/bin/dpagent/ssl/cacerts]
DPAgent keystore created successfully.
***Using self-signed certificates for dpagent***
Executing ->[keytool, -exportcert, -keystore, /hana1/bin/
dpagent/ssl/cacerts, -file, /hana1/bin/dpagent/ssl/dpagent.cer, -alias,
dataprovisioningagent, -noprompt]
Certificate stored in file </hana1/bin/dpagent/ssl/dpagent.cer>
```

The Data Provisioning Agent keystore now has the Data Provisioning Agent certificate and exports the certificate to the SSL folder. Now, copy the certificate to the SAP HANA machine.

- On the SAP HANA Server, because this certificate is self-signed, create the SAP HANA keystore with a *noreq* flag.

```
*****
                HANA Configuration
*****
Now for the HANA side setup you need to have HANA Shell Access.
* Once you have access please navigate to
=>cd $SECUDIR
*)If sapcli.pse exists there, the server certificate is created
already. If not, create sapcli.pse via the following
=> sapgenpse get_pse -p sapcli.pse -noreq
"CN=hostname.fully.qualified, OU=Support, O=SAP, C=CA"
*) Import DPAgent Certificate /hana1/bin/dpagent/ssl/dpagent.cer,
which is required by Client Authentication.
```

```
-----BEGIN CERTIFICATE-----
MIIDhTCCAm2gAwIBAgIEclVYkDANBgkqhkiG9w0BAQsFAADBMQswCQYDVQQGEwJV
UzELMAkGA1UECBMCQ0ExEjAQBgNVBACgTCVBhbG8gQWw0bzEMMAoGA1UEChMDU0FQ
MRlWEAYDVQQLEw1TQVAgVW9vbHMxITAfBgNVBAMTGG1vLTFhNjgwM2NjNS5tby5z
YXAuY29ycDAeFw0xNzA4MjIxNzNzMDVAFw0yNzA4MjAxNzNzMDVAMHMxCzAJBgNV
BAYTAlVTMQswCQYDVQQIEwJkQTESMBAGAlUEBxMJUGFsbyBBbHRvMQwwCgYDVQQK
EwNTQVAXEjAQBgNVBAsTCVNBUCBUB29sczEhMB8GA1UEAxMYbW8tMWE2ODAzY2M1
LmlvLnNhCz5jb3JwMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEApopu
2Z6700ByR5PKR8pL5C9jkrGiCIDBXVdY6ZdbZPkrkchIwl3SL60eRLzxxDeWfVZO
TA5JoIKy7BSuTlSvX/6qN9NHYSFTtEJAV5g01B2fI+mPQ1RpWp/a2IPXUW8Lm1BQ
tAiiFCBazA3nAyf7wn8NvILM3s3anALgqLrZsZOWc2cWAKv9LZDdJjvZZtdP8zDV
65YUPYxthGOD+K/yftOSlaFmSBOLSzkcUK/hCKy7mDEBjjQbviHVDV43akaRnJED
ClCCVToJSoprdeGCLab06vjfPIv37sID4sNhaTECRDyDIB5eVpYttd2ZDhEpJk5V
WsKKSmGgnLsm9gtDQIDABoyEwHzAdBgNVHQ4EFqQUZfrkKpGfoggzAdknrXOEX
IGdwn3MwDQYJKoZIhvcNAQELBQADggEBADd0sLSyeXOqSuePOhdUS2CLyJkMLgrY
BQ2t6cEyGJ8OPep6qmhTshqyUZ/psgtSDO6YTkD/d0ecB0kp+bXeoeJpFLRb5cLM
HePG39Meu3S1dxoo6ybNsmGWHIzZlk2MhbMBO15zzc9X8FsflsGuRTHGx7Z7q61E
PwihFNImkEu8uI3Zz8lrT+ggVlJpmm5zqRyS5+iFV4kMjMoimkrGD2sBNY5wpF7O
LO6L/SiZng9q1//9j2zp/fCSKjjyd/jn/veo10y6rUECOje8B1J5+WGeA6bDsEei
WiAmhF60A+63xXN3tdKIayRl0F8Hvz+RO081LyAX6U0m4zo4g140uCo=
-----END CERTIFICATE-----
```

```
*) You can save the above certificate to a file dpagent.cer in the
serverside and import it to sapcli.pse
=> sapgenpse maintain_pk -a dpagent.cer -p sapcli.pse
*)If SSO has not yet been enabled for this keystore, you can do it
with
=> sapgenpse seclogin -lps -p sapcli.pse -O <Instance_Name>adm
*)Export the HANA Server certificate and save it in dpagent machine
=> sapgenpse export_own_cert -o hana_server.cer -p sapcli.pse
Press Enter to continue...
```

9. After you create the SAP HANA keystore, add the agent certificate, and then export the SAP HANA certificate and import the SAP HANA certificate into the Data Provisioning Agent.

```
*****
Post HANA Configuration.
*****
Enter path to Server certificate or CA Root certificate path? ()
/hana1/bin/dpagent/ssl/hana_server.cer
Executing ->[keytool, -importcert, -keystore, /hana1/bin/
dpagent/ssl/cacerts, -file, /hana1/bin/dpagent/ssl/hana_server.cer, -alias,
hanaserverrootca
Certificate was added to keystore
[Storing /hana1/bin/dpagent/ssl/cacerts]
Successfully imported certificate as hanaserverrootca
```

After configuration, the command-line tool updates.

1. It connects to SAP HANA to validate the connection.
  2. It registers the agent without SSL to test the SAP HANA connection to the Data Provisioning Agent.
  3. If the previous steps are successful, it updates the dpagentconfig.ini and secure\_storage, and persists all of the provided information.
10. Restart the Data Provisioning Agent.
  11. Reregister the agent with the SSL flag.

```
Connecting to HANA Server at pall00553681a.amer.global.corp.sap
Registering agent as ProductionAgent with SSL=false
Enabling SSL on DPAGENT TCP Sockets.
Successfully switched dpagent to use SSL.
Press Enter to continue...
```



## 7.2.3 Configure SSL for SAP HANA On-Premise [Manual Steps]

When SAP HANA is installed on-premise, you must obtain a certificate for the agent and import certificates on both the agent host machine and the SAP HANA system.

### Prerequisites

Before configuring the agent, ensure that the SAP HANA system is already configured for SSL. For more information, see the *SAP HANA Security Guide*.

You need the password for the keytool Java program to generate a keystore and import an SAP HANA certificate. You can find the password, commands, and instructions in the `keytool.txt` file at `<DPAgent_root>\ssl\keytool.txt`.

#### Note

When running the keytool commands, use the keytool from `<DPAgent_root>/sapjvm/bin` and not the one from the operating system.

#### Note

To safeguard your certificates, change the default password of the keystore.

Also, back up the following:

- SAP HANA `sec` directory
- Back up your `<DPAgent_root>/ssl`, `<DPAgent_root>/sec`, and `<DPAgent_root/secure_storage>` directories, if they exist.

### Procedure

1. Generate a keystore on the agent host machine.

```
<DPAgent_root>/sapjvm/bin/keytool -genkeypair -alias DPAgent -keyalg RSA
-keysize 2048 -dname
"CN=<agent_hostname>,OU=<organizational_unit>,O=<organization>,L=<city>,S=<state>,C=<country>" -keypass <key_password> -storepass <store_password>
-keystore <DPAgent_root>/ssl/dpagent.jks
```

`<agent_hostname>` must be the fully qualified hostname of the machine where the agent is installed. (For example, `machine.company.com`)

#### Note

Use the same passwords from above later in steps when accessing the `.jks` when using `-keypass` and `-storepass` options.

The alias and keystore values can be any value, but if referencing them later on, when creating the certificate request and when importing the signed agent certificate, these alias and keystore values — defined here — should be used again. So, the Data Provisioning Agent alias and keystore values should be the same.

2. Obtain a signed certificate for the agent and import the certificate into the keystore. Refer to step 3 if you have multiple certificates to import.

- a. Generate the certificate request.

```
<DPAgent_root>/sapjvm/bin/keytool -certreq -file <DPAgent_root>/ssl/  
Agent_Req.pem -alias Agent_Cert -keystore <DPAgent_root>/ssl/dpagent.jks  
-storepass <store password>
```

- b. Verify that the alias entry is of type PrivateKeyEntry.

```
<DPAgent_root>/sapjvm/bin/keytool -keystore <DPAgent_root>/ssl/dpagent.jks  
-list -storepass <store password>
```

### Note

After generating the agent request, make sure that the alias entry is of type PrivateKeyEntry and not trustedCertEntry. If the alias entry isn't PrivateKeyEntry, we recommend that you delete the alias and rerun the `keytool -genkeypair ...` command to re-create the key pair, before generating a certificate request for the Data Provisioning Agent.

- c. Send the certificate request to a Certificate Authority (CA) to be signed.
- d. After receiving the signed certificate from the CA, import it into the agent keystore.

```
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore cacerts -storepass  
<store password> -file <signed agent certificate_filename>.der -noprompt  
-alias DPAgent
```

- e. Import the server certificate into the agent keystore.

```
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore cacerts -storepass  
<store password> -file <server certificate_filename>.der -noprompt -alias  
Server
```

3. (Optional) If you have more than one type of certificate to import, then import them **in the order** shown below. It is important to ensure that they are imported in the correct order.

```
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore <your_keystore>  
-storepass <store_password> -file <CA_certificate_filename>.der -noprompt  
-alias <your CA alias> -v  
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore <your_keystore>  
-storepass <store_password> -file <intermediate_certificate_filename>.der  
-noprompt -alias <your intermediate alias> -v  
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore <your_keystore>  
-storepass <store_password> -file <self_signed_certificate_filename>.der  
-noprompt -alias <your Agent alias> -v
```


You can obtain the certificate by exporting it with the SAP Web Dispatcher. For more information, see SAP Note [2009483](#).

4. Validate the agent certificate Entry type by running the following command to verify this before moving on to the next steps.

In the Data Provisioning keystore, the entry for the agent alias when the keystore is created should be of Entry type: PrivateKeyEntry.

```
<DPAgent_root>/sapjvm/bin/keytool -list -keystore <DPAgent_root>/ssl<your keystore> -storepass changeit -v
```

The `Entry` type parameter should return a value of "PrivateKeyEntry". If this value is not returned, something is wrong with the agent entry. One possibility is that the keytool from the os was used

5. Use either the SAP HANA command-line tool (`sapgenpse`) or the Web Dispatcher user interface to import the signed agent certificate. On SAP HANA, add the signed agent certificate to the `sapcli` Personal Security Environment (PSE). For more information about Web Dispatcher, see SAP Note [2009483](#)
  - a. Back up `sapcli.pse`

```
mv sapcli.pse sapcli.pse.old
```

#### Note

Use `sapcli.pse`, and not `sapsrv.pse` trust store, which will be used for client authentication.

- b. Generate a new PSE file. After this file (`<server_certificate_name>.pem`) is created, get it signed by the CA.

```
sapgenpse get_pse -p sapcli.pse -x <your pin> -r <server cert name>.pem "CN=...,OU=..., O=..., C=..."
```

- c. Import the `<signed_server_certificate_name>.pse` file.

```
sapgenpse import_own_cert -c <signed server cert> -p sapcli.pse -x <your pin> -r <CA cert> -r <intermediate cert> -v
```

- d. Import the signed agent certificate into the PSE file.

```
sapgenpse maintain_pk -a <your signed agent cert> -p sapcli.pse -x <your pin>
```

- e. In SAP HANA, enable SSL logon for a HANA user:

```
sapgenpse seclogin -p sapcli.pse -x <your pin> -O <HANA ADM User>
```

6. Register a new agent with SSL enabled.
  - a. Run the `agentcli` tool with the `-configAgent` option. (`agentcli.sh -configAgent (Linux)/agentcli.bat -configAgent (Windows)`)
    1. Arrive at main menu go to Select SSL Keystores & Settings option.
    2. Select Configure Framework Keystore option and enter values for keystore path, keystore password, confirm keystore password.
    3. Select Configure Adapters Truststore option and enter values for adapters truststore path, adapters truststore type, adapters truststore password, confirm adapters truststore password.
    4. Select Configure Adapters Keystore option and enter vales for adapters keystore path, adapters keystore type, adapters keystore password, confirm adapters keystore password.
    5. Select Turn SSL on/off for Agent (for TCP connection) option and enter value true for Use SSL for HANA-to-Agent communication over TCP.
    6. Return to main menu go to Start or Stop Agent option.
    7. Select Stop Agent option.
    8. Select Start Agent option.
    9. Return to main menu go to SAP HANA Connection option.

10. Select Connect to SAP HANA on Premise (TCP) option and enter values for hostname, port number, agent admin HANA user, agent admin HANA user password, confirm agent admin HANA user password.
11. Return to main menu go to Agent Registration option.
12. Select Register Agent option and enter values for agent name, agent host name. Agent should be successfully registered. We can also go to HANA studio and run "select \* from agents" and the column IS\_SSL\_ENABLED should be true.

## Next Steps

If you require stronger encryption than 128-bit key length, update the existing JCE policy files.

## Related Information

[Register a New SSL-Enabled Data Provisioning Agent \[page 604\]](#)

[Start the Agent Configuration Tool \[page 40\]](#)

[Register the Agent with SAP HANA \[page 64\]](#)

[SAP Note 2009483](#) 

[Update JCE Policy Files for Stronger Encryption \[page 613\]](#)

## 7.2.4 Register a New SSL-Enabled Data Provisioning Agent

Specify connection information, user credentials, and SSL configuration information (using the Data Provisioning Agent configuration tool) when the SAP HANA system is located on-premise and requires a secure SSL connection.

### Prerequisites

- Before you can configure the Data Provisioning Agent to use SSL with SAP HANA on-premise, you must obtain the SSL certificates and import them to both the agent host machine and the SAP HANA system. See [Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#) for more information.
- The Agent Admin HANA User must have the following privileges:

| Action              | Role or Privilege               |
|---------------------|---------------------------------|
| Connect to SAP HANA | System privilege: AGENT ADMIN   |
|                     | System privilege: ADAPTER ADMIN |

## Procedure

1. Navigate to the `<DPAgent_root>/configTool` directory.
2. Run the `agentcli` tool with `-configAgent` option.
  - `agentcli.sh --configAgent` (Linux)
  - `agentcli.bat -configAgent` (Windows)
3. At the main menu, select the *Select SSL Keystores & Settings option*.
  - a. Select the *Configure Framework Keystore*, and enter values for keystore path, keystore password, and then confirm the keystore password.
  - b. Select *Configure Adapters Truststore* option, and enter values for the adapters truststore path, adapters truststore type, adapters truststore password, and confirm the adapters truststore password.
  - c. Select *Configure Adapters Keystore*, and enter values for adapters keystore path, adapters keystore type, adapters keystore password, and confirm the adapters keystore password.
  - d. Select *Turn SSL on/off for Agent (for TCP connection)* option, and enter *True* for *Use SSL for HANA-to-Agent communication over TCP*.
4. Return to the main menu, and select the *Start or Stop Agent* option.
5. Select the *Stop Agent* option, then select the *Start Agent* option.
6. Return to the main menu, and select the *SAP HANA Connection* option.
7. Select the *Connect to SAP HANA on Premise (TCP)* option, and enter values for hostname, port number, agent admin HANA user, agent admin HANA user password, and then confirm the agent admin HANA user password.
8. Return to the main menu, and select the *Agent Registration* option.
9. Select the *Register Agent* option, and enter values for agent name, agent host name. At this point, the Data Provisioning Agent should be successfully registered.
10. In SAP HANA studio, run `select * from agents`, and the column *IS\_SSL\_ENABLED* should be "true".

## Related Information

[Default Installation Paths](#)

[Assign Roles and Privileges \[page 21\]](#)

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

[Configure the Adapter Truststore and Keystore \[page 607\]](#)

## 7.2.5 Enable SSL on an Existing Data Provisioning Agent

If you have an existing Data Provisioning that is not enabled for SSL, you can run the command line tool to configure the agent for SSL.

### Prerequisites

- You need the password for the keytool Java program to generate a keystore and import a HANA certificate. You can find the password, commands, and the instructions in the `keytool.txt` file at `<DPAgent_root>\ssl\keytool.txt`.  
Change the default password of the keystore to safeguard your certificates.
- Stop any remote subscriptions before you make this change, and then restart them after the agent is restarted..

### Procedure

1. Navigate to the `<DPAgent_root>/configTool` directory.
2. Run the `agentcli` tool with `-configAgent` option.
  - `agentcli.sh --configAgent` (Linux)
  - `agentcli.bat -configAgent` (Windows)
3. At the main menu, select the *Select SSL Keystores & Settings option*.
  - a. Select the *Configure Framework Keystore*, and enter values for keystore path, keystore password, and then confirm the keystore password.
  - b. Select *Configure Adapters Truststore* option, and enter values for the adapters truststore path, adapters truststore type, adapters truststore password, and confirm the adapters truststore password.
  - c. Select *Configure Adapters Keystore*, and enter values for adapters keystore path, adapters keystore type, adapters keystore password, and confirm the adapters keystore password.
  - d. Select *Turn SSL on/off for Agent (for TCP connection)* option, and enter *True* for *Use SSL for HANA-to-Agent communication over TCP*.
4. Return to the main menu, and select the *Start or Stop Agent* option.
5. Select the *Stop Agent* option, then select the *Start Agent* option.
6. In SAP HANA studio, run the following command:

```
alter agent "<your agent name>" enable ssl;  
select * from agents;
```

The column `IS_SSL_ENABLED` should be "true".

## 7.2.6 Disable SSL on an Existing Data Provisioning Agent

If you have an existing Data Provisioning that is enabled for SSL, you can run the command line tool to disable SSL on the agent.

### Prerequisites

Stop any remote subscriptions before you make this change, and then restart them after the agent is restarted.

### Procedure

1. Navigate to the `<DPAgent_root>/configTool` directory.
2. Run the `agentcli` tool with `-configAgent` option.
  - `agentcli.sh --configAgent` (Linux)
  - `agentcli.bat -configAgent` (Windows)
3. At the main menu, select the *Select SSL Keystores & Settings option*.
4. Select *Turn SSL on/off for Agent (for TCP connection)* option, and enter *false* for *Use SSL for HANA-to-Agent communication over TCP*.
5. Return to the main menu, and select the *Start or Stop Agent* option.
6. Select the *Stop Agent* option, then select the *Start Agent* option.
7. In SAP HANA studio, run the following command:

```
alter agent "<your agent name>" disable ssl;
select * from agents;
```

The column `IS_SSL_ENABLED` should be "false".

## 7.2.7 Configure the Adapter Truststore and Keystore

The Data Provisioning Agent uses certificates stored in the adapter truststore and adapter keystore to manage SSL connections to adapter-based remote sources. The adapter truststore contains the public keys and Certificate Authority (CA) certificates for the remote sources, while the adapter keystore contains private keys used for client authentication.

### Context

Configure the location, type, and password for both the adapter truststore and the adapter keystore with the Data Provisioning Agent configuration tool.

## Procedure

1. Start the agent configuration tool.
2. Choose *Select SSL Keystores & Settings*.
3. Choose *Configure Adapters Truststore* and enter the path, type, and password for the adapter truststore.

### Note

By default, both the adapter truststore and the adapter keystore use the same settings:

- For all "...Path" settings, enter `<DPAgent_root>/ssl/cacerts`
- For all "...Type" settings, enter `JKS`
- For the password, enter the default password `changeit`.

### Tip

Use the Java keytool to change the default password to safeguard your certificates.

4. Choose *Configure Adapters Keystore* and enter the path, type, and password for the adapter keystore.

### Note

By default, both the adapter truststore and the adapter keystore use the same settings:

- For all "...Path" settings, enter `<DPAgent_root>/ssl/cacerts`
- For all "...Type" settings, enter `JKS`
- For the password, enter the default password `changeit`.

### Tip

Use the Java keytool to change the default password to safeguard your certificates.

5. If you are using SAP HANA on-premise, choose *Turn SSL on/off for Agent (for TCP connection)* and enter `true` for *Use SSL for HANA to Agent communication over TCP*
6. Stop and restart the Data Provisioning Agent service.

## Next Steps

Use the Java keytool to import remote source CA certificates into the adapter truststore.

For example:

```
keytool -importcert -alias <source_name> -keystore <path_to_truststore>
-storepass <password> -file <path_to_certificate>
```

By default, keytool is located in `<DPAgent_root>/sapjvm/bin`.



## Related Information

[Start the Agent Configuration Tool \[page 40\]](#)

[Manage the Agent Service \[page 63\]](#)

## 7.2.8 Enable Data Provisioning Agent Support for SAP HANA Property `sslEnforce=true`

You can change the connection settings or certificates used by the Data Provisioning Agent Configuration tool to connect to the SAP HANA server.

### Context

By default, the Data Provisioning Agent Configuration tool does not validate the SAP HANA server against a certificate stored in the agent truststore when connecting with SSL.

If you want to change the default behavior, advanced properties can be added to the `dpagentconfig.ini` file for your agent:

Table 68: JDBC SSL properties for `dpagentconfig.ini`

| Property                              | Type    | Default                                                                                                    | Description                                          |
|---------------------------------------|---------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| <code>jdbc.encrypt</code>             | boolean | false (when <code>sslEnforce</code> is turned off)<br><br>true (when <code>sslEnforce</code> is turned on) | Enables or disables TLS/SSL encryption               |
| <code>jdbc.validateCertificate</code> | boolean | false                                                                                                      | Specifies whether to validate the server certificate |

| Property                   | Type   | Default | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------|--------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| jdbc.hostNameInCertificate | string | *       | <p>Host name used to verify the server identity (CN value in certificate)</p> <p>The specified host name is used to verify the identity of the server instead of the host name with which the connection was established.</p> <p>For example, in a single-host system, if a connection is established from a client on the same host as the server, a mismatch would arise between the host named in the certificate (actual host name) and the host used to establish the connection (localhost).</p> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>If you specify <i>*</i> as the host name, this parameter has no effect. Other wildcards are not permitted.</p> </div> |

For example, to validate against a trusted certificate:

## Procedure

1. Add the advanced properties to the `dpagentconfig.ini` file for your agent.

```
jdbc.encrypt=true
jdbc.hostNameInCertificate=*
jdbc.validateCertificate=true
```

2. From the SAP HANA server, export the public certificate.
 

```
sapgenpse export_own_cert -p sapsrv.pse -o server_jdbc_pubkey.cer
```
3. Copy the certificate to a location that can be reached from the agent host machine.
4. Use the command-line agent configuration tool to import the server certificate into the agent truststore.

On Windows: `agentcli.bat --configAgentKeystore`

On Linux: `agentcli.sh --configAgentKeystore`

You can also use the `keytool` to import the certificate.

```
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore <DPAgent_root>/ssl/
<KEYSTORE> -storepass <KEYSTORE PASSWORD> -file <PATH TO EXPORTED CERT>
-noprompt -alias <ALIAS>
```

5. Restart the Data Provisioning Agent.

## 7.2.9 Troubleshoot the SSL Configuration

If the configuration process does not succeed due to misconfiguration, unopen ports, or other settings, you can try these troubleshooting steps.

- View the errors in the `log/framework_alert.trc` files.
- Verify that in the `dpagentconfig.ini` file, the `framework.enableSSL` parameter is set to true.
- Restart the Data Provisioning Agent and run the following command from SAP HANA: `ALTER AGENT "" ENABLE SSL.`
- Disable the SSL by setting `framework.enableSSL=false`. Restart the agent, then run `ALTER AGENT "" DISABLE SSL.` Check whether the communication is working. If it is working, then the input might not have been correct.
- To restart from the beginning, remove the `ssl/cacerts` and rename `cacerts.bak` to `cacerts`. Remove all `*.cer` and `*.pem` files. Similarly, on the SAP HANA side, remove the `sapcli.pse` file and all `*.cer` and `*.pem` files and perform the setup again.
- If you get a “Cipher suite not found” error, or something similar, be sure to update the JCE policy files. See [Update JCE Policy Files for Stronger Encryption \[page 613\]](#) for more information.

### Check the Agent Certificate Entry Type

In the Data Provisioning agent keystore, the entry for the agent certificate alias when the keystore is created should be of Entry type: PrivateKeyEntry. Run the command below to verify..

```
<DPAgent_root>/sapjvm/bin/keytool -list -keystore <DPAgent_root>/ssl<your keystore> -storepass  
changeit -v
```

Keystore provider: SUN

Keystore type: JKS

Alias name: agent\_cert (if “agent\_cert” was used as the alias name)

Creation date: Apr 30, 2019

Entry type: PrivateKeyEntry (If PrivateKeyEntry is not the value, something is wrong with the agent entry. One possibility is that the keytool from the OS was used.

## 7.2.10 Disable Revealing Certificate Information When Using an OpenSSL Client

If you use an OpenSSL, you can hide SSL certificate information.

### Procedure

1. Open `<DPAgent_root>/sapjvm/lib/security/java.security`.

Edit the following property by adding "TLSv1.1" to be disabled:

```
jdk.tls.disabledAlgorithms=SSLv3, RC4, DES, MD5withRSA, DH keySize < 1024, \ EC
keySize < 224, 3DES_EDE_CBC, anon, TLSv1.1
```

2. Restart the Data Provisioning Agent.
3. Rerun the OpenSSL command:

```
openssl s_client -connect llbpalbl05.pal.sap.corp:9872 -tls1_1 -servername
llbpalbl05.pal.sap.corp -CAfile /usr/sap/agent72/ssl/CA_Cert.pem
```

### Results

Now, the certificate information is blocked after the OpenSSL connection occurs.

```
CONNECTED(00000003)
139808563586704:error:1408F10B:SSL routines:SSL3_GET_RECORD:wrong version
number:s3_pkt.c:340:
---
no peer certificate available
---
No client certificate CA names sent
---
SSL handshake has read 5 bytes and written 7 bytes
---
New, (NONE), Cipher is (NONE)
Secure Renegotiation IS NOT supported
Compression: NONE
Expansion: NONE
SSL-Session:
    Protocol  : TLSv1.1
    Cipher    : 0000
    Session-ID:
    Session-ID-ctx:
    Master-Key:
    Key-Arg   : None
    PSK identity: None
    PSK identity hint: None
    SRP username: None
    Start Time: 1573880690
    Timeout   : 7200 (sec)
    Verify return code: 0 (ok)
```

## 7.3 Update JCE Policy Files for Stronger Encryption

If you require stronger encryption for Kerberos or TLS/SSL implementations, you may need to update the existing Java Cryptography Extension (JCE) policy files.

### Context

Some TLS/SSL implementations, such as the connections between the Data Provisioning Agent and SAP HANA and other remote sources, and Kerberos implementations require stronger encryption than what the SAP JVM provides. If you require more than 128-bit key length encryption, update your JCE policy files to the latest Oracle JCE policy files, which you can find on the Oracle download Web site.

### Procedure

1. Navigate to `<DPAgent_root>/sapjvm/lib/security`, and backup the `local_policy.jar` and `US_export_policy.jar` files before you update the files, in case you need to restore the Data Provisioning Agent to its original state.
2. Download the latest Oracle JCE library ZIP file.
3. Unzip the downloaded ZIP file, and copy the `local_policy.jar` and `US_export_policy.jar` files to `<DPAgent_root>/sapjvm/lib/security`.
4. Restart the Data Provisioning Agent.

### Related Information

[Authentication \[page 589\]](#)

## 7.4 Authorizations

SAP HANA smart data integration adds entities that are stored as catalog objects in the SAP HANA database.

Catalog objects such as adapters and remote subscriptions follow standard SAP HANA database security concepts. That is, they follow standard processes for metadata management, system views, public views, authorizations, and so on.

In addition to the privileges supported by the GRANT statement in the *SAP HANA SQL and System Views Reference*, the following privileges are relevant to SAP HANA smart data integration and its associated catalog objects:

## System Privileges

| System Privilege | Privilege Purpose                                                                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ADAPTER ADMIN    | Controls the execution of the following adapter-related commands: CREATE ADAPTER, DROP ADAPTER and ALTER ADAPTER. Also allows access to ADAPTERS and ADAPTER_LOCATIONS system views. |
| AGENT ADMIN      | Controls the execution of the following agent-related commands: CREATE AGENT, DROP AGENT and ALTER AGENT. Also allows access to AGENTS and ADAPTER_LOCATIONS system views.           |

## Source Privileges

| Source Privilege                      | Privilege Purpose                                                                                                                                                                                            |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CREATE REMOTE SUBSCRIPTION            | This privilege allows the creation of remote subscriptions executed on this source entry. Remote subscriptions are created in a schema and point to a virtual table or SQL on tables to capture change data. |
| PROCESS REMOTE SUBSCRIPTION EXCEPTION | This privilege allows processing exceptions on this source entry. Exceptions that are relevant for all remote subscriptions are created for a remote source entry.                                           |

## Object Privileges

| Object Privilege                      | Privilege Purpose                                                                                            | Command Types |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------|---------------|
| AGENT MESSAGING                       | Authorizes the user with which the agent communicates with the data provisioning server using HTTP protocol. | DDL           |
| PROCESS REMOTE SUBSCRIPTION EXCEPTION | Authorizes processing exceptions of a remote subscription.                                                   | DDL           |

## Related Information

[Activating and Executing Task Flowgraphs and Replication Tasks \[page 615\]](#)

[SAP HANA Security Guide](#)

[SAP HANA SQL and System Views Reference](#)

## 7.4.1 Activating and Executing Task Flowgraphs and Replication Tasks

\_SYS\_REPO requires additional object or schema authorizations to activate and execute objects such as task flowgraphs and replication tasks.

To activate and execute these objects, \_SYS\_REPO requires the following authorizations:

- For any input sources: `SELECT`
- For any output sources: `INSERT`, `UPDATE`, and `DELETE`
- For any stored procedures or Application Function Library: `EXECUTE`
- For any sequences: `SELECT`

For example, the following statement grants all necessary authorizations to \_SYS\_REPO on a specific schema:

```
GRANT SELECT, INSERT, UPDATE, DELETE, EXECUTE  
ON SCHEMA "<schema_name>" TO _SYS_REPO WITH GRANT OPTION;
```

### Related Information

[Assign Roles and Privileges \[page 21\]](#)

## 7.5 Communication Channel Security

Communication channel security between SAP HANA and adapters hosted by the Data Provisioning Agent depends on the SAP HANA deployment.

Additional components added to the SAP HANA landscape by SAP HANA Smart Data Integration and SAP HANA smart data quality require security considerations in addition to the information described in the *SAP HANA Security Guide*.

### SAP HANA On-Premise

When SAP HANA and the Data Provisioning Agent are both installed on-premise, or locally in relation to each other, communication is performed using TCP/IP encrypted with SSL.

The Data Provisioning Server connects to a port listened to by the agent. The agent generates a key pair and stores its public certificate in SAP HANA. The Data Provisioning Server then uses this public certificate to perform SSL server authentication when connecting to the agent.

#### Caution

Passwords for remote systems accessed by adapters are sent in plain text over this communication channel. Therefore, encryption is mandatory.

## SAP HANA service for SAP BTP, Neo Environment

When you use the SAP HANA service for SAP BTP, Neo Environment, or a firewall exists between SAP HANA and the Data Provisioning Agent, the agent connects to SAP HANA using a proxy XS application. The proxy performs authentication and authorization before passing messages to or from the Data Provisioning Server.

The agent can connect using the user name and password scheme supported by SAP HANA XS applications.

### Related Information

[SAP HANA Security Guide](#)

[Architecture and Connections \[page 8\]](#)

[Configure SSL for SAP HANA On-Premise \[Manual Steps\] \[page 601\]](#)

## 7.6 Auditing Activity on SAP HANA Smart Data Integration Objects

Auditing provides you with visibility on who did what in the SAP HANA database (or tried to do what) and when.

Actions performed on SAP HANA smart data integration objects can be audited using the standard auditing tools and processes described in the *SAP HANA Security Guide*.

In addition to the audit actions listed in the *SAP HANA SQL and System Views Reference*, the following audit actions are available:

| Audit Action Name          | Group Number | Audit Operation                                          |
|----------------------------|--------------|----------------------------------------------------------|
| CREATE AGENT               | 17           | Registering a Data Provisioning Agent                    |
| ALTER AGENT                | 17           | Altering a Data Provisioning Agent's registration        |
| DROP AGENT                 | 17           | Dropping a Data Provisioning Agent registration          |
| CREATE ADAPTER             | 17           | Registering a Data Provisioning Adapter                  |
| ALTER ADAPTER              | 17           | Altering the registration of a Data Provisioning Adapter |
| DROP ADAPTER               | 17           | Dropping the registration of a Data Provisioning Adapter |
| CREATE REMOTE SUBSCRIPTION | 17           | Creating a subscription to a remote source               |
| ALTER REMOTE SUBSCRIPTION  | 17           | Altering a subscription to a remote source               |



| Audit Action Name                     | Group Number | Audit Operation                                            |
|---------------------------------------|--------------|------------------------------------------------------------|
| DROP REMOTE SUBSCRIPTION              | 17           | Dropping a subscription to a remote source                 |
| PROCESS REMOTE SUBSCRIPTION EXCEPTION | 17           | Processing exceptions raised by a subscribed remote source |

## Related Information

[SAP HANA Security Guide](#)

[SAP HANA SQL and System Views Reference](#)

## 7.7 Data Protection and Privacy in SAP HANA Smart Data Integration and SAP HANA Smart Data Quality

SAP HANA provides the technical enablement and infrastructure to allow you to run applications on SAP HANA to conform to the legal requirements of data protection in the different scenarios in which SAP HANA is used.

SAP HANA smart data integration and SAP HANA smart data quality are applications based on SAP HANA, and they rely on SAP HANA as the platform for security and data protection. For information about how SAP HANA provides and enables data protection, see the *SAP HANA Security Guide*.

## Related Information

[Data Protection and Privacy in SAP HANA](#)

# 8 SQL and System Views Reference for Smart Data Integration and Smart Data Quality

This section contains information about SQL syntax and system views that can be used in SAP HANA smart data integration and SAP HANA smart data quality.

For complete information about all SQL statements and system views for SAP HANA and other SAP HANA contexts, see the *SAP HANA SQL and System Views Reference*.

For information about the capabilities available for your license and installation scenario, refer to the Feature Scope Description (FSD) for your specific SAP HANA version on the [SAP HANA Platform](#) page.

## [SQL Functions \[page 618\]](#)

Documents the built-in SQL functions that are provided with SAP HANA smart data integration and SAP HANA smart data quality.

## [SQL Statements \[page 619\]](#)

SAP HANA smart data integration and SAP HANA smart data quality support many SQL statements to allow you to do such tasks as create agents and adapters, administer your system, and so on.

## [System Views \[page 658\]](#)

System views allow you to query for various information about the system state using SQL commands. The results appear as tables.

## Related Information

[SAP HANA SQL and System Views Reference](#)

## 8.1 SQL Functions

Documents the built-in SQL functions that are provided with SAP HANA smart data integration and SAP HANA smart data quality.

### [SESSION\\_CONTEXT Function \[Smart Data Integration\] \[page 619\]](#)

Returns the value of session\_variable assigned to the current user.

## Related Information

## 8.1.1 SESSION\_CONTEXT Function [Smart Data Integration]

Returns the value of session\_variable assigned to the current user.

SESSION\_CONTEXT is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the SESSION\_CONTEXT topic for complete information. The information below is specific to smart data integration functionality.

### Syntax

```
SESSION_CONTEXT(<session_variable>)
```

### Description

A predefined session variables that is set by the server and is read-only (cannot be SET or UNSET) is 'TASK\_EXECUTION\_ID'.

### Related Information

[SESSION\\_CONTEXT Function \(Miscellaneous\) \(SAP HANA SQL and System Views Reference\)](#)

## 8.2 SQL Statements

SAP HANA smart data integration and SAP HANA smart data quality support many SQL statements to allow you to do such tasks as create agents and adapters, administer your system, and so on.

#### [ALTER ADAPTER Statement \[Smart Data Integration\] \[page 621\]](#)

The ALTER ADAPTER statement alters an adapter. Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

#### [ALTER AGENT Statement \[Smart Data Integration\] \[page 622\]](#)

The ALTER AGENT statement changes an agent's host name and/or port and SSL property if it uses the TCP protocol. It can also assign an agent to an agent group.

#### [ALTER REMOTE SOURCE Statement \[Smart Data Integration\] \[page 624\]](#)

The ALTER REMOTE SOURCE statement modifies the configuration of an external data source connected to the SAP HANA database.

#### [ALTER REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 628\]](#)

The ALTER REMOTE SUBSCRIPTION statement allows the QUEUE command to initiate real-time data processing, and the DISTRIBUTE command applies the changes.

#### [CANCEL TASK Statement \[Smart Data Integration\] \[page 629\]](#)

Cancels a task that was started with START TASK.

#### [CREATE ADAPTER Statement \[Smart Data Integration\] \[page 631\]](#)

The CREATE ADAPTER statement creates an adapter that is deployed at the specified location.

#### [CREATE AGENT Statement \[Smart Data Integration\] \[page 633\]](#)

The CREATE AGENT statement registers connection properties of an agent that is installed on another host.

#### [CREATE AGENT GROUP Statement \[Smart Data Integration\] \[page 635\]](#)

The CREATE AGENT GROUP statement creates an agent clustering group to which individual agents can be assigned.

#### [CREATE AUDIT POLICY Statement \[Smart Data Integration\] \[page 636\]](#)

The CREATE AUDIT POLICY statement creates a new audit policy, which can then be enabled and cause the specified audit actions to occur.

#### [CREATE REMOTE SOURCE Statement \[Smart Data Integration\] \[page 638\]](#)

The CREATE REMOTE SOURCE statement defines an external data source connected to SAP HANA database.

#### [CREATE REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 639\]](#)

The CREATE REMOTE SUBSCRIPTION statement creates a remote subscription in SAP HANA to capture changes specified on the entire virtual table or part of a virtual table using a subquery.

#### [CREATE VIRTUAL PROCEDURE Statement \[Smart Data Integration\] \[page 645\]](#)

Creates a virtual procedure using the specified programming language that allows execution of the procedure body at the specified remote source.

#### [DROP ADAPTER Statement \[Smart Data Integration\] \[page 647\]](#)

The DROP ADAPTER statement removes an adapter from all locations.

#### [DROP AGENT Statement \[Smart Data Integration\] \[page 648\]](#)

The DROP AGENT statement removes an agent.

#### [DROP AGENT GROUP Statement \[Smart Data Integration\] \[page 649\]](#)

The DROP AGENT GROUP statement removes an agent clustering group.

#### [DROP REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 650\]](#)

The DROP REMOTE SUBSCRIPTION statement drops an existing remote subscription.

#### [GRANT Statement \[Smart Data Integration\] \[page 651\]](#)

GRANT is used to grant privileges and structured privileges to users and roles. GRANT is also used to grant roles to users and other roles.

#### [PROCESS REMOTE SUBSCRIPTION EXCEPTION Statement \[Smart Data Integration\] \[page 653\]](#)

The PROCESS REMOTE SUBSCRIPTION EXCEPTION statement allows the user to indicate how an exception should be processed.

#### [START TASK Statement \[Smart Data Integration\] \[page 654\]](#)

Starts a task.

## Related Information

[SQL Reference for Additional SAP HANA Contexts \(SAP HANA SQL and System Views Reference\)](#)

## 8.2.1 ALTER ADAPTER Statement [Smart Data Integration]

The ALTER ADAPTER statement alters an adapter. Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

### Syntax

```
ALTER ADAPTER <adapter_name> [PROPERTIES <properties>]  
| {ADD | REMOVE} LOCATION {DPSEVER | AGENT <agent_name>}  
| REFRESH AT LOCATION {DPSEVER | AGENT <agent_name>}
```

### Syntax Elements

#### <adapter\_name>

The name of the adapter to be altered.

```
<adapter_name> ::= <identifier>
```

#### <agent\_name>

The agent name if the adapter is set up on the agent.

```
<agent_name> ::= <identifier>
```

#### <properties>

The optional properties of the adapter, such as display\_name. If display\_name is not specified, then adapter\_name appears in the user interface.

```
<properties> ::= <string_literal>
```

### Description

The ALTER ADAPTER statement alters an adapter. Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

### Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

System privilege: ADAPTER ADMIN

## Examples

### Add or remove an existing adapter at agent or Data Provisioning Server

Create two agents and an adapter at the first agent:

```
CREATE AGENT TEST_AGENT_1 PROTOCOL 'TCP' HOST 'test_host1'
PORT 5050;
CREATE AGENT TEST_AGENT_2 PROTOCOL 'HTTP';
CREATE ADAPTER TEST_ADAPTER AT LOCATION AGENT TEST_AGENT_1;
```

Add an existing adapter TEST\_ADAPTER to agent TEST\_AGENT\_2:

```
ALTER ADAPTER TEST_ADAPTER ADD LOCATION AGENT TEST_AGENT_2;
```

Remove an existing adapter TEST\_ADAPTER from agent TEST\_AGENT\_2:

```
ALTER ADAPTER TEST_ADAPTER REMOVE LOCATION AGENT
TEST_AGENT_2;
```

Add an existing adapter TEST\_ADAPTER at the Data Provisioning Server:

```
ALTER ADAPTER TEST_ADAPTER ADD LOCATION DPSEVER;
```

Remove an existing adapter TEST\_ADAPTER at Data Provisioning Server:

```
ALTER ADAPTER TEST_ADAPTER REMOVE LOCATION DPSEVER;
```

### Refresh configuration and query optimization capabilities of an adapter

Read configuration and query optimization capabilities of an adapter from the adapter setup at the agent or Data Provisioning Server:

```
ALTER ADAPTER TEST_ADAPTER REFRESH AT LOCATION DPSEVER;
ALTER ADAPTER TEST_ADAPTER REFRESH AT LOCATION AGENT
TEST_AGENT_2;
```

### Update display name property of an adapter

Change display name for an adapter to 'My Custom Adapter':

```
ALTER ADAPTER TEST_ADAPTER PROPERTIES 'display_name=My
Custom Adapter';
```

## 8.2.2 ALTER AGENT Statement [Smart Data Integration]

The ALTER AGENT statement changes an agent's host name and/or port and SSL property if it uses the TCP protocol. It can also assign an agent to an agent group.

### Syntax

```
ALTER AGENT <agent_name>
HOST <agent_hostname> [ PORT <agent_port_number> ] [ { ENABLE | DISABLE } SSL ]
```

```
| PORT <agent_port_number> [ {ENABLE | DISABLE} SSL ]  
| [ {ENABLE | DISABLE} SSL ]  
| { SET | UNSET } AGENT GROUP <agent_group_name>
```

## Syntax Elements

### <agent\_name>

The name of the agent to be altered.

```
<agent_name> ::= <identifier>
```

### <agent\_hostname>

The name of the agent host.

```
<agent_hostname> ::= <string_literal>
```

### <agent\_port\_number>

Specifies whether the agent's TCP listener on the specified port uses SSL.

```
<agent_port_number> ::= <integer_literal> {ENABLE | DISABLE}  
SSL
```

### <agent\_group\_name>

The name of the agent clustering group to which the agent should be attached.

```
<agent_group_name> ::= <identifier>
```

## Description

The ALTER AGENT statement changes an agent's host name and/or port if it uses the TCP protocol. It can also assign an agent to an agent group.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::AlterAgent

System privilege: AGENT ADMIN

## Examples

- Alter TEST\_AGENT's hostname to test\_host and port to 5051, if it uses TCP protocol:

```
ALTER AGENT TEST_AGENT HOST 'test_host' PORT 5051;
```

- Alter TEST\_AGENT's hostname to test\_host, if it uses TCP protocol:

```
ALTER AGENT TEST_AGENT HOST 'test_host';
```

- Alter TEST\_AGENT's port to 5051, if it uses TCP protocol:

```
ALTER AGENT TEST_AGENT PORT 5051;
```

- Assign TEST\_AGENT to agent group TEST\_GROUP:

```
ALTER AGENT TEST_AGENT SET AGENT GROUP TEST_GROUP;
```

- Remove TEST\_AGENT from agent group TEST\_GROUP:

```
ALTER AGENT TEST_AGENT UNSET AGENT GROUP TEST_GROUP;
```

## 8.2.3 ALTER REMOTE SOURCE Statement [Smart Data Integration]

The ALTER REMOTE SOURCE statement modifies the configuration of an external data source connected to the SAP HANA database.

The ALTER REMOTE SOURCE SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the ALTER REMOTE SOURCE topic for complete information. This information is specific to smart data integration functionality.

### Syntax

```
ALTER REMOTE SOURCE <remote_source_name> <adapter_clause> [<credential_clause>]
| { SUSPEND | RESUME } { CAPTURE | DISTRIBUTION }
| { CLEAR OBJECTS | REFRESH OBJECTS | CANCEL REFRESH OBJECTS }
| START LATENCY MONITORING <latency_ticket_name> [ INTERVAL
<interval_in_seconds> ]
| STOP LATENCY MONITORING <latency_ticket_name>
| CLEAR LATENCY HISTORY [ <latency_ticket_name> ]
```

### Syntax Elements

Syntax elements specific to smart data integration are described as follows. For information about syntax elements that aren't specific to smart data integration, refer to the ALTER REMOTE SOURCE topic.



## <adapter\_clause>

Adapter configuration.

```
<adapter_clause> ::= [ADAPTER <adapter_name>
[AT LOCATION { DPSEVER | AGENT <agent_name> | AGENT GROUP
<agent_group_name>}] <configuration_clause>]
```

```
<agent_name> ::= <identifier>
<agent_group_name> ::= <identifier>
```

```
<configuration_clause> ::= CONFIGURATION
'<configuration_xml_string>'
```

The <configuration\_xml\_string> is the XML-formatted configuration string for the remote source.

Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

## { SUSPEND | RESUME } { CAPTURE | DISTRIBUTION }

|                                                                            |                                                                                                                                                                                         |
|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ALTER REMOTE SOURCE SUSPEND CAPTURE</b>                                 | Suspends the adapter and agent from reading any more changes from source system. This is helpful when the source system or SAP HANA is preparing for planned maintenance or an upgrade. |
| <b>ALTER REMOTE SOURCE &lt;remote_source_name&gt; RESUME CAPTURE</b>       | Resumes the suspended adapter to read changed data from source system.                                                                                                                  |
| <b>ALTER REMOTE SOURCE &lt;remote_source_name&gt; SUSPEND DISTRIBUTION</b> | Suspends the application of real-time changes in SAP HANA tables but collects changed data from the source system.                                                                      |
| <b>ALTER REMOTE SOURCE &lt;remote_source_name&gt; RESUME DISTRIBUTION</b>  | Resumes applying real-time changes in SAP HANA tables.                                                                                                                                  |

## { CLEAR OBJECTS | REFRESH OBJECTS | CANCEL REFRESH OBJECTS }

|                                                                              |                                                                                                                                                                               |
|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ALTER REMOTE SOURCE &lt;remote_source_name&gt; CLEAR OBJECTS</b>          | Clears all the data received from the adapter for this remote source from HANA tables.                                                                                        |
| <b>ALTER REMOTE SOURCE &lt;remote_source_name&gt; REFRESH OBJECTS</b>        | Starts building HANA dictionary tables that contain remote source objects.                                                                                                    |
| <b>ALTER REMOTE SOURCE &lt;remote_source_name&gt; CANCEL REFRESH OBJECTS</b> | Cancels the long-running REFRESH background operation. This stops fetching records from the adapter but keeps the data received so far from the remote source on HANA tables. |

**ALTER REMOTE SOURCE <remote\_source\_name> START LATENCY MONITORING <ticket\_name>**

Starts the collection of latency statistics one time or at regular intervals. The user specifies a target latency ticket in the monitoring view.

**ALTER REMOTE SOURCE <remote\_source\_name> STOP LATENCY MONITORING <ticket\_name>**

Stops the collection of latency statistics into the given latency ticket.

**ALTER REMOTE SOURCE <remote\_source\_name> CLEAR LATENCY HISTORY**

Clears the latency statistics (for either one latency ticket, or for the whole remote source, from the monitoring view.

## Description

The ALTER REMOTE SOURCE statement modifies the configuration of an external data source connected to the SAP HANA database. Only database users with the object privilege ALTER for remote sources or the system privilege DATA ADMIN may alter remote sources.

### Note

You may not change a user name while a remote source is suspended.

## Permissions

This statement requires the ALTER object privilege on the remote source.

## Examples

```
ALTER REMOTE SOURCE "odata_nw" ADAPTER "ODataAdapter"  
AT LOCATION DPSEVER  
CONFIGURATION '<?xml version="1.0" encoding="UTF-8" standalone="yes"?>  
<ConnectionProperties name="connection_properties">  
<PropertyEntry name="URL">http://services.odata.org/Northwind/Northwind.svc/</  
PropertyEntry>  
<PropertyEntry name="proxyserver">proxy</PropertyEntry>  
<PropertyEntry name="proxyport">8080</PropertyEntry> <PropertyEntry  
name="truststore"></PropertyEntry>  
<PropertyEntry name="supportformatquery"></PropertyEntry>  
</ConnectionProperties>' WITH CREDENTIAL TYPE 'PASSWORD'  
USING '<CredentialEntry name="password"><user></user><password></password></  
CredentialEntry>';
```

The configuration clause must be a structured XML string that defines the settings for the remote source. For example, the CONFIGURATION string in the following example configures a remote source for an Oracle database.

```
CONFIGURATION '<?xml version="1.0" encoding="UTF-8"?>  
<ConnectionProperties name="configurations">  
<PropertyGroup name="generic">
```

```

    <PropertyEntry name="instance_name">ora_inst</PropertyEntry>
    <PropertyEntry name="admin_port">12345</PropertyEntry>
    <PropertyEntry name="map_char_types_to_unicode">>false</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="database">
    <PropertyEntry name="cdb_enabled">>false</PropertyEntry>
    <PropertyEntry name="pds_use_tnsnames">>false</PropertyEntry>
    <PropertyEntry name="pds_host_name"><db_hostname></PropertyEntry>
    <PropertyEntry name="pds_port_number">1521</PropertyEntry>
    <PropertyEntry name="pds_database_name">ORCL</PropertyEntry>
    <PropertyEntry name="cdb_service_name"></PropertyEntry>
    <PropertyEntry name="pds_service_name"></PropertyEntry>
    <PropertyEntry name="pds_tns_filename"></PropertyEntry>
    <PropertyEntry name="pds_tns_connection"></PropertyEntry>
    <PropertyEntry name="cdb_tns_connection"></PropertyEntry>
    <PropertyEntry name="_pds_tns_connection_with_cdb_enabled"></
PropertyEntry>
    <PropertyEntry name="pds_byte_order"></PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="schema_alias_replacements">
    <PropertyEntry name="schema_alias"></PropertyEntry>
    <PropertyEntry name="schema_alias_replacement"></PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="security">
    <PropertyEntry name="pds_use_ssl">>false</PropertyEntry>
    <PropertyEntry name="pds_ssl_sc_dn"></PropertyEntry>
    <PropertyEntry name="_enable_ssl_client_auth">>false</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="jdbc_flags">
    <PropertyEntry name="remarksReporting">>false</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="cdc">
    <PropertyGroup name="databaseconf">
      <PropertyEntry name="pdb_timezone_file"><timezone_file></
PropertyEntry>
      <PropertyEntry name="pdb_archive_path"></PropertyEntry>
      <PropertyEntry name="pdb_supplemental_logging_level">table</
PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="parallelsca">
      <PropertyEntry name="lr_parallel_scan">>false</PropertyEntry>
      <PropertyEntry name="lr_parallel_scanner_count"></PropertyEntry>
      <PropertyEntry name="lr_parallel_scan_queue_size"></
PropertyEntry>
      <PropertyEntry name="lr_parallel_scan_range"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="logreader">
      <PropertyEntry name="skip_lr_errors">>false</PropertyEntry>
      <PropertyEntry name="lr_max_op_queue_size">1000</PropertyEntry>
      <PropertyEntry name="lr_max_scan_queue_size">1000</PropertyEntry>
      <PropertyEntry name="lr_max_session_cache_size">1000</
PropertyEntry>
      <PropertyEntry name="scan_fetch_size">10</PropertyEntry>
      <PropertyEntry name="pdb_dflt_column_repl">>true</PropertyEntry>
      <PropertyEntry name="pdb_ignore_unsupported_anydata">>false</
PropertyEntry>
      <PropertyEntry name="pds_sql_connection_pool_size">15</
PropertyEntry>
      <PropertyEntry name="pds_retry_count">5</PropertyEntry>
      <PropertyEntry name="pds_retry_timeout">10</PropertyEntry>
    </PropertyGroup>
  </PropertyGroup>
</ConnectionProperties>'

```

## Related Information

[ALTER REMOTE SOURCE Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

## 8.2.4 ALTER REMOTE SUBSCRIPTION Statement [Smart Data Integration]

The ALTER REMOTE SUBSCRIPTION statement allows the QUEUE command to initiate real-time data processing, and the DISTRIBUTE command applies the changes.

### Syntax

```
ALTER REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name>  
{ QUEUE | DISTRIBUTE | RESET }
```

### Syntax Elements

**<subscription\_name>**

The name of the remote subscription.

```
<subscription_name> ::= <identifier>
```

### Description

The ALTER REMOTE SUBSCRIPTION statement allows the QUEUE command to initiate real-time data processing, and the DISTRIBUTE command applies the changes. Typically, the initial load of data is preceded by QUEUE command. The DISTRIBUTE command is used when initial load completes. The RESET command can be used to reset the real-time process to start from the initial load again.

### Permissions

This statement requires the ALTER object privilege on the remote source.

## Example

Capture changes from a virtual table to an SAP HANA table.

```
CREATE AGENT TEST_AGENT PROTOCOL 'TCP' HOST 'test_host1' PORT 5050;
CREATE ADAPTER 'DB2ECCAdapter' AT LOCATION AGENT TEST_AGENT;
CREATE REMOTE SOURCE MYECC ADAPTER 'DB2ECCAdapter' CONFIGURATION
'<configuration_xml>' AT LOCATION AGENT TEST_AGENT;
CREATE VIRTUAL TABLE MARA_VT AT MYECC."<NULL>". "<NULL>".MARA;
CREATE COLUMN TABLE TGT_MARA LIKE MARA_VT;
CREATE REMOTE SUBSCRIPTION TEST_SUB ON MARA_VT TARGET TABLE TGT_MARA;
ALTER REMOTE SUBSCRIPTION TEST_SUB QUEUE;
```

Perform initial load of data using INSERT-SELECT or a TASK.

```
INSERT INTO TGT_MARA SELECT * FROM MARA_VT;
ALTER REMOTE SUBSCRIPTION TEST_SUB DISTRIBUTE;
```

Now insert or update a material record in ECC system and see it updated to TGT\_MARA table in SAP HANA. Reset the real-time process and restart the load.

```
ALTER REMOTE SUBSCRIPTION TEST_SUB RESET;
ALTER REMOTE SUBSCRIPTION TEST_SUB QUEUE;
```

Perform initial load of data using INSERT-SELECT or a TASK.

```
INSERT INTO TGT_MARA SELECT * FROM MARA_VT;
ALTER REMOTE SUBSCRIPTION TEST_SUB DISTRIBUTE;
```

## 8.2.5 CANCEL TASK Statement [Smart Data Integration]

Cancels a task that was started with START TASK.

### Syntax

```
CANCEL TASK <task_execution_id> [WAIT <wait_time_in_seconds>]
```

### Syntax Elements

```
<task_execution_id> ::= <unsigned_integer>
```

Specifies the task execution ID to cancel. See the START TASK topic for more information about TASK\_EXECUTION\_ID.

```
<wait_time_in_seconds> ::= <identifier>
```

Number of seconds to wait for the task to cancel before returning from the command.

## Description

Cancels a task that was started with START TASK.

The default behavior is for the CANCEL TASK command to return after sending the cancel request. Optionally, a WAIT value can be specified where the command will wait for the task to actually cancel before returning. If the command has waited the specified amount of time, then the CANCEL TASK will error out with the error code 526 (request to cancel task was sent but task did not cancel before timeout was reached).

### Note

If the WAIT value is 0, the command returns immediately after sending the cancel request, as it would if no WAIT value were entered.

## Permissions

The user that called START TASK can implicitly CANCEL; otherwise, the CATALOG READ and SESSION ADMIN roles are required.

## Examples

Assuming that a TASK performTranslation was already started using START TASK and has a task execution ID of 255, it would be cancelled using the following commands. The behavior is the same for the following two cases:

```
CANCEL TASK 255 ;
```

```
CANCEL TASK 255 WAIT 0 ;
```

Assuming that a TASK performTranslation was already started using START TASK and has a task execution id of 256 and the user wants to wait up to 5 seconds for the command to cancel, it would be cancelled using the following command:

```
CANCEL TASK 256 WAIT 5 ;
```

If the task was able to cancel within 5 seconds, the CANCEL TASK will return as a success. If it didn't cancel within 5 seconds, then the return will be the error code 526.

## SQL Script

You can call CANCEL TASK within the SQL Script CREATE PROCEDURE. Refer to the [SAP HANA SQL Script Reference](#) for complete details about CREATE PROCEDURE.

```
CREATE PROCEDURE "CANCEL_TASK"."CANCEL_MY_TASK"(in exec_id INT)
LANGUAGE SQLSCRIPT AS
BEGIN
    CANCEL TASK :exec_id;
END;
```

CANCEL TASK is not supported in:

- Table UDF
- Scalar UDF
- Trigger
- Read-only procedures

## Related Information

[START TASK Statement \[Smart Data Integration\] \[page 654\]](#)

## 8.2.6 CREATE ADAPTER Statement [Smart Data Integration]

The CREATE ADAPTER statement creates an adapter that is deployed at the specified location.

## Syntax

```
CREATE ADAPTER <adapter_name> [PROPERTIES <properties>] AT LOCATION
{DPSEVER | AGENT <agent_name>}
```

## Syntax Elements

**<adapter\_name>**

The name of the adapter to be created.

```
<adapter_name> ::= <identifier>
```

**<agent\_name>**

The agent name if the adapter is set up on the agent.

```
<agent_name> ::= <identifier>
```

#### <properties>

The optional properties of the adapter, such as display\_name. When display\_name is not specified, then adapter\_name displays in the user interface.

```
<properties> ::= <string_literal>
```

#### AT LOCATION DPSEVER

The adapter runs inside the Data Provisioning Server process in SAP HANA.

#### AT LOCATION

Specify an agent that is set up outside of SAP HANA for the adapter to run inside.

```
AT LOCATION AGENT <agent_name>
```

## Description

The CREATE ADAPTER statement creates an adapter that is deployed at the specified location. The adapter must be set up on the location prior to running this statement. When the statement is executed, the Data Provisioning Server contacts the adapter to retrieve its configuration details such as connection properties and query optimization capabilities.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::AddLocationToAdapter

System privilege: ADAPTER ADMIN

## Examples

### Create an adapter at the Data Provisioning Server

Create an adapter TEST\_ADAPTER running in the Data Provisioning Server.

```
CREATE ADAPTER TEST_ADAPTER AT LOCATION DPSEVER;
```

### Create an adapter at a specified agent

Create an agent with name TEST\_AGENT.

```
CREATE AGENT TEST_AGENT PROTOCOL 'TCP' HOST  
'test_host' PORT 5050;
```



Create an adapter TEST\_ADAPTER on agent TEST\_AGENT.

```
CREATE ADAPTER TEST_ADAPTER AT LOCATION AGENT
TEST_AGENT;
```

## 8.2.7 CREATE AGENT Statement [Smart Data Integration]

The CREATE AGENT statement registers connection properties of an agent that is installed on another host.

### Syntax

```
CREATE AGENT <agent_name> PROTOCOL {'HTTP' [HOST <agent_hostname> PORT
<agent_port_number>] | 'TCP' HOST <agent_hostname> PORT <agent_port_number>
[{'ENABLE' | 'DISABLE'} SSL]} [AGENT GROUP <agent_group_name>]
```

### Syntax Elements

#### <agent\_name>

The name of the agent to be created and its protocol.

```
<agent_name> ::= <identifier>
```

#### PROTOCOL

The protocol for the agent.

#### HTTP

Agent uses HTTP protocol for communication with DP server. Use this protocol when the SAP HANA database is on the cloud.

```
PROTOCOL 'HTTP' [HOST <agent_hostname> PORT
<agent_port_number>]
```

#### → Tip

While HOST and PORT are not mandatory when you use HTTP, we recommend that you provide them so that it is easier to distinguish between different agents that are registered.

In the M\_AGENTS monitoring view, the protocol is displayed as HTTP when the agent connects to SAP HANA using HTTP mode (when xsengine is available) or JDBC mode.

## TCP

Agent uses TCP protocol and listens on the specified port to receive requests from DP server. Use this protocol when the SAP HANA database can connect to agent's TCP port.

```
PROTOCOL 'TCP' HOST <agent_hostname> PORT  
<agent_port_number>
```

```
<agent_hostname> ::= <string_literal>  
<agent_port_number> ::= <integer_literal>
```

DP server connects to the agent listening on the specified hostname and port. Use this protocol when the SAP HANA database is on-premise.

{ENABLE |  
DISABLE}  
SSL

Specifies if agent's TCP listener on the specified port uses SSL.

<agent\_group\_name>

The name of the agent clustering group to which the agent should belong.

```
<agent_group_name> ::= <identifier>
```

## Description

The CREATE AGENT statement registers connection properties of an agent that is installed on another host. The DP server and agent use these connection properties when establishing communication channel.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::CreateAgent

System privilege: AGENT ADMIN

## Examples

Create an agent with TCP protocol

Create an agent TEST\_AGENT running on test\_host and port 5050.

```
CREATE AGENT TEST_AGENT PROTOCOL 'TCP' HOST  
'test_host' PORT 5050;
```

Create an agent with HTTP protocol

Create an agent TEST\_AGENT that uses HTTP.

```
CREATE AGENT TEST_AGENT PROTOCOL 'HTTP' ;
```

Create an agent with HTTP protocol in an agent group

Create an agent TEST\_AGENT that uses HTTP and belongs to agent clustering group TEST\_GROUP.

```
CREATE AGENT TEST_AGENT PROTOCOL 'HTTP' AGENT GROUP TEST_GROUP ;
```

## 8.2.8 CREATE AGENT GROUP Statement [Smart Data Integration]

The CREATE AGENT GROUP statement creates an agent clustering group to which individual agents can be assigned.

### Syntax

```
CREATE AGENT GROUP <agent_group_name>
```

### Syntax Elements

<agent\_group\_name>

The name of the agent group to create.

```
<agent_group_name> ::= <identifier>
```

### Description

The CREATE AGENT GROUP statement creates an agent clustering group to which individual agents can be assigned. An agent group can be used instead of a single agent to provide fail-over capabilities.

### Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::CreateAgent

System privilege: AGENT ADMIN

## Examples

Create an agent group named TEST\_GROUP.

```
CREATE AGENT GROUP TEST_GROUP;
```

## Related Information

[ALTER AGENT Statement \[Smart Data Integration\] \[page 622\]](#)

[CREATE AGENT Statement \[Smart Data Integration\] \[page 633\]](#)

## 8.2.9 CREATE AUDIT POLICY Statement [Smart Data Integration]

The CREATE AUDIT POLICY statement creates a new audit policy, which can then be enabled and cause the specified audit actions to occur.

The CREATE AUDIT POLICY SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the CREATE AUDIT POLICY topic for complete information. The information below is specific to smart data integration functionality.

## Syntax

Refer to the *SAP HANA SQL and System Views Reference* for complete information about CREATE AUDIT POLICY syntax.

## Syntax Elements

Syntax elements specific to smart data integration are described below. For information about syntax elements that are not specific to smart data integration, refer to the *SAP HANA SQL and System Views Reference*.

```
<audit_action_name> ::= CREATE AGENT  
| ALTER AGENT  
| DROP AGENT  
| CREATE AGENT GROUP  
| DROP AGENT GROUP  
| CREATE ADAPTER  
| ALTER ADAPTER
```

```

DROP ADAPTER
CREATE REMOTE SUBSCRIPTION
ALTER REMOTE SUBSCRIPTION
DROP REMOTE SUBSCRIPTION
PROCESS REMOTE SUBSCRIPTION EXCEPTION

```

| Audit Action Name                     | Group Number | Audit Operation                                            |
|---------------------------------------|--------------|------------------------------------------------------------|
| CREATE AGENT                          | 17           | Registering a Data Provisioning Agent                      |
| ALTER AGENT                           | 17           | Altering a Data Provisioning Agent's registration          |
| DROP AGENT                            | 17           | Dropping a Data Provisioning Agent registration            |
| CREATE ADAPTER                        | 17           | Registering a Data Provisioning Adapter                    |
| ALTER ADAPTER                         | 17           | Altering the registration of a Data Provisioning Adapter   |
| DROP ADAPTER                          | 17           | Dropping the registration of a Data Provisioning Adapter   |
| CREATE REMOTE SUBSCRIPTION            | 17           | Creating a subscription to a remote source                 |
| ALTER REMOTE SUBSCRIPTION             | 17           | Altering a subscription to a remote source                 |
| DROP REMOTE SUBSCRIPTION              | 17           | Dropping a subscription to a remote source                 |
| PROCESS REMOTE SUBSCRIPTION EXCEPTION | 17           | Processing exceptions raised by a subscribed remote source |

## Description

The CREATE AUDIT POLICY statement creates a new audit policy. This audit policy can then be enabled and cause the auditing of the specified audit actions to occur.

## Permissions

Only database users with the CATALOG READ, DATA ADMIN, or INIFILE ADMIN system privilege can view information in the M\_INIFILE\_CONTENTS view. For other database users, this view is empty. Users with the AUDIT ADMIN privilege can see audit-relevant parameters.

## Related Information

[CREATE AUDIT POLICY Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

## 8.2.10 CREATE REMOTE SOURCE Statement [Smart Data Integration]

The CREATE REMOTE SOURCE statement defines an external data source connected to SAP HANA database. The CREATE REMOTE SOURCE SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the CREATE REMOTE SOURCE topic for complete information. The information below is specific to smart data integration functionality.

### Syntax

Refer to the *SAP HANA SQL and System Views Reference* for complete information about CREATE REMOTE SOURCE syntax.

### Syntax Elements

Syntax elements specific to smart data integration are described below. For information about syntax elements that are not specific to smart data integration, refer to the *SAP HANA SQL and System Views Reference*.

#### <adapter\_clause>

Configures the adapter.

```
<adapter_clause> ::= ADAPTER <adapter_name>
    [AT LOCATION {DPSEVER | AGENT <agent_name> | AGENT GROUP
    <agent_group_name>} ]
    CONFIGURATION <connection_info_string>
```

```
<agent_name> ::= <identifier>
<agent_group_name> ::= <identifier>
```

Refer to CREATE ADAPTER for description of AT LOCATION.

### Description

The CREATE REMOTE SOURCE statement defines an external data source connected to SAP HANA database. Only database users having the system privilege CREATE SOURCE or DATA ADMIN are allowed to add a new remote source.

### Permissions

This statement requires the CREATE SOURCE system privilege.

## Related Information

[CREATE REMOTE SOURCE Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

### 8.2.11 CREATE REMOTE SUBSCRIPTION Statement [Smart Data Integration]

The CREATE REMOTE SUBSCRIPTION statement creates a remote subscription in SAP HANA to capture changes specified on the entire virtual table or part of a virtual table using a subquery.

#### Syntax

```
CREATE REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name>
{
  {ON [<schema_name>.]<virtual_table_name> } |
  {AS (<subquery>)}
}
[ WITH SCHEMA CHANGES | WITH RESTRICTED SCHEMA CHANGES ]
{ TARGET TABLE <table_spec> <load_behavior> } |
{ TARGET TASK <task_spec> } |
{ TARGET PROCEDURE <proc_spec> }
```

#### Syntax Elements

**<subscription\_name>**

The name of the remote subscription.

```
<subscription_name> ::= <identifier>
```

**ON [<schema\_name>.]<virtual\_table\_name>**

See "Remote subscription for TARGET TASK or TARGET TABLE using ON Clause" below.

**AS (<subquery>)**

See "Remote subscription for TARGET TASK or TARGET TABLE using AS Clause" below.

**[WITH SCHEMA CHANGES]**

Include this clause to propagate source schema changes to the SAP HANA virtual table and remote subscription target table.

WITH SCHEMA CHANGES corresponds to the replication task options *Initial + realtime with structure* or *Realtime only with structure* and the flowgraph options *Real-time* and *with Schema Change*.

**[WITH RESTRICTED SCHEMA CHANGES]**

The restrict schema changes option is supported only on subscriptions where the target is a TARGET TABLE. It is not supported on subscription targets of TARGET TASK or PROCEDURE.

Restricted schema changes mode is intended to allow jobs dependent on the schema of the target table to continue running even when some schema changes have been made to the source table because the target table column names are unchanged. When possible, the target table data continues to be updated as the source table data changes.

Schema changes made to the source table that affect column names and number of columns are not propagated to the target table. Dropping or adding columns in the source table does not affect the target table.

*Behavior of [WITH RESTRICTED SCHEMA CHANGES] ON*  
*[<schema\_name>].<virtual\_table\_name>*

- **Add Column**  
Columns may be added to the source table and will not be added to the target table. The target table continues to be updated, but as it is missing the newly-added columns, source table data for the added columns is not promulgated to the target table.  
The column is added to the virtual table.
- **Drop Column**  
Columns may be dropped from the source table and will not be dropped from the target table. The dropped column remains in the target table with its values preserved up to the point of the drop. After the drop, the dropped column still present in the target table is populated with null values as rows are added to the source table.  
The column is dropped from the virtual table.
- **Rename Column**  
Non-primary key columns may be renamed and will not be renamed in the target table. The originally-named column remains in the target table with its values preserved up to the time of the rename. After the renaming, the originally-named column still present in the target table is populated with null values as rows are added to the target table. Attempting to rename a column that is a primary key results in a subscription exception.  
The column is renamed in the virtual table.
- **Alter Column**  
The column data type may be changed and will change the data type of the column in the target table. The new data type must be one supported by SAP HANA.  
The column data type is also changed in the virtual table.

*Behavior of [WITH RESTRICTED SCHEMA CHANGES] with <subquery>*

- **Add Column**  
Columns may be added to the source table and will not be added to the target table. The target table continues to be updated, but as it is missing the newly-added columns, source table data for the added columns is not promulgated to the target table.  
If the added column is part of the subquery, it is added to the virtual table.
- **Drop Column**



Dropping columns from the source table results in a subscription error if the dropped columns are part of the subquery. Source table columns that are not part of the subscription subquery may be dropped.

The column is not dropped from the virtual table because the subscription error prevents it.

- **Rename Column**

Source table columns may be renamed, but the change is not promulgated to the target table. The subquery is updated with the new column name and the virtual table is changed to reflect the new name.

With the subquery option, the originally-named target table column continues to be updated as rows are added to the source table, even though the column name differs between the subquery and the target table.

- **Alter Column**

The column data type may be changed and will change the data type of the column in the target table. The new data type must be one supported by SAP HANA.

The column data type is also changed in the virtual table.

#### <table\_spec>

The table definition.

```
<table_spec> ::= [<schema_name>].<table_name>
```

#### <load\_behavior>

```
[CHANGE TYPE COLUMN <column_name> CHANGE TIME COLUMN  
<column_name> CHANGE SEQUENCE COLUMN <column_name> {INSERT |  
UPSERT | ARCHIVE}]
```

CHANGE { TYPE | TIME | SEQUENCE } COLUMN <column\_name>

For a target table that logs the loading history, these parameters specify the target column names that will show the change type and corresponding timestamp for each operation. The `CHANGE TYPE COLUMN <column_name>` displays I, U, or D for INSERT, UPSERT, or DELETE. In the case when multiple operations of the same type occur on the same source row with the same timestamp (because the operations are in the same transaction), use the `CHANGE SEQUENCE COLUMN <column_name>`, which adds an incremental digit to distinguish the operations.

The load behavior options are:

**UPSERT:** INSERT and UPDATE apply as is, DELETE converts to UPDATE

**INSERT:** INSERT applies as is, UPDATE and DELETE convert to INSERT

**ARCHIVE:** INSERT, UPDATE, and DELETE apply as is, ARCHIVE rows with a change type code of M are flagged as M in the CHANGE\_TYPE column

The following example is for UPSERT for a remote subscription called `user.subscription` on a source table called `SQLServer_dbo.table`. The target table `user.table` includes a column called `CHANGE_TYPE` (with a data type of `VARCHAR` or `NVARCHAR`) and a column `CHANGE_TIME` (with a data type of `TIMESTAMP`).

```
CREATE REMOTE SUBSCRIPTION user.subscription  
ON "user"."SQLServer_dbo.table"
```

```
TARGET TABLE user.table
CHANGE TYPE COLUMN "CHANGE_TYPE"
CHANGE TIME COLUMN "CHANGE_TIME"
UPSERT;
```

The following example for INSERT is for the same remote subscription and includes the CHANGE\_SEQUENCE column.

```
CREATE REMOTE SUBSCRIPTION user.subscription
ON "user"."SQLServer_dbo.table"
TARGET TABLE user.table
CHANGE TYPE COLUMN "CHANGE_TYPE"
CHANGE TIME COLUMN "CHANGE_TIME"
CHANGE SEQUENCE COLUMN "CHANGE_SEQUENCE"
INSERT;
```

### <task\_spec>

The task definition.

```
<task_spec> ::= TARGET TASK[ <schema_name> ].<task_name>
[(<var_list>)]
[PROCEDURE PARAMETERS{<param_list>}]
```

<var\_list> specifies one or more start task variables.

```
<var_list> ::= <start_task_var>[{, <start_task_var>}...]
```

<start\_task\_var> specifies the name and value for a start task variable.

```
<start_task_var> ::= <var_name> => <var_value>
```

<var\_name> is the name of variable that was defined within the task plan.

Variable values provided in this section will be used at runtime (for example, when executing the task using START TASK).

```
<var_name> ::= <identifier>
```

<var\_value> is the value that should be used in place of the variable name specified when executing the task.

```
<var_value> ::= <string_literal>
```

<param\_list> specifies one or more start task parameters.

```
<param_list> ::= <start_task_param> [{,
<start_task_param>}...]
```

```
<start_task_param> ::= <identifier>
```

If the task uses table types for input and/or output, then the task expects actual table, virtual table, or view names at runtime. These actual tables, virtual tables, or view names are specified as task parameters. Depending on the type of remote subscription being created, the task parameters may or may not need actual table, virtual table, or view names for specific parameters (see below for more details).

<proc\_spec>

```
{ TARGET PROCEDURE  
  [<schema_name>.]<proc_name>[( <param_list>)] }
```

## Description

The CREATE REMOTE SUBSCRIPTION statement creates a remote subscription in SAP HANA to capture changes specified on the entire virtual table or part of a virtual table using a subquery. The changed data can be applied to an SAP HANA target table or passed to a TASK or PROCEDURE if the changes require transformation. The owner of the remote subscription must have the following privileges:

- SELECT privilege on tables specified in the ON or AS <subquery> clauses
- INSERT, UPDATE, DELETE privileges on the target table
- EXECUTE privilege on the stored procedure
- START TASK privilege on the task

### Note

If you create a remote subscription using the CREATE REMOTE SUBSCRIPTION SQL statement, use **technical user** for the *Credentials Mode* parameter when creating a remote source.

## Permissions

This statement requires the CREATE REMOTE SUBSCRIPTION object privilege on the remote source.

## Remote Subscription for TARGET TASK or TARGET TABLE Using ON Clause

```
CREATE REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name>  
ON [<schema_name>.]<virtual_table_name>  
TARGET TASK [<schema_name>].<task_name>[( <var_list>)] [PROCEDURE  
PARAMETERS( <param_list>)]
```

<param\_list> must contain one of the parameters as [<schema\_name>.]<virtual\_table\_name>. This parameter must be the same schema and virtual table name as specified in the ON clause. Only one parameter in <param\_list> can be a virtual table.

Each parameter in <param\_list> is used in comparing its columns with columns for the corresponding table type defined in the task plan. Hence, the order of parameters in <param\_list> must match the order of table types defined in the task plan for input and output sources.

The task plan table type corresponding to the procedure parameter [<schema\_name>.]<virtual\_table\_name> must have the same columns (excluding \_OP\_CODE and \_COMMIT\_TIMESTAMP). This table type must have \_OP\_CODE as the last but one column and \_COMMIT\_TIMESTAMP as the last column.

## Remote Subscription for TARGET TASK or TARGET TABLE Using AS Clause

```
CREATE REMOTE SUBSCRIPTION [<schema_name>.<subscription_name>
AS <subquery>
TARGET TASK [<schema_name>].<task_name>[(<var_list>)] [PROCEDURE
PARAMETERS(<param_list>)]
```

The AS (<subquery>) part of the syntax lets you define the SQL and the columns to use for the subscription. The subquery should be a simple SELECT <column\_list> from <virtual\_table> and shouldn't contain a WHERE clause. The <column\_list> should match the target table schema in column order and name.

<param\_list> must contain one of the parameters as table type and this table type (schema and name) must be the same as the one defined in the task plan. This table type must also have the same columns as being output by the subquery (excluding \_OP\_CODE and \_COMMIT\_TIMESTAMP). This table type must have \_OP\_CODE as the last but one column and \_COMMIT\_TIMESTAMP as the last column. Only one parameter in <param\_list> can be a table type.

Each parameter in <param\_list> is used in comparing its columns with columns for the corresponding table type defined in the task plan. Hence, the order of parameters in <param\_list> must match the order of table types defined in task plan for input and output sources.

### Example

Create a remote subscription on a virtual table and apply changes using a real-time task.

```
CREATE SCHEMA "IM_SERVICES";
DROP REMOTE SOURCE "OracleAdapter" CASCADE;
CREATE REMOTE SOURCE "OracleAdapter" ADAPTER "OracleAdapter" AT LOCATION
dpserver CONFIGURATION '' WITH CREDENTIAL TYPE 'PASSWORD' USING '';
DROP TABLE "SYSTEM"."VT_EMPLOYEE_PK_TABLE";
CREATE VIRTUAL TABLE "SYSTEM"."VT_EMPLOYEE_PK_TABLE" AT
"OracleAdapter"."<NULL>".<NULL>".employee_pk_table";
DROP TYPE "IM_SERVICES"."TT_PARAM_IN";
DROP TYPE "IM_SERVICES"."TT_PARAM_OUT";
CREATE TYPE "IM_SERVICES"."TT_PARAM_IN" AS TABLE ("empno" integer, "deptid"
integer, "empname" VARCHAR(200), "salary" decimal(28,7), "bonus" double,
" _OP_CODE" VARCHAR(1), "_COMMIT_TIMESTAMP" SECONDDATE);
CREATE TYPE "IM_SERVICES"."TT_PARAM_OUT" AS TABLE ("empno" integer, "deptid"
integer, "empname" VARCHAR(200), "salary" decimal(28,7), "bonus" double);
DROP TABLE "IM_SERVICES"."T_OUT";
CREATE COLUMN TABLE "IM_SERVICES"."T_OUT" LIKE "IM_SERVICES"."TT_PARAM_OUT" ;
DROP TASK "IM_SERVICES"."TSKM_RT_VAR";
DROP REMOTE SUBSCRIPTION "IM_SERVICES"."RSUB_VAR";
CREATE REMOTE SUBSCRIPTION "IM_SERVICES"."RSUB_VAR"
AS (SELECT "empno", "deptid", "empname", "salary", "bonus" FROM
"SYSTEM"."VT_EMPLOYEE_PK_TABLE")
TARGET TASK "IM_SERVICES"."TSKM_RT_VAR" ("expr_var01_in1" => '100',
"expr_var02_in2" => 'upper('walkerIN')')
PROCEDURE PARAMETERS ( "IM_SERVICES"."TT_PARAM_IN", "IM_SERVICES"."T_OUT");
DROP REMOTE SUBSCRIPTION "IM_SERVICES"."RSUB_VAR";
CREATE REMOTE SUBSCRIPTION "IM_SERVICES"."RSUB_VAR"
ON "SYSTEM"."VT_EMPLOYEE_PK_TABLE"
TARGET TASK "IM_SERVICES"."TSKM_RT_VAR" ("expr_var01_in1" => '100',
"expr_var02_in2" => 'upper('walkerIN')')
PROCEDURE PARAMETERS ( "SYSTEM"."VT_EMPLOYEE_PK_TABLE", "IM_SERVICES"."T_OUT");
SELECT * FROM "SYS"."REMOTE_SUBSCRIPTIONS_";
TRUNCATE TABLE "IM_SERVICES"."T_OUT";
```

```
ALTER REMOTE SUBSCRIPTION "IM_SERVICES"."RSUB_VAR" QUEUE;  
ALTER REMOTE SUBSCRIPTION "IM_SERVICES"."RSUB_VAR" DISTRIBUTE;
```

## Related Information

[SQL Notation Conventions \(SAP HANA SQL and System Views Reference\)](#)

[Data Types \(SAP HANA SQL and System Views Reference\)](#)

## 8.2.12 CREATE VIRTUAL PROCEDURE Statement [Smart Data Integration]

Creates a virtual procedure using the specified programming language that allows execution of the procedure body at the specified remote source.

The CREATE VIRTUAL PROCEDURE SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the CREATE VIRTUAL PROCEDURE Statement (Procedural) topic for complete information. The information in this topic is specific to smart data integration functionality.

## Syntax

```
CONFIGURATION <configuration_json_string>
```

## Syntax Elements

<configuration\_json\_string>

A JSON string that includes required source procedure parameters.

## Description

The CREATE VIRTUAL PROCEDURE statement creates a new virtual procedure from a remote source procedure. When creating a virtual procedure using the SQL Console:

1. Return the metadata of the source procedure [number, types, and configuration (JSON) string] by invoking the built-in SAP HANA procedure:

```
call "PUBLIC"."GET_REMOTE_SOURCE_FUNCTION_DEFINITION"  
( '<remote_source_name>', '<remote_object_unique_name>', ?, ?, ? );
```

2. Edit the CONFIGURATION JSON string to include the appropriate parameter values.

## Permissions

This statement requires the CREATE VIRTUAL PROCEDURE object privilege on the remote source.

## Example

If you use the SQL Console to create a virtual procedure, the following example illustrates an ABAP adapter.

```
CREATE VIRTUAL PROCEDURE BAPI_BANK_GETLIST (
  IN BANK_CTRY NVARCHAR(6) ,
  IN MAX_ROWS INT,
  OUT RETURN_TYPE NVARCHAR (2),
  OUT RETURN_ID NVARCHAR (40),
  OUT RETURN_NUMBER VARCHAR (6) ,
  OUT RETURN_MESSAGE NVARCHAR (440) ,
  OUT RETURN_LOG_NO NVARCHAR (40),
  OUT RETURN_LOG_MSG_NO VARCHAR (12),
  OUT RETURN_MESSAGE_V1 NVARCHAR (100) ,
  OUT RETURN_MESSAGE_V2 NVARCHAR (100),
  OUT RETURN_MESSAGE_V3 NVARCHAR (100) ,
  OUT RETURN_MESSAGE_V4 NVARCHAR (100),
  OUT RETURN_PARAMETER NVARCHAR (64),
  OUT RETURN_ROW INTEGER,
  OUT RETURN_FIELD NVARCHAR (60),
  OUT RETURN_SYSTEM NVARCHAR (20),
  IN BANK_LIST_IN TABLE (
    BANK_CTRY NVARCHAR (6),
    BANK_KEY NVARCHAR (30),
    BANK_NAME NVARCHAR (120) ,
    CITY NVARCHAR (70)
  ),
  OUT BANK_LIST TABLE (
    BANK_CTRY NVARCHAR (6) ,
    BANK_KEY NVARCHAR (30) ,
    BANK_NAME NVARCHAR (120) ,
    CITY NVARCHAR (70)
  )
) CONFIGURATION '
{
  "__DP_UNIQUE_NAME__": "BAPI_BANK_GETLIST",
  "__DP_VIRTUAL_PROCEDURE__": true
}' AT "QA1";
```

Then call the procedure as follows:

```
CALL bapi_bank_getlist('DE', 1000, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?,
bank_list, ?);

[where "bank_list" is a table of type

TABLE (
    BANK_CTRY NVARCHAR (6),
    BANK_KEY NVARCHAR (30),
    BANK_NAME NVARCHAR (120) ,
    CITY NVARCHAR (70)
```

```
)  
]
```

For more information about using the SQL Console, see the *SAP HANA Administration Guide*.

## 8.2.13 DROP ADAPTER Statement [Smart Data Integration]

The DROP ADAPTER statement removes an adapter from all locations.

### Syntax

```
DROP ADAPTER <adapter_name> [<drop_option>]
```

### Syntax Elements

#### <adapter\_name>

The name of the adapter to be dropped.

```
<adapter_name> ::= <identifier>
```

#### <drop\_option>

When <drop\_option> is not specified, a restrict drop will be performed.

```
<drop_option> ::= CASCADE | RESTRICT
```

CASCADE drops the adapter and dependent objects.

### Description

The DROP ADAPTER statement removes an adapter from all locations.

### Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::RemoveLocationFromAdapter

System privilege: ADAPTER ADMIN

## Example

Create two agents and an adapter at both the agents.

```
CREATE AGENT TEST_AGENT_1 PROTOCOL 'TCP' HOST 'test_host1' PORT 5050;  
CREATE AGENT TEST_AGENT_2 PROTOCOL 'HTTP';  
CREATE ADAPTER TEST_ADAPTER AT LOCATION AGENT TEST_AGENT_1;  
ALTER ADAPTER TEST_ADAPTER ADD LOCATION AGENT TEST_AGENT_2;  
--Drop adapter TEST_ADAPTER.  
DROP ADAPTER TEST_ADAPTER;
```

## 8.2.14 DROP AGENT Statement [Smart Data Integration]

The DROP AGENT statement removes an agent.

### Syntax

```
DROP AGENT <agent_name> [<drop_option>]
```

### Syntax Elements

#### <agent\_name>

The name of the agent to be dropped.

```
<agent_name> ::= <identifier>
```

#### <drop\_option>

When <drop\_option> is not specified, a restrict drop is performed.

```
<drop_option> ::= CASCADE | RESTRICT
```

CASCADE drops the agent and its dependent objects.

RESTRICT drops the agent only if it does not have any dependent objects.

### Description

The DROP AGENT statement removes an agent.



## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::DropAgent

System privilege: AGENT ADMIN

## Example

Create an agent TEST\_AGENT and adapter CUSTOM\_ADAPTER on the agent. Make sure that the custom adapter is setup on the agent.

```
CREATE AGENT TEST_AGENT PROTOCOL 'TCP' HOST 'test_host' PORT 5050;  
CREATE ADAPTER CUSTOM_ADAPTER AT LOCATION AGENT TEST_AGENT;
```

Drop the agent called TEST\_AGENT.

```
DROP AGENT TEST_AGENT;
```

## 8.2.15 DROP AGENT GROUP Statement [Smart Data Integration]

The DROP AGENT GROUP statement removes an agent clustering group.

### Syntax

```
DROP AGENT GROUP <agent_group_name>
```

### Syntax Elements

<agent\_group\_name>

The name of the agent group to be dropped.

```
<agent_group_name> ::= <identifier>
```

## Description

The DROP AGENT GROUP statement removes an agent clustering group. All dependent objects must be removed before an agent clustering group can be dropped.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::DropAgent

System privilege: AGENT ADMIN

## Examples

Create an agent group TEST\_GROUP.

```
CREATE AGENT GROUP TEST_GROUP;
```

Drop the agent group called TEST\_GROUP.

```
DROP AGENT GROUP TEST_GROUP;
```

## 8.2.16 DROP REMOTE SUBSCRIPTION Statement [Smart Data Integration]

The DROP REMOTE SUBSCRIPTION statement drops an existing remote subscription.

## Syntax

```
DROP REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name>
```

## Syntax Elements

<subscription\_name>

The name of the remote subscription.

```
<subscription_name> ::= <identifier>
```

## Description

The DROP REMOTE SUBSCRIPTION statement drops an existing remote subscription. If the remote subscription is actively receiving changes from source table, then a RESET command is automatically called before dropping it.

## Permissions

This statement requires the DROP object privilege on the remote source.

## Example

Drop the remote subscription TEST\_SUB.

```
DROP REMOTE SUBSCRIPTION TEST_SUB;
```

## 8.2.17 GRANT Statement [Smart Data Integration]

GRANT is used to grant privileges and structured privileges to users and roles. GRANT is also used to grant roles to users and other roles.

The GRANT SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the GRANT topic for complete information. The information below is specific to smart data integration functionality.

## Syntax

Refer to the GRANT topic for complete information about GRANT syntax.

## Syntax Elements

Syntax elements specific to smart data integration are described below. For information about syntax elements that are not specific to smart data integration, refer to the GRANT topic.

### <system\_privilege>

System privileges are used to restrict administrative tasks.

```
<system_privilege> ::= ADAPTER ADMIN | AGENT ADMIN
```

The table below describes the supported system privileges.

| System Privilege | Privilege Purpose                                                                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ADAPTER ADMIN    | Controls the execution of the following adapter-related commands: CREATE ADAPTER, DROP ADAPTER and ALTER ADAPTER. Also allows access to ADAPTERS and ADAPTER_LOCATIONS system views. |
| AGENT ADMIN      | Controls the execution of the following agent-related commands: CREATE AGENT, DROP AGENT and ALTER AGENT. Also allows access to AGENTS and ADAPTER_LOCATIONS system views.           |

### <source\_privilege>

Source privileges are used to restrict the access and modifications of a source entry.

```
<source_privilege> ::= CREATE REMOTE SUBSCRIPTION | PROCESS  
REMOTE SUBSCRIPTION EXCEPTION
```

| Source Privilege                      | Privilege Purpose                                                                                                                                                                                            |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CREATE REMOTE SUBSCRIPTION            | This privilege allows the creation of remote subscriptions executed on this source entry. Remote subscriptions are created in a schema and point to a virtual table or SQL on tables to capture change data. |
| PROCESS REMOTE SUBSCRIPTION EXCEPTION | This privilege allows processing exceptions on this source entry. Exceptions that are relevant for all remote subscriptions are created for a remote source entry.                                           |

### <object\_privilege>

Object privileges are used to restrict the access and modifications on database objects. Database objects are tables, views, sequences, procedures, and so on.

```
<object_privilege> ::= AGENT MESSAGING | PROCESS REMOTE  
SUBSCRIPTION EXCEPTION
```

The table below describes the supported object privileges.

| Object Privilege | Privilege Purpose                                                                                            | Command Types |
|------------------|--------------------------------------------------------------------------------------------------------------|---------------|
| AGENT MESSAGING  | Authorizes the user with which the agent communicates with the data provisioning server using HTTP protocol. | DDL           |

| Object Privilege                      | Privilege Purpose                                          | Command Types |
|---------------------------------------|------------------------------------------------------------|---------------|
| PROCESS REMOTE SUBSCRIPTION EXCEPTION | Authorizes processing exceptions of a remote subscription. | DDL           |

Not all object privileges are applicable to all kinds of database objects. To learn which object types allow which privilege to be used, see the table below.

| Privilege                             | Schema | Table | View | Sequence | Function / Procedure | Remote Subscription | Agent |
|---------------------------------------|--------|-------|------|----------|----------------------|---------------------|-------|
| AGENT MESSAGING                       | --     | --    | --   | --       | --                   | --                  | YES   |
| PROCESS REMOTE SUBSCRIPTION EXCEPTION | --     | --    | --   | --       | --                   | YES                 | --    |

## Related Information

[GRANT Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

## 8.2.18 PROCESS REMOTE SUBSCRIPTION EXCEPTION Statement [Smart Data Integration]

The PROCESS REMOTE SUBSCRIPTION EXCEPTION statement allows the user to indicate how an exception should be processed.

### Syntax

```
PROCESS REMOTE SUBSCRIPTION EXCEPTION <exception_id> { RETRY | IGNORE }
```

### Syntax Elements

**<exception\_id>**

The exception ID for remote subscription or remote source.

```
<exception_id> ::= <integer_literal>
```

RETRY Indicates to retry the current failed operation. If the failure is due to opening a connection to a remote source, then the connection is established. If the failure

happens when applying changed data to a target table, then the RETRY operation retries the transaction again on the target table.

IGNORE Indicates to ignore the current failure. If the failure happens when applying changed data to a target table, then the IGNORE operation skips the current transaction and proceeds with the next transaction. The exception is cleared.

## Description

The PROCESS REMOTE SUBSCRIPTION EXCEPTION statement allows the user to indicate how an exception should be processed.

## Permissions

This statement requires the PROCESS REMOTE SUBSCRIPTION EXCEPTION object privilege on the remote source.

## Example

Ignore exception 101.

```
PROCESS REMOTE SUBSCRIPTION EXCEPTION 101 IGNORE;
```

## 8.2.19 START TASK Statement [Smart Data Integration]

Starts a task.

## Syntax

```
START TASK <task_name> [ASYNC] [( <var_list> )] [PROCEDURE  
PARAMETERS( <param_list> )]
```

## Syntax Elements

<task\_name>

The identifier of the task to be called, with optional schema name.

```
<task_name> ::= [<schema_name>.]<identifier>  
<schema_name> ::= <identifier>
```

#### <var\_list>

Specifies one or more start task variables. Variables passed to a task are scalar constants. Scalar parameters are assumed to be NOT NULL.

```
<var_list> ::= <start_task_var>[ {, <start_task_var>} ... ]
```

**<start\_task\_var>** Specifies the name and value for a start task variable. A task can contain variables that allow for dynamic replacement of task plan parameters. This section is where, at run time during START TASK, the values that should be used for those variables can be provided.

```
<start_task_var> ::= <var_name> =>  
<var_value>
```

**<var\_name>** Name of variable that was defined.

```
<var_name> ::= <identifier>
```

**<var\_value>** Value that should be used in place of the variable name specified when executing the task.

```
<var_value> ::= <string_literal>
```

#### <param\_list>

Specifies one or more start task parameters.

```
<param_list> ::= <start_task_param>[ {, <start_task_param>} ... ]
```

```
<start_task_param> ::= <identifier>
```

Task parameters. If the task uses table types for input and/or output, then those need to be specified within this section. For more information about these data types, see BNF Lowest Terms Representations and Data Types in the Notation topic.

Parameters are implicitly defined as either IN or OUT, as inferred from the task plan. Arguments for IN parameters could be anything that satisfies the schema of the input table type (for example, a table variable internal to the procedure, or a temporary table). The actual value passed for tabular OUT parameters can be, for example, '?', a physical table name, or a table variable defined inside the procedure.

## Description

Starts a task.

START TASK when executed by the client the syntax behaves in a way consistent with the SQL standard semantics, e.g. Java clients can call a procedure using a JDBC CallableStatement. Scalar output variables are a scalar value that can be retrieved from the callable statement directly.

### Note

Unquoted identifiers are implicitly treated as uppercase. Quoting identifiers will respect capitalization and allow for using white spaces which are normally not allowed in SQL identifiers.

## Permissions

This statement requires the EXECUTE privilege on the schema in which the task was created.

## Examples

The TASK performTranslation was already created, and the task plan has two table type input parameters and a single table type output parameter. You call the performTranslation task passing in the table types to use for execution.

```
START TASK performTranslation PROCEDURE PARAMETERS (in1, in2, out1);
```

## SQL Script

You can call START TASK within the SQL Script CREATE PROCEDURE. Refer to the [SAP HANA SQL Script Reference](#) for complete details about CREATE PROCEDURE.

<proc\_sql> now includes <start\_task>:

```
<proc_sql> ::= <subquery>
| <select_into_stmt>
| <insert_stmt>
| <delete_stmt>
| <update_stmt>
| <replace_stmt>
| <call_stmt>
| <create_table>
| <drop_table>
| <start_task>
```

START TASK is not supported in:

- Table UDF
- Scalar UDF
- Trigger
- Read-only procedures



## TASK\_EXECUTION\_ID session variable

The TASK\_EXECUTION\_ID session variable provides a unique task execution ID. Knowing the proper task execution ID is critical for various pieces of task functionality including querying for side-effect information and task processing status, and canceling a task.

TASK\_EXECUTION\_ID is a read-only session variable. Only the internal start task code updates the value.

The value of TASK\_EXECUTION\_ID will be set during the START TASK command execution. In the case of asynchronous execution (START TASK ASYNC), the value is updated before the command returns so it is available before the actual task has finished asynchronously running. If the execution of START TASK was successful, then the value is updated to the unique execution ID for that START TASK execution. If the execution of START TASK was unsuccessful, then the TASK\_EXECUTION\_ID variable will be set back to the state as if no START TASK was run.

The users can obtain the value of TASK\_EXECUTION\_ID by using either of the following:

- The already existing SESSION\_CONTEXT() function. If this function is used and if no tasks have been run or a task was run and it was unsuccessful, then a NULL value will be returned.
- The M\_SESSION\_CONTEXT monitoring view. This would need to be queried using a KEY value of "TASK\_EXECUTION\_ID". If no row exists with that key, then that means that the session variable hasn't been set (no tasks run or last task execution was unsuccessful).

### Note

Session variables are string values. The user needs to cast appropriately based on how they want to use the value.

Table 69: Examples

| Action                                                                             | SQL                                                                                                                  |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Obtain the last task execution ID                                                  | <pre>SELECT SESSION_CONTEXT( 'TASK_EXECUTION_ID' ) FROM dummy;</pre>                                                 |
| See monitoring information for the last task that was executed (with type casting) | <pre>SELECT * FROM M_TASKS WHERE TASK_EXECUTION_ID = CAST( SESSION_CONTEXT( 'TASK_EXECUTION_ID' ) AS BIGINT );</pre> |
| Cancel the last task that was executed (with type casting)                         | <pre>CANCEL TASK CAST( SESSION_CONTEXT( 'TASK_EXECUTION_ID' ) AS BIGINT );</pre>                                     |

## Related Information

[SQL Notation Conventions \(SAP HANA SQL and System Views Reference\)](#)

## 8.3 System Views

System views allow you to query for various information about the system state using SQL commands. The results appear as tables.

System views are located in the SYS schema. In a system with tenant databases, every database has a SYS schema with system views that contain information about that database only. In addition, the system database has a further schema, SYS\_DATABASES, which contains views for monitoring the system as a whole. The views in the SYS\_DATABASES schema provide aggregated information from a subset of the views available in the SYS schema of all tenant databases in the system. These union views have the additional column DATABASE\_NAME to allow you to identify to which database the information refers. To be able to view information in these views, you need the system privilege CATALOG READ or DATABASE ADMIN.

SAP HANA system views are separated into two categories: **metadata** views and **runtime** views. Metadata views provide metadata about objects in the database, including options or settings that were set using a DDL statement. Runtime views provide actual HANA runtime data, including statistics and status information related to the execution of DML statements. Runtime views start with M\_ for monitoring.

[ADAPTER\\_CAPABILITIES System View \[Smart Data Integration\] \[page 661\]](#)

Specifies the SQL capabilities of the adapters stored in the system.

[ADAPTER\\_LOCATIONS System View \[Smart Data Integration\] \[page 661\]](#)

Specifies the location of adapters.

[ADAPTERS System View \[Smart Data Integration\] \[page 661\]](#)

Stores adapters available in the SAP HANA system.

[AGENT\\_CONFIGURATION System View \[Smart Data Integration\] \[page 662\]](#)

Agent configuration

[AGENT\\_GROUPS System View \[Smart Data Integration\] \[page 662\]](#)

Lists active data provisioning agent groups in the system.

[AGENTS System View \[Smart Data Integration\] \[page 663\]](#)

Lists active data provisioning agents in the system.

[M\\_AGENTS System View \[Smart Data Integration\] \[page 663\]](#)

Provides the status of all agents registered in the SAP HANA database.

[M\\_REMOTE\\_SOURCES System View \[Smart Data Integration\] \[page 664\]](#)

Stores dictionary status information, remote source owner information, and the status of data collection.

[M\\_REMOTE\\_SUBSCRIPTION\\_COMPONENTS System View \[Smart Data Integration\] \[page 665\]](#)

Provides the status of a remote subscription for each internal component.

[M\\_REMOTE\\_SUBSCRIPTION\\_STATISTICS System View \[Smart Data Integration\] \[page 665\]](#)

Provides details of current processing details of a remote subscription (e.g. number of messages or transactions received, applied since the start of the SAP HANA database).

[M\\_REMOTE\\_SUBSCRIPTIONS System View \[Smart Data Integration\] \[page 666\]](#)

Provides the status and run-time information of a remote subscription.

[M\\_REMOTE\\_QUERY\\_STATISTICS System View \[Smart Data Integration\] \[page 668\]](#)

Provides monitoring statistics for remote source queries.

[M\\_SESSION\\_CONTEXT System View \[Smart Data Integration\] \[page 670\]](#)

Session variables for each connection

[REMOTE\\_SOURCE\\_OBJECT\\_COLUMNS System View \[Smart Data Integration\] \[page 671\]](#)

If the adapter can provide column-level information for each table in the remote system, once this dictionary is built you can search for relationships between tables. This table is useful for analyzing relationships between tables in the remote source.

[REMOTE\\_SOURCE\\_OBJECT\\_DESCRIPTIONS System View \[Smart Data Integration\] \[page 672\]](#)

Stores description of browsable node in different languages.

[REMOTE\\_SOURCE\\_OBJECTS System View \[Smart Data Integration\] \[page 672\]](#)

Stores browsable nodes as well as importable objects (virtual tables). This view is built from remote source metadata dictionaries.

[REMOTE\\_SOURCES System View \[Smart Data Integration\] \[page 673\]](#)

Remote sources

[REMOTE\\_SUBSCRIPTION\\_EXCEPTIONS System View \[Smart Data Integration\] \[page 673\]](#)

Provides details about an exception that occurred during the execution of a remote subscription. The exceptions can be processed using the PROCESS REMOTE SUBSCRIPTION EXCEPTION SQL statement.

[REMOTE\\_SUBSCRIPTIONS System View \[Smart Data Integration\] \[page 674\]](#)

Lists all the remote subscriptions created for a remote source.

[TASK\\_CLIENT\\_MAPPING System View \[Smart Data Integration\] \[page 675\]](#)

Provides the client mapping when a task is created by the ABAP API.

[TASK\\_COLUMN\\_DEFINITIONS System View \[Smart Data Integration\] \[page 675\]](#)

Defines the columns present in a particular table.

[TASK\\_EXECUTIONS System View \[Smart Data Integration\] \[page 676\]](#)

Task-level run-time statistics generated when START TASK is run.

[TASK\\_LOCALIZATION System View \[Smart Data Integration\] \[page 677\]](#)

Contains localized values for the task framework tables.

[TASK\\_OPERATIONS System View \[Smart Data Integration\] \[page 677\]](#)

Contains all operations that exist for a given task, as well as details about those operations.

[TASK\\_OPERATIONS\\_EXECUTIONS System View \[Smart Data Integration\] \[page 678\]](#)

Operations-level task statistics generated when START TASK is run.

[TASK\\_PARAMETERS System View \[Smart Data Integration\] \[page 679\]](#)

Details about the task parameters view

[TASK\\_TABLE\\_DEFINITIONS System View \[Smart Data Integration\] \[page 679\]](#)

Contains all of the tables used by the various side-effect producing operation.

[TASK\\_TABLE\\_RELATIONSHIPS System View \[Smart Data Integration\] \[page 680\]](#)

Defines the relationships, if any, between tables within an operation.

[TASKS System View \[Smart Data Integration\] \[page 680\]](#)

Details about tasks.

[VIRTUAL\\_COLUMN\\_PROPERTIES System View \[Smart Data Integration\] \[page 682\]](#)

Lists the properties of the columns in a virtual table sent by the adapter via CREATE VIRTUAL TABLE SQL statement.

[VIRTUAL\\_TABLE\\_PROPERTIES System View \[Smart Data Integration\] \[page 682\]](#)

Lists the properties of a virtual table sent by the adapter via the CREATE VIRTUAL TABLE SQL statement.

[BEST\\_RECORD\\_GROUP\\_MASTER\\_STATISTICS System View \[Smart Data Quality\] \[page 683\]](#)

Contains a summary of Best Record group master statistics.

[BEST\\_RECORD\\_RESULTS System View \[Smart Data Quality\] \[page 683\]](#)

Contains governance information for every column in every record that is updated in the best record process.

[BEST\\_RECORD\\_STRATEGIES System View \[Smart Data Quality\] \[page 684\]](#)

Contains information on which strategies are used in each strategy group and in which order.

[CLEANSE\\_ADDRESS\\_RECORD\\_INFO System View \[Smart Data Quality\] \[page 685\]](#)

Describes how well an address was assigned as well as the type of address.

[CLEANSE\\_CHANGE\\_INFO System View \[Smart Data Quality\] \[page 686\]](#)

Describes the changes made during the cleansing process.

[CLEANSE\\_COMPONENT\\_INFO System View \[Smart Data Quality\] \[page 687\]](#)

Identifies the location of parsed data elements in the input and output.

[CLEANSE\\_INFO\\_CODES System View \[Smart Data Quality\] \[page 688\]](#)

Contains one row per info code generated by the cleansing process.

[CLEANSE\\_STATISTICS System View \[Smart Data Quality\] \[page 689\]](#)

Contains a summary of Cleanse statistics.

[GEOCODE\\_INFO\\_CODES System View \[Smart Data Quality\] \[page 690\]](#)

Contains one row per info code generated by the geocode transformation process.

[GEOCODE\\_STATISTICS System View \[Smart Data Quality\] \[page 691\]](#)

Contains a summary of Geocode statistics.

[MATCH\\_GROUP\\_INFO System View \[Smart Data Quality\] \[page 691\]](#)

Contains one row for each match group.

[MATCH\\_RECORD\\_INFO System View \[Smart Data Quality\] \[page 692\]](#)

Contains one row for each matching record per level.

[MATCH\\_SOURCE\\_STATISTICS System View \[Smart Data Quality\] \[page 693\]](#)

Contains counts of matches within and between data sources.

[MATCH\\_STATISTICS System View \[Smart Data Quality\] \[page 693\]](#)

Contains statistics regarding the run of the transformation operation.

[MATCH\\_TRACING System View \[Smart Data Quality\] \[page 694\]](#)

Contains one row for each match decision made during the matching process.

## Related Information

[System Views Reference for Additional SAP HANA Contexts \(SAP HANA SQL and System Views Reference\)](#)

## 8.3.1 ADAPTER\_CAPABILITIES System View [Smart Data Integration]

Specifies the SQL capabilities of the adapters stored in the system.

### Structure

| Column         | Data type    | Description                              |
|----------------|--------------|------------------------------------------|
| ADAPTER_NAME   | NVARCHAR(64) | Adapter name                             |
| SOURCE_VERSION | NVARCHAR(64) | Source versions supported by the adapter |

## 8.3.2 ADAPTER\_LOCATIONS System View [Smart Data Integration]

Specifies the location of adapters.

### Structure

| Column       | Data type     | Description                                                 |
|--------------|---------------|-------------------------------------------------------------|
| ADAPTER_NAME | NVARCHAR(64)  | Adapter name                                                |
| LOCATION     | VARCHAR(11)   | Location of the adapter: 'indexserver', 'dpserver', 'agent' |
| AGENT_NAME   | NVARCHAR(256) | Agent name                                                  |

## 8.3.3 ADAPTERS System View [Smart Data Integration]

Stores adapters available in the SAP HANA system.

## Structure

| Column                      | Data type      | Description                                                                                                                                 |
|-----------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| ADAPTER_NAME                | NVARCHAR(64)   | Adapter name                                                                                                                                |
| PROPERTIES                  | NVARCHAR(1000) | Optional properties of the adapter such as display_name and description                                                                     |
| CONFIGURATION               | NCLOB          | UI properties that must be displayed when configuring remote data source                                                                    |
| IS_SYSTEM_ADAPTER           | VARCHAR(5)     | Specifies whether the adapter is a system adapter: 'TRUE'/'FALSE'                                                                           |
| IS_ESS_DEFINITION_SUPPORTED | VARCHAR(5)     | Specifies if the procedure GET_REMOTE_SOURCE_TABLE_ESS_DEFINITIONS is enabled for remote sources created using this adapter: 'TRUE'/'FALSE' |

### 8.3.4 AGENT\_CONFIGURATION System View [Smart Data Integration]

Agent configuration

## Structure

| Column name | Data type     | Description          |
|-------------|---------------|----------------------|
| AGENT_NAME  | NVARCHAR(256) | Agent name           |
| KEY         | VARCHAR(128)  | Agent property key   |
| VALUE       | NCLOB         | Agent property value |

### 8.3.5 AGENT\_GROUPS System View [Smart Data Integration]

Lists active data provisioning agent groups in the system.

## Structure

| Column           | Data type     | Description              |
|------------------|---------------|--------------------------|
| AGENT_GROUP_NAME | NVARCHAR(256) | Name of the agent group. |

## 8.3.6 AGENTS System View [Smart Data Integration]

Lists active data provisioning agents in the system.

## Structure

| Column           | Data type     | Description                                                      |
|------------------|---------------|------------------------------------------------------------------|
| AGENT_NAME       | NVARCHAR(256) | Agent name                                                       |
| PROTOCOL         | VARCHAR(4)    | Protocol for communication with SAP HANA database: 'TCP', 'HTTP' |
| AGENT_HOST       | NVARCHAR (64) | Agent host specified when using TCP                              |
| AGENT_PORT       | INTEGER       | Agent port specified when using TCP                              |
| IS_SSL_ENABLED   | VARCHAR(5)    | Specifies whether the agent listening on TCP port uses SSL       |
| AGENT_GROUP_NAME | NVARCHAR(256) | Agent clustering group to which the agent belongs.               |

## 8.3.7 M\_AGENTS System View [Smart Data Integration]

Provides the status of all agents registered in the SAP HANA database.

## Structure

| Column               | Data type     | Description                                                            |
|----------------------|---------------|------------------------------------------------------------------------|
| AGENT_NAME           | NVARCHAR(256) | Agent name                                                             |
| FREE_PHYSICAL_MEMORY | BIGINT        | Free physical memory on the host                                       |
| FREE_SWAP_SPACE      | BIGINT        | Free swap memory on the host                                           |
| LAST_CONNECT_TIME    | TIMESTAMP     | The last time the session cookie was used for successful re-connection |

| Column               | Data type   | Description                       |
|----------------------|-------------|-----------------------------------|
| SYS_TIMESTAMP        | TIMESTAMP   | Host timestamp in local time zone |
| USED_PHYSICAL_MEMORY | BIGINT      | Used physical memory on the host  |
| USED_SWAP_SPACE      | BIGINT      | Used swap memory on the host      |
| UTC_TIMESTAMP        | TIMESTAMP   | Host timestamp in UTC             |
| AGENT_VERSION        | VARCHAR(32) | Agent version                     |
| AGENT_STATUS         | VARCHAR(16) | Agent status                      |

### 8.3.8 M\_REMOTE\_SOURCES System View [Smart Data Integration]

Stores dictionary status information, remote source owner information, and the status of data collection.

#### Note

This system view is for keeping track of the status of metadata dictionaries for remote sources. If there is no dictionary for a given remote source, it will not appear in the view.

For basic remote source information you can select from REMOTE\_SOURCES. It includes the following.

- REMOTE\_SOURCE\_NAME
- ADAPTER\_NAME
- CONNECTION\_INFO
- AGENT\_GROUP\_NAME

#### Structure

| Column             | Data type     | Description                                                  |
|--------------------|---------------|--------------------------------------------------------------|
| USER_NAME          | NVARCHAR(256) | User name                                                    |
| REMOTE_SOURCE_NAME | NVARCHAR(256) | Remote source name                                           |
| LAST_REFRESH_TIME  | TIMESTAMP     | The successful completion timestamp of the refresh operation |
| REFRESH_START_TIME | TIMESTAMP     | The timestamp of when the refresh operation was executed     |



| Column                | Data type      | Description                                                                                                                                                                                                                     |
|-----------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| REFRESH_STATUS        | VARCHAR(32)    | Refresh operation status: <ul style="list-style-type: none"> <li>STARTED</li> <li>COMPLETED</li> <li>RUNNING (GET OBJECTS)</li> <li>RUNNING (GET OBJECT DETAILS)</li> <li>FAILED</li> <li>CANCELLED</li> <li>CLEARED</li> </ul> |
| REFRESH_ERROR_MESSAGE | NVARCHAR(2000) | Exception message that occurred during refresh operation                                                                                                                                                                        |

### 8.3.9 M\_REMOTE\_SUBSCRIPTION\_COMPONENTS System View [Smart Data Integration]

Provides the status of a remote subscription for each internal component.

#### Structure

| Column            | Data type     | Description                                                                                                    |
|-------------------|---------------|----------------------------------------------------------------------------------------------------------------|
| SCHEMA_NAME       | NVARCHAR(256) | Remote subscription schema name                                                                                |
| SUBSCRIPTION_NAME | NVARCHAR(256) | Remote subscription name                                                                                       |
| COMPONENT         | VARCHAR(10)   | <ul style="list-style-type: none"> <li>DPSERVER</li> <li>ADAPTER</li> <li>RECEIVER</li> <li>APPLIER</li> </ul> |
| STATUS            | VARCHAR       | Component status                                                                                               |
| MESSAGE           | VARCHAR       | Additional information                                                                                         |

### 8.3.10 M\_REMOTE\_SUBSCRIPTION\_STATISTICS System View [Smart Data Integration]

Provides details of current processing details of a remote subscription (e.g. number of messages or transactions received, applied since the start of the SAP HANA database).

## Structure

| Column                 | Data type     | Description                                                            |
|------------------------|---------------|------------------------------------------------------------------------|
| SCHEMA_NAME            | NVARCHAR(256) | Remote subscription schema name                                        |
| SUBSCRIPTION_NAME      | NVARCHAR(256) | Remote subscription name                                               |
| RECEIVED_MESSAGE_COUNT | BIGINT        | Total message/transaction count received by the current connection     |
| RECEIVED_MESSAGE_SIZE  | BIGINT        | Total size of messages/transactions received by the current connection |
| APPLIED_MESSAGE_COUNT  | BIGINT        | Total number of messages/transactions applied                          |
| APPLIED_MESSAGE_SIZE   | BIGINT        | Total size of messages/records applied                                 |
| REJECTED_MESSAGE_COUNT | BIGINT        | Total number of messages/records rejected                              |
| LAST_MESSAGE_RECEIVED  | TIMESTAMP     | Time at which the last message/transaction is received                 |
| LAST_MESSAGE_APPLIED   | TIMESTAMP     | Time at which the last message/transaction is applied                  |
| RECEIVER_LATENCY       | BIGINT        | Receiver latency in microseconds                                       |
| APPLIER_LATENCY        | BIGINT        | Applier latency in microseconds                                        |

### 8.3.11 M\_REMOTE\_SUBSCRIPTIONS System View [Smart Data Integration]

Provides the status and run-time information of a remote subscription.

## Structure

| Column                 | Data type     | Description                                                                                                                                                                                     |
|------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SCHEMA_NAME            | NVARCHAR(256) | Remote subscription schema name                                                                                                                                                                 |
| SUBSCRIPTION_NAME      | NVARCHAR(256) | Remote subscription name                                                                                                                                                                        |
| STATE                  | VARCHAR(256)  | State of event                                                                                                                                                                                  |
| OPTIMIZED_QUERY_STRING | NCLOB         | This is generated and saved so that if there are multiple subscriptions interested in same query result, and the same internal_distribution_id, both the subscriptions can use the same result. |
| OPTIMIZED_QUERY_HASH   | VARCHAR(128)  | Hash is used to query the match for optimized query string                                                                                                                                      |

| Column                            | Data type      | Description                                                                                                                                |
|-----------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| INTERNAL_DISTRIBUTION_ID          | BIGINT         | Generated integer to identify if multiple target tables are interested in the changes from same source SQL or virtual table                |
| OPTIMIZED_QUERY_RESULTSET_TYPE    | TINYINT        | 0 - REGULAR<br>1 - CLUSTER<br>2 - POOL                                                                                                     |
| REMOTE_SUBSCRIPTION               | NVARCHAR(256)  | An optional subscription name registered by the adapter in the remote source system                                                        |
| VOLUME_ID                         | INTEGER        | Persistence Volume ID                                                                                                                      |
| BEGIN_MARKER                      | VARCHAR(64)    | Generated begin marker in the format B<remote_source_oid>_<remote_subscription_oid>_<YYYYMMDDHH24MMSSFF7> when QUEUE command is called.    |
| END_MARKER                        | VARCHAR(64)    | Generated end marker in the format E<remote_source_oid>_<remote_subscription_oid>_<YYYYMMDDHH24MMSSFF7> when DISTRIBUTE command is called. |
| BEGIN_MARKER_TIME                 | TIMESTAMP      | Timestamp when QUEUE request is received.                                                                                                  |
| END_MARKER_TIME                   | TIMESTAMP      | Timestamp when DISTRIBUTE command is called.                                                                                               |
| LAST_PROCESSED_TRANSACTION_ID     | VARBINARY(128) | Transaction ID of the last processed transaction.                                                                                          |
| LAST_PROCESSED_TRANSACTION_TIME   | TIMESTAMP      | Time when the last transaction was applied.                                                                                                |
| LAST_PROCESSED_BEGIN_SEQUENCE_ID  | VARBINARY(68)  | Last processed transaction's begin record sequence ID                                                                                      |
| LAST_PROCESSED_COMMIT_SEQUENCE_ID | VARBINARY(68)  | Last processed transaction's commit record sequence ID                                                                                     |
| LAST_RECEIVED_SEQUENCE_ID         | VARBINARY(68)  | Last received sequence ID                                                                                                                  |
| LAST_RECEIVED_CUSTOM_ID           | NVARCHAR(64)   | Last received custom ID. Custom IDs may be used by adapters with every changed-data row of a transaction.                                  |
| LAST_PROCESSED_CUSTOM_ID          | NVARCHAR(64)   | Last processed custom ID. Custom IDs may be used by adapters with every changed-data row of a transaction.                                 |

## 8.3.12 M\_REMOTE\_QUERY\_STATISTICS System View [Smart Data Integration]

Provides monitoring statistics for remote source queries.

### Structure

| Column                       | Data type     | Description                                                                                                                                                                                                  |
|------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONNECTION_ID                | INTEGER       | Connection ID                                                                                                                                                                                                |
| TRANSACTION_ID               | INTEGER       | Transaction ID                                                                                                                                                                                               |
| STATEMENT_ID                 | NVARCHAR(12)  | Statement ID                                                                                                                                                                                                 |
| REMOTE_SOURCE_SCHEMA_NAME    | NVARCHAR(256) | Remote source schema name                                                                                                                                                                                    |
| REMOTE_SOURCE_NAME           | NVARCHAR(256) | Remote source name                                                                                                                                                                                           |
| USER_NAME                    | NVARCHAR(256) | User name                                                                                                                                                                                                    |
| ACCESSED_VIRTUAL_TABLE_NAMES | NCLOB         | Relevant virtual table name list accessed by the query. The format is <code>&lt;schema&gt; . &lt;name&gt;</code> for a list entry, with entries separated by a comma.                                        |
| STATEMENT_STRING             | NCLOB         | SAP HANA statement string                                                                                                                                                                                    |
| STATEMENT_HASH               | NVARCHAR(32)  | MD5 hash value for the SAP HANA statement string                                                                                                                                                             |
| REMOTE_STATEMENT_STRING      | NCLOB         | Rewritten remote statement string                                                                                                                                                                            |
| REMOTE_STATEMENT_STATUS      | NVARCHAR(10)  | Remote statement status: <ul style="list-style-type: none"> <li>• STARTING</li> <li>• EXECUTING</li> <li>• FETCHING</li> <li>• CANCELLING</li> <li>• CANCELLED</li> <li>• ERROR</li> <li>• CLOSED</li> </ul> |
| REMOTE_STATEMENT_DETAILS     | NCLOB         | Remote statement details                                                                                                                                                                                     |
| FETCH_SIZE                   | INTEGER       | Number of records to fetch at a time                                                                                                                                                                         |
| MAX_RECORD_SIZE              | INTEGER       | Maximum potential size of a record, in bytes                                                                                                                                                                 |
| IS_STREAMING                 | NVARCHAR(5)   | Flag indicating whether results are streamed                                                                                                                                                                 |
| START_TIME                   | TIMESTAMP     | Statement start time                                                                                                                                                                                         |
| END_TIME                     | TIMESTAMP     | Time when the statement is closed                                                                                                                                                                            |

| Column                                         | Data type     | Description                                                                    |
|------------------------------------------------|---------------|--------------------------------------------------------------------------------|
| STATEMENT_REWRITE_DURATION                     | INTEGER       | Time taken to rewrite the statement, in milliseconds                           |
| STATEMENT_EXECUTE_DURATION                     | INTEGER       | Time taken to execute the statement, in milliseconds                           |
| RESULTSET_FETCH_DURATION                       | INTEGER       | Time taken to fetch the result set, in milliseconds                            |
| RESULTSET_SERIALIZE_DURATION                   | INTEGER       | Time taken to serialize the result set, in milliseconds                        |
| RESULTSET_SEND_DURATION                        | INTEGER       | Time taken to send the result set, in milliseconds                             |
| RECEIVED_RECORD_COUNT                          | BIGINT        | Number of records received by the Data Provisioning Server                     |
| RECEIVED_SIZE                                  | BIGINT        | Size of the records received by the Data Provisioning Server, in bytes         |
| DELIVERED_RECORD_COUNT                         | BIGINT        | Number of records delivered to the Index Server                                |
| DELIVERED_RECORD_SIZE                          | BIGINT        | Size of the records delivered to the Index Server, in bytes                    |
| AVG_REQUEST_IDLE_DURATION                      | INTEGER       | Average time waiting for fetch requests from the Index Server, in milliseconds |
| AVG_REQUEST_SERVICING_DURATION                 | INTEGER       | Average time servicing fetch requests from the Index Server, in milliseconds   |
| AGENT_NAME                                     | NVARCHAR(256) | Name of the agent used to process the remote query                             |
| AGENT_START_TIME                               | TIMESTAMP     | Agent statement start time                                                     |
| AGENT_END_TIME                                 | TIMESTAMP     | Time when the statement is closed on the agent                                 |
| AGENT_SENDING_RECORD_COUNT                     | BIGINT        | Number of records sent by the agent                                            |
| AGENT_SERIALIZER_QUEUE_PEAK_MEMORY_IN_USE      | BIGINT        | Peak memory used by the serializer queue, in bytes                             |
| AGENT_SERIALIZER_QUEUE_SIZE_ON_PEAK_MEMORY_USE | BIGINT        | Number of objects in the serializer queue at the time of peak memory usage     |
| AGENT_SERIALIZER_QUEUE_PEAK_TIME               | TIMESTAMP     | Time when the serializer queue reached its peak usage                          |
| AGENT_SERIALIZER_QUEUE_TOTAL_OBJECT_SIZE       | BIGINT        | Total size of all objects that passed through the serializer queue, in bytes   |
| AGENT_SERIALIZER_QUEUE_TOTAL_OBJECT_COUNT      | BIGINT        | Total count of all objects that passed through the serializer queue            |
| AGENT_SERIALIZER_POOL_CAPACITY                 | BIGINT        | Capacity of the serializer shared memory pool, in bytes                        |

| Column                                                    | Data type | Description                                                                                |
|-----------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------|
| AGENT_SERIALIZER_POOL_PEAK_MEMORY_IN_USE_DURING_EXECUTION | BIGINT    | Peak memory used by the serializer shared memory pool during statement execution, in bytes |
| AGENT_SERIALIZER_POOL_PEAK_TIME                           | TIMESTAMP | Time when the serializer pool reached its peak size                                        |
| AGENT_RESPONSE_QUEUE_PEAK_MEMORY_IN_USE                   | BIGINT    | Peak memory used by the response queue, in bytes                                           |
| AGENT_RESPONSE_QUEUE_SIZE_ON_PEAK_MEMORY_IN_USE           | BIGINT    | Number of objects in the response queue at the time of peak usage                          |
| AGENT_RESPONSE_QUEUE_PEAK_TIME                            | TIMESTAMP | Time when the response queue reached its peak usage                                        |
| AGENT_RESPONSE_QUEUE_TOTAL_OBJECT_SIZE                    | BIGINT    | Total size of all objects that passed through the response queue, in bytes                 |
| AGENT_RESPONSE_QUEUE_TOTAL_OBJECT_COUNT                   | BIGINT    | Total count of all objects that passed through the response queue                          |
| AGENT_RESPONSE_POOL_CAPACITY                              | BIGINT    | Capacity of the response shared memory pool, in bytes                                      |
| AGENT_RESPONSE_POOL_PEAK_MEMORY_IN_USE_DURING_EXECUTION   | BIGINT    | Peak memory used by the response shared memory pool during statement execution, in bytes   |
| AGENT_RESPONSE_POOL_PEAK_TIME                             | TIMESTAMP | Time when the response pool reached its peak usage                                         |
| PREFETCH_QUEUE_AVG_MEMORY_IN_USE                          | BIGINT    | Average memory used by the Data Provisioning Server prefetch queue, in bytes               |
| PREFETCH_QUEUE_PEAK_MEMORY_IN_USE                         | BIGINT    | Peak memory used by the Data Provisioning Server prefetch queue, in bytes                  |
| PREFETCH_QUEUE_PEAK_TIME                                  | TIMESTAMP | Time when the prefetch queue reached its peak usage                                        |

### 8.3.13 M\_SESSION\_CONTEXT System View [Smart Data Integration]

Session variables for each connection

#### Note

The M\_SESSION\_CONTEXT view is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the M\_SESSION\_CONTEXT topic for complete information. The information below is specific to smart data integration functionality.

This view shows session variables of all open connections.

Each variable is categorized in SECTION column to USER (user defined variable using SET command or client API call) or SYSTEM (predefined variable or system property).

Table 70: Predefined variables

| Variable Name (M_SESSION_CONTEXT.KEY) | Value Constraint | Set by Client or Server | Shown in M_SESSION_CONTEXT | Server Usage | Description                    |
|---------------------------------------|------------------|-------------------------|----------------------------|--------------|--------------------------------|
| TASK_EXECUTION_ID                     | bigint           | server                  | yes                        | START TASK   | Shows unique task execution ID |

## Related Information

[M\\_SESSION\\_CONTEXT System View \(SAP HANA SQL and System Views Reference\)](#)

### 8.3.14 REMOTE\_SOURCE\_OBJECT\_COLUMNS System View [Smart Data Integration]

If the adapter can provide column-level information for each table in the remote system, once this dictionary is built you can search for relationships between tables. This table is useful for analyzing relationships between tables in the remote source.

## Structure

| Column                | Data type      | Description                                                                        |
|-----------------------|----------------|------------------------------------------------------------------------------------|
| USER_NAME             | NVARCHAR(256)  | For secondary credentials, need to know the owner name                             |
| REMOTE_SOURCE_NAME    | NVARCHAR(256)  | To uniquely identify a remote source                                               |
| OBJECT_NAME           | NVARCHAR(5000) | Unique name to identify remote source object                                       |
| COLUMN_NAME           | NVARCHAR(256)  | Column name                                                                        |
| DATA_TYPE_NAME        | VARCHAR(16)    | SAP HANA data type                                                                 |
| REMOTE_DATA_TYPE_NAME | VARCHAR(32)    | Remote source data type                                                            |
| REMOTE_CONTENT_TYPE   | NVARCHAR(256)  | Examples include address, unit of measure, user-defined types, ZIP code, and so on |
| LENGTH                | INTEGER        | Length/precision of the column                                                     |
| SCALE                 | INTEGER        | Scale of the column                                                                |
| IS_NULLABLE           | VARCHAR(5)     | Various column properties                                                          |
| IS_AUTOINCREMENT      |                |                                                                                    |

## 8.3.15 REMOTE\_SOURCE\_OBJECT\_DESCRIPTIONS System View [Smart Data Integration]

Stores description of browsable node in different languages.

### Structure

| Column             | Data type      | Description                                  |
|--------------------|----------------|----------------------------------------------|
| USER_NAME          | NVARCHAR(256)  | User name                                    |
| REMOTE_SOURCE_NAME | NVARCHAR(256)  | Remote source name                           |
| OBJECT_NAME        | NVARCHAR(5000) | Unique name to identify remote source object |
| LANGUAGE_CODE      | VARCHAR(2)     | Language code                                |
| DESCRIPTION        | NVARCHAR(5000) | Description of this object                   |

## 8.3.16 REMOTE\_SOURCE\_OBJECTS System View [Smart Data Integration]

Stores browsable nodes as well as importable objects (virtual tables). This view is built from remote source metadata dictionaries.

### Structure

| Column             | Data type      | Description                                                                   |
|--------------------|----------------|-------------------------------------------------------------------------------|
| USER_NAME          | NVARCHAR(256)  | User name                                                                     |
| REMOTE_SOURCE_NAME | NVARCHAR(256)  | Remote source name                                                            |
| OBJECT_NAME        | NVARCHAR(5000) | Unique name to identify remote source object                                  |
| DISPLAY_NAME       | NVARCHAR(256)  | Display name for this object                                                  |
| IS_IMPORTABLE      | VARCHAR(5)     | If the object is importable as a virtual table: 'TRUE'/'FALSE'                |
| IS_EXPANDABLE      | VARCHAR(5)     | If the object can be expanded or browsed to get inner objects: 'TRUE'/'FALSE' |
| PARENT_OBJECT_NAME | NVARCHAR(5000) | The parent object name for this object                                        |
| DEFINITION_TYPE    | VARCHAR(32)    | Object definition type                                                        |
| DEFINITION         | NCLOB          | Object definition                                                             |



## 8.3.17 REMOTE\_SOURCES System View [Smart Data Integration]

Remote sources

### Structure

| Column name        | Data type     | Description                  |
|--------------------|---------------|------------------------------|
| REMOTE_SOURCE_NAME | NVARCHAR(256) | Remote source name           |
| ADAPTER_NAME       | NVARCHAR(256) | Adapter name                 |
| CONNECTION_INFO    | NVARCHAR(256) | Connection information       |
| AGENT_GROUP_NAME   | NVARCHAR(256) | Name of the agent group name |

### Related Information

[REMOTE\\_SOURCES System View \(SAP HANA SQL and System Views Reference\)](#)

## 8.3.18 REMOTE\_SUBSCRIPTION\_EXCEPTIONS System View [Smart Data Integration]

Provides details about an exception that occurred during the execution of a remote subscription. The exceptions can be processed using the PROCESS REMOTE SUBSCRIPTION EXCEPTION SQL statement.

### Structure

| Column             | Data type     | Description                                                              |
|--------------------|---------------|--------------------------------------------------------------------------|
| EXCEPTION_OID      | BIGINT        | Exception ID                                                             |
| OBJECT_TYPE        | VARCHAR(19)   | 'REMOTE SOURCE', 'REMOTE SUBSCRIPTION'                                   |
| OBJECT_SCHEMA_NAME | NVARCHAR(256) | Schema name of remote source or remote subscription based on OBJECT_TYPE |

| Column         | Data type      | Description                                                              |
|----------------|----------------|--------------------------------------------------------------------------|
| OBJECT_NAME    | NVARCHAR(256)  | Object name of remote source or remote subscription based on OBJECT_TYPE |
| EXCEPTION_TIME | TIMESTAMP      | Time at which the exception was raised                                   |
| ERROR_NUMBER   | INTEGER        | Error number                                                             |
| ERROR_MESSAGE  | NVARCHAR(2000) | Error message                                                            |
| COMPONENT      | VARCHAR(8)     | Component that raised the exception                                      |

## 8.3.19 REMOTE\_SUBSCRIPTIONS System View [Smart Data Integration]

Lists all the remote subscriptions created for a remote source.

### Structure

| Column                    | Data type      | Description                                                                                                                             |
|---------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| SCHEMA_NAME               | NVARCHAR(256)  | Remote subscription schema name                                                                                                         |
| SUBSCRIPTION_NAME         | NVARCHAR(256)  | Remote subscription name                                                                                                                |
| OWNER_NAME                | NVARCHAR(256)  | Owner name                                                                                                                              |
| REMOTE_SOURCE_NAME        | NVARCHAR(256)  | Remote source name                                                                                                                      |
| IS_VALID                  | VARCHAR(5)     | Specifies whether the remote subscription is valid or not. This becomes FALSE when its source or target objects are changed or dropped. |
| SUBSCRIPTION_TYPE         | VARCHAR(13)    | Remote subscription type                                                                                                                |
| VIRTUAL_TABLE_SCHEMA_NAME | NVARCHAR(256)  | Virtual table schema name                                                                                                               |
| VIRTUAL_TABLE_NAME        | NVARCHAR(256)  | Virtual table name                                                                                                                      |
| SUBSCRIPTION_QUERY_STRING | NCLOB          | Select statement specified in the subscription when subscription type is SQL                                                            |
| TARGET_OBJECT_TYPE        | VARCHAR(9)     | Remote subscription target object type: 'TABLE', 'PROCEDURE', 'TASK'                                                                    |
| TARGET_OBJECT_SCHEMA_NAME | NVARCHAR(256)  | Target object schema name                                                                                                               |
| TARGET_OBJECT_NAME        | NVARCHAR(256)  | Target object name                                                                                                                      |
| TARGET_OTHER_PARAM_STRING | NVARCHAR(4000) | Constant parameter string to pass at execution when target object type is PROCEDURE or TASK                                             |
| TASK_PROCEDURE_PARAMETERS | NVARCHAR(5000) | A comma-separated list of task parameters.                                                                                              |

## 8.3.20 TASK\_CLIENT\_MAPPING System View [Smart Data Integration]

Provides the client mapping when a task is created by the ABAP API.

### Structure

| Column      | Data type     | Description                                                |
|-------------|---------------|------------------------------------------------------------|
| SCHEMA_NAME | NVARCHAR(256) | Name of the schema where the task is located               |
| TASK_NAME   | NVARCHAR(256) | Name of the task                                           |
| CLIENT      | NVARCHAR(128) | Name of the client that created the task with the ABAP API |

## 8.3.21 TASK\_COLUMN\_DEFINITIONS System View [Smart Data Integration]

Defines the columns present in a particular table.

### Structure

| Column         | Data type     | Description                                                  |
|----------------|---------------|--------------------------------------------------------------|
| SCHEMA_NAME    | NVARCHAR(256) | Name of the schema where the task is located                 |
| TASK_NAME      | NVARCHAR(256) | Name of the task                                             |
| OPERATION_NAME | NVARCHAR(128) | Name of the operation in the task plan                       |
| TABLE_NAME     | NVARCHAR(128) | Name of the table defined in the task plan for the operation |
| COLUMN_NAME    | NVARCHAR(128) | Name of the column used in the task plan within a table      |
| MAPPED_NAME    | NVARCHAR(128) | Mapped name of the column used in a task plan within a table |

## 8.3.22 TASK\_EXECUTIONS System View [Smart Data Integration]

Task-level run-time statistics generated when START TASK is run.

TASK\_EXECUTIONS shows one record per task plan execution.

Data in this view is updated while the task is in progress. For example, STATUS, PROCESSED\_RECORDS, and TOTAL\_PROGRESS\_PERCENT are continuously updated until the task is complete.

Users may view information only for tasks that they ran themselves or were granted permissions to view.

### Structure

| Column                   | Data type      | Description                                                                              |
|--------------------------|----------------|------------------------------------------------------------------------------------------|
| HOST                     | VARCHAR(64)    | Host name                                                                                |
| PORT                     | INTEGER        | Internal port                                                                            |
| SCHEMA_NAME              | NVARCHAR(256)  | Schema name used in the task                                                             |
| TASK_NAME                | NVARCHAR(256)  | Name of the task                                                                         |
| CONNECTION_ID            | INTEGER        | Connection identifier                                                                    |
| TRANSACTION_ID           | INTEGER        | Transaction identifier used for the task execution                                       |
| TASK_EXECUTION_ID        | BIGINT         | Task execution unique identifier                                                         |
| PARENT_TASK_EXECUTION_ID | BIGINT         | Parent task identifier                                                                   |
| IS_ASYNC                 | VARCHAR(5)     | TRUE if the task is asynchronous, else FALSE                                             |
| PARAMETERS               | NVARCHAR(5000) | Input parameters for the task                                                            |
| PROCEDURE_PARAMETERS     | NVARCHAR(5000) | Displays the input <param-list> values that were specified in the START TASK SQL command |
| START_TIME               | TIMESTAMP      | Start time of the task                                                                   |
| END_TIME                 | TIMESTAMP      | End time of the task                                                                     |
| DURATION                 | BIGINT         | Execution time of the task (microseconds)                                                |
| STATUS                   | VARCHAR(16)    | Status of the task: STARTING, RUNNING, FAILED, COMPLETED, CANCELLING, or CANCELLED       |
| CURRENT_OPERATION        | NVARCHAR(128)  | Current operation of the task                                                            |
| PROCESSED_RECORDS        | BIGINT         | Total number of records processed                                                        |
| TOTAL_PROGRESS_PERCENT   | BIGINT         | Total task progress (percent)                                                            |
| USER_NAME                | NVARCHAR(256)  | User name                                                                                |
| APPLICATION_USER_NAME    | NVARCHAR(256)  | Application user name                                                                    |
| HAS_SIDE_EFFECTS         | VARCHAR(5)     | 'TRUE' if the task produces side effect data, else 'FALSE'                               |

## 8.3.23 TASK\_LOCALIZATION System View [Smart Data Integration]

Contains localized values for the task framework tables.

### Structure

| Column      | Data type      | Description                                          |
|-------------|----------------|------------------------------------------------------|
| LOC_TYPE_ID | INTEGER        | Identifier of the type of the entity being localized |
| LOC_ID      | NVARCHAR(64)   | Identifier of the entity being localized             |
| LANGUAGE    | NVARCHAR(1)    | One-character code of the localized language         |
| DESCRIPTION | NVARCHAR(1024) | Localized description                                |

## 8.3.24 TASK\_OPERATIONS System View [Smart Data Integration]

Contains all operations that exist for a given task, as well as details about those operations.

### Structure

| Column           | Data type     | Description                                          |
|------------------|---------------|------------------------------------------------------|
| SCHEMA_NAME      | NVARCHAR(256) | Name of the schema where the task is located         |
| TASK_NAME        | NVARCHAR(256) | Name of the task                                     |
| OPERATION_NAME   | NVARCHAR(128) | Name of the operation in the task plan               |
| COMMENTS         | NVARCHAR(512) | Comments made on the operation                       |
| HAS_SIDE_EFFECTS | TINYINT       | Specifies whether the operation has side-effect data |
| OPERATION_TYPE   | NVARCHAR(128) | Type of operation in the task plan                   |

## 8.3.25 TASK\_OPERATIONS\_EXECUTIONS System View [Smart Data Integration]

Operations-level task statistics generated when START TASK is run.

TASK\_OPERATIONS\_EXECUTIONS shows one record per operation.

Data in this view is updated while the task is in progress. For example, STATUS, PROCESSED\_RECORDS, and OPERATIONS\_PROGRESS\_PERCENT are continuously updated until the task is complete.

Users may view information only for tasks that they ran themselves or were granted permissions to view.

### Structure

| Column                     | Data type     | Description                                                                                                                                                                           |
|----------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HOST                       | VARCHAR(64)   | Host name                                                                                                                                                                             |
| PORT                       | INTEGER       | Internal port                                                                                                                                                                         |
| TASK_EXECUTION_ID          | BIGINT        | Task identifier                                                                                                                                                                       |
| CONNECTION_ID              | INTEGER       | Connection identifier                                                                                                                                                                 |
| TRANSACTION_ID             | INTEGER       | Transaction identifier used for the task execution                                                                                                                                    |
| CURRENT_OPERATION          | NVARCHAR      | Name of operation                                                                                                                                                                     |
| OPERATION_TYPE             | NVARCHAR(128) | Type of operation                                                                                                                                                                     |
| OPERATION_NAME             | NVARCHAR(128) | Internal name of operation                                                                                                                                                            |
| START_TIME                 | TIMESTAMP     | Start time of the task                                                                                                                                                                |
| END_TIME                   | TIMESTAMP     | End time of the task                                                                                                                                                                  |
| DURATION                   | BIGINT        | Execution time of the task (microseconds)                                                                                                                                             |
| STATUS                     | VARCHAR(16)   | Status of the task: <ul style="list-style-type: none"> <li>• STARTING</li> <li>• RUNNING</li> <li>• FAILED</li> <li>• COMPLETED</li> <li>• CANCELLING</li> <li>• CANCELLED</li> </ul> |
| PROCESSED_RECORDS          | BIGINT        | Total number of records processed                                                                                                                                                     |
| OPERATION_PROGRESS_PERCENT | DOUBLE        | Operation progress (percent)                                                                                                                                                          |
| HAS_SIDE_EFFECTS           | VARCHAR(5)    | 'TRUE' if the task produces side effect data, else 'FALSE'                                                                                                                            |

## 8.3.26 TASK\_PARAMETERS System View [Smart Data Integration]

Details about the task parameters view

### Structure

| Column            | Data type     | Description                               |
|-------------------|---------------|-------------------------------------------|
| SCHEMA_NAME       | NVARCHAR(256) | Schema in which the task was created      |
| TASK_NAME         | NVARCHAR(256) | Name of task                              |
| PARAMETER_NAME    | NVARCHAR(256) | Name of parameter                         |
| POSITION          | INTEGER       | Position of parameter                     |
| TABLE_TYPE_SCHEMA | NVARCHAR(256) | Schema in which the TableType was created |
| TABLE_TYPE_NAME   | NVARCHAR(256) | Name of TableType                         |
| PARAMETER_TYPE    | VARCHAR(7)    | Parameter type: IN or OUT                 |

## 8.3.27 TASK\_TABLE\_DEFINITIONS System View [Smart Data Integration]

Contains all of the tables used by the various side-effect producing operation.

### Structure

| Column             | Data type     | Description                                                 |
|--------------------|---------------|-------------------------------------------------------------|
| SCHEMA_NAME        | NVARCHAR(256) | Name of the schema where the task is located                |
| TASK_NAME          | NVARCHAR(256) | Name of the task                                            |
| OPERATION_NAME     | NVARCHAR(128) | Name of the operation in the task plan                      |
| TABLE_ID           | INTEGER       | Unique identifier for the table                             |
| TABLE_NAME         | NVARCHAR(128) | Name of the table defined in the task plan for an operation |
| SIDE_EFFECT_SCHEMA | NVARCHAR(128) | Schema where the generated side-effect table is located     |

| Column               | Data type     | Description                                                         |
|----------------------|---------------|---------------------------------------------------------------------|
| SIDE_EFFECT_NAME     | NVARCHAR(128) | Name of the generated side-effect table                             |
| IS_PRIMARY_TABLE     | TINYINT       | Specifies whether this table is the primary table in a relationship |
| OPERATION_TABLE_TYPE | NVARCHAR(20)  | Type of operation that the table is used within                     |

### 8.3.28 TASK\_TABLE\_RELATIONSHIPS System View [Smart Data Integration]

Defines the relationships, if any, between tables within an operation.

#### Structure

| Column             | Data type     | Description                                                                           |
|--------------------|---------------|---------------------------------------------------------------------------------------|
| SCHEMA_NAME        | NVARCHAR(256) | Name of the schema where the task is located                                          |
| TASK_NAME          | NVARCHAR(256) | Name of the task                                                                      |
| OPERATION_NAME     | NVARCHAR(128) | Name of the operation in the task plan                                                |
| TABLE_NAME         | NVARCHAR(128) | Name of the table defined in the task plan for an operation                           |
| RELATED_TABLE_NAME | NVARCHAR(128) | Name of the table to which the table specified in TABLE_NAME is related               |
| FROM_ATTRIBUTE     | NVARCHAR(128) | Name of the column in the TABLE_NAME table that relates to the TO_ATTRIBUTE           |
| TO_ATTRIBUTE       | NVARCHAR(128) | Name of the column in the RELATED_TABLE_NAME table that relates to the FROM_ATTRIBUTE |

### 8.3.29 TASKS System View [Smart Data Integration]

Details about tasks.



## Structure

| Column                | Data type     | Description                                                                                                                     |
|-----------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------|
| TASK_OID              | BIGINT        | Unique identifier for a task                                                                                                    |
| TASK_NAME             | NVARCHAR(256) | Name of task                                                                                                                    |
| SCHEMA_NAME           | NVARCHAR(256) | Schema the task was created in                                                                                                  |
| OWNER_NAME            | NVARCHAR(256) | Owner of the task                                                                                                               |
| CREATE_TIME           | TIMESTAMP     | Creation time                                                                                                                   |
| MEMORY_SIZE           | BIGINT        | Memory size of loaded task                                                                                                      |
| TASK_TYPE             | NVARCHAR(64)  | Type of task ('PLAN' or 'PROCEDURE'), based on how the task was created                                                         |
| PLAN_VERSION          | NVARCHAR(32)  | Version of the task plan                                                                                                        |
| PLAN                  | NCLOB         | Task plan used to define the task, or task plan generated to call the procedure                                                 |
| COMMENTS              | NVARCHAR(256) | Description of the task, from the task plan                                                                                     |
| HAS_TABLE_TYPE_INPUT  | VARCHAR(5)    | 'TRUE' if the task is modeled with a table type as input, meaning data would need to be passed at execution time                |
| HAS_SDQ               | VARCHAR(5)    | 'TRUE' if the task contains SDQ (smart data quality) functionality                                                              |
| IS_REALTIME_TASK      | VARCHAR(5)    | 'TRUE' if the task is a realtime task, else 'FALSE'                                                                             |
| IS_VALID              | VARCHAR(5)    | 'TRUE' if the task is in a valid state; 'FALSE' if it has been invalidated by a dependency                                      |
| IS_READ_ONLY          | VARCHAR(5)    | 'TRUE' if the task is read only (has only table type outputs), 'FALSE' if it writes to non-table-type outputs                   |
| PROCEDURE_SCHEMA      | NVARCHAR(256) | If the task was created with a procedure instead of a plan, this attribute will contain the schema name of the stored procedure |
| PROCEDURE_NAME        | NVARCHAR(256) | If the task was created with a procedure instead of a plan, this attribute will contain the name of the stored procedure        |
| INPUT_PARAMETER_COUNT | SMALLINT      | Number of input (tableType) parameters                                                                                          |
| OUTPUT_PARAMETER      | SMALLINT      | Number of output (tableType) parameters                                                                                         |
| SQL_SECURITY          | VARCHAR(7)    | Security model for the task, either 'DEFINER' or 'INVOKER'                                                                      |

## 8.3.30 VIRTUAL\_COLUMN\_PROPERTIES System View [Smart Data Integration]

Lists the properties of the columns in a virtual table sent by the adapter via CREATE VIRTUAL TABLE SQL statement.

### Structure

| Column      | Data type     | Description                  |
|-------------|---------------|------------------------------|
| SCHEMA_NAME | NVARCHAR(256) | Schema name of virtual table |
| TABLE_NAME  | NVARCHAR(256) | Virtual table name           |
| COLUMN_NAME | NVARCHAR(256) | Virtual table column name    |
| PROPERTY    | NVARCHAR(256) | Property name                |
| VALUE       | NVARCHAR(512) | Property value               |

## 8.3.31 VIRTUAL\_TABLE\_PROPERTIES System View [Smart Data Integration]

Lists the properties of a virtual table sent by the adapter via the CREATE VIRTUAL TABLE SQL statement.

### Structure

| Column      | Data type     | Description                                                                                       |
|-------------|---------------|---------------------------------------------------------------------------------------------------|
| SCHEMA_NAME | NVARCHAR(256) | Schema name of virtual table                                                                      |
| TABLE_NAME  | NVARCHAR(256) | Virtual table name                                                                                |
| PROPERTY    | NVARCHAR(256) | Property name                                                                                     |
| VALUE       | NCLOB         | Property value. For example: <ul style="list-style-type: none"><li>Large XSD of size 1M</li></ul> |

## 8.3.32 BEST\_RECORD\_GROUP\_MASTER\_STATISTICS System View [Smart Data Quality]

Contains a summary of Best Record group master statistics.

### Structure

| Column                | Data type     | Description                                                                             |
|-----------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME           | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME             | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID     | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME        | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| NUM_RECORDS           | BIGINT        | Total number of records processed                                                       |
| NUM_GROUP_MASTERS     | BIGINT        | Number of group master records processed                                                |
| NUM_DUPLICATES        | BIGINT        | Number of duplicate records processed                                                   |
| NUM_SURVIVORS         | BIGINT        | Number of surviving records processed                                                   |
| NUM_NON_MATCH_RECORDS | BIGINT        | Number of non-matching records processed                                                |

## 8.3.33 BEST\_RECORD\_RESULTS System View [Smart Data Quality]

Contains governance information for every column in every record that is updated in the best record process.

### Structure

| Column      | Data type     | Description                                  |
|-------------|---------------|----------------------------------------------|
| SCHEMA_NAME | NVARCHAR(256) | Name of the schema where the task is located |

| Column            | Data type     | Description                                                                                         |
|-------------------|---------------|-----------------------------------------------------------------------------------------------------|
| TASK_NAME         | NVARCHAR(256) | Name of the task                                                                                    |
| TASK_EXECUTION_ID | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called             |
| OPERATION_NAME    | NVARCHAR(128) | Name of the operation in the task plan                                                              |
| DST_TABLE_NAME    | NVARCHAR(128) | Name of the destination table for the operation                                                     |
| DST_ROW_ID        | BIGINT        | Unique identifier for the destination row                                                           |
| DST_COLUMN_NAME   | NVARCHAR(128) | Name of the destination column in the destination table                                             |
| DST_ROW_TYPE      | NVARCHAR(1)   | Identifies how the record was updated or if it was newly created                                    |
| SRC_TABLE_NAME    | NVARCHAR(128) | Name of the source table for the operation                                                          |
| SRC_ROW_ID        | BIGINT        | Unique identifier for the source row                                                                |
| SRC_COLUMN_NAME   | NVARCHAR(128) | Name of the source column in the source table                                                       |
| STRATEGY_GROUP_ID | INTEGER       | Identification number that identifies the best record strategy group                                |
| STRATEGY_ID       | INTEGER       | Identification number that identifies each strategy listed in the strategy group                    |
| BEST_RECORD_RULE  | NVARCHAR(256) | Name of the rule that updates one or more columns as it is defined in the best record configuration |
| ACTION_NAME       | NVARCHAR(256) | Name of the action that updates a column as it is defined in the best record configuration          |
| UPDATE_NUM        | INTEGER       | Number of times the column was updated in the best record process                                   |
| OPERATION_TYPE    | NVARCHAR(1)   | Identifies how the record was updated in the best record process                                    |

### 8.3.34 BEST\_RECORD\_STRATEGIES System View [Smart Data Quality]

Contains information on which strategies are used in each strategy group and in which order.

## Structure

| Column              | Data type     | Description                                                                             |
|---------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME         | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME           | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID   | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME      | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| STRATEGY_GROUP_NAME | NVARCHAR(256) | Name of the strategy group as defined in the best record configuration                  |
| STRATEGY_ID         | INTEGER       | Identification number that identifies each strategy listed in the strategy group        |
| STRATEGY_ORDER      | INTEGER)      | Order of the strategy as defined in the list of strategies                              |
| STRATEGY_NAME       | NVARCHAR(256) | Name of the strategy as defined in the best record configuration                        |

### 8.3.35 CLEANSE\_ADDRESS\_RECORD\_INFO System View [Smart Data Quality]

Describes how well an address was assigned as well as the type of address.

## Structure

| Column            | Data type     | Description                                                                             |
|-------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME       | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME         | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME    | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| TABLE_NAME        | NVARCHAR(128) | Name of the table defined in the task plan for the operation                            |

| Column                     | Data type     | Description                                                                                    |
|----------------------------|---------------|------------------------------------------------------------------------------------------------|
| ROW_ID                     | BIGINT        | Unique identifier of the row processed for this execution of the task plan                     |
| ENTITY_INSTANCE            | INTEGER       | Identifier to differentiate between multiple entities processed in a row                       |
| ENTITY_INSTANCE_OCCURRENCE | INTEGER       | Unique identifier to identify the occurrence of an entity                                      |
| DATA_SOURCE                | NVARCHAR(256) | Source where the data was produced                                                             |
| ISO_COUNTRY_2CHAR          | NVARCHAR(4)   | Two-character country code                                                                     |
| ASSIGNMENT_TYPE            | NVARCHAR(4)   | Code that represents the type of an address                                                    |
| ASSIGNMENT_INFORMATION     | NVARCHAR(4)   | Code that specifies the validity of an address                                                 |
| ASSIGNMENT_LEVEL           | NVARCHAR(4)   | Code that represents the level to which the address matched data in the address reference data |

### 8.3.36 CLEANSE\_CHANGE\_INFO System View [Smart Data Quality]

Describes the changes made during the cleansing process.

#### Structure

| Column            | Data type     | Description                                                                             |
|-------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME       | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME         | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME    | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| TABLE_NAME        | NVARCHAR(128) | Name of the table defined in the task plan for the operation                            |

| Column                     | Data type     | Description                                                                    |
|----------------------------|---------------|--------------------------------------------------------------------------------|
| ROW_ID                     | BIGINT        | Unique identifier of the row processed for this execution of the task plan     |
| ENTITY_ID                  | NVARCHAR(12)  | Identifier describing the type of record that was processed                    |
| ENTITY_INSTANCE            | INTEGER       | Identifier to differentiate between multiple entities processed in a row       |
| ENTITY_INSTANCE_OCCURRENCE | INTEGER       | Unique identifier to identify the occurrence of an entity                      |
| COMPONENT_ID               | NVARCHAR(12)  | Identification number that refers to data components                           |
| COMPONENT_ELEMENT_ID       | NVARCHAR(12)  | Identification number that refers to more granular elements within a component |
| DATA_SOURCE                | NVARCHAR(256) | Source where the data was produced                                             |
| CHANGE_SIGNIFICANCE_ID     | NVARCHAR(12)  | Identification number that refers to the significance of the change            |

### 8.3.37 CLEANSE\_COMPONENT\_INFO System View [Smart Data Quality]

Identifies the location of parsed data elements in the input and output.

#### Structure

| Column            | Data type     | Description                                                                                         |
|-------------------|---------------|-----------------------------------------------------------------------------------------------------|
| SCHEMA_NAME       | NVARCHAR(256) | Name of the schema where the task is located                                                        |
| TASK_NAME         | NVARCHAR(256) | Name of the task                                                                                    |
| TASK_EXECUTION_ID | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called             |
| OPERATION_NAME    | NVARCHAR(128) | Name of the operation in the task plan                                                              |
| ENTITY_ID         | NVARCHAR(12)  | Identifier describing a data attribute such as a person name, organization name, address and so on. |

| Column                       | Data type     | Description                                                                    |
|------------------------------|---------------|--------------------------------------------------------------------------------|
| ENTITY_INSTANCE              | INTEGER       | Identifier to differentiate between multiple entities processed in a row       |
| ENTITY_INSTANCE_OCCURRENCE   | INTEGER       | Unique identifier to identify the occurrence of an entity                      |
| DATA_SOURCE                  | NVARCHAR(256) | Source where the data originated                                               |
| COMPONENT_ID                 | NVARCHAR(12)  | Identification number that refers to data components                           |
| COMPONENT_ELEMENT_ID         | NVARCHAR(12)  | Identification number that refers to more granular elements within a component |
| TABLE_NAME                   | NVARCHAR(128) | Name of the input table where the component element was found                  |
| ROW_ID                       | BIGINT        | Unique identifier of the row processed for this execution of the task plan     |
| COLUMN_NAME                  | NVARCHAR(128) | Name of the column in the input table where the component element was found    |
| COLUMN_START_POSITION        | INTEGER       | Starting character of the component element in the input column                |
| COLUMN_DATA_LENGTH           | INTEGER       | Number of characters of the component element in the input column              |
| OUTPUT_TABLE_NAME            | NVARCHAR(128) | Name of the output table where the component element was written               |
| OUTPUT_COLUMN_NAME           | NVARCHAR(128) | Name of the column in the output table where the component element was written |
| OUTPUT_COLUMN_START_POSITION | INTEGER       | Starting character of the component element in the output column               |
| OUTPUT_COLUMN_DATA_LENGTH    | INTEGER       | Number of characters of the component element in the output column             |

### 8.3.38 CLEANSE\_INFO\_CODES System View [Smart Data Quality]

Contains one row per info code generated by the cleansing process.



## Structure

| Column                     | Data type     | Description                                                                             |
|----------------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME                | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME                  | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID          | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME             | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| TABLE_NAME                 | NVARCHAR(128) | Name of the table defined in the task plan for the operation                            |
| ROW_ID                     | BIGINT        | Unique identifier of the row processed for this execution of the task plan              |
| ENTITY_ID                  | NVARCHAR(12)  | Identifier describing the type of record that was processed                             |
| ENTITY_INSTANCE            | INTEGER       | Identifier to differentiate between multiple entities processed in a row                |
| ENTITY_INSTANCE_OCCURRENCE | INTEGER       | Unique identifier to identify the occurrence of an entity                               |
| DATA_SOURCE                | NVARCHAR(256) | Source where the data was produced                                                      |
| INFO_CODE                  | NVARCHAR(10)  | Information code that gives information about the processing of the record              |

### 8.3.39 CLEANSE\_STATISTICS System View [Smart Data Quality]

Contains a summary of Cleanse statistics.

## Structure

| Column      | Data type     | Description                                  |
|-------------|---------------|----------------------------------------------|
| SCHEMA_NAME | NVARCHAR(256) | Name of the schema where the task is located |
| TASK_NAME   | NVARCHAR(256) | Name of the task                             |

| Column                       | Data type     | Description                                                                             |
|------------------------------|---------------|-----------------------------------------------------------------------------------------|
| TASK_EXECUTION_ID            | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME               | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| ENTITY_ID                    | NVARCHAR(12)  | Identifier describing the type of record that was processed                             |
| ENTITY_INSTANCE              | INTEGER       | Identifier to differentiate between multiple entities processed in a row                |
| NUM_RECORDS                  | BIGINT        | Total number of records processed for the entity instance                               |
| NUM_VALIDS                   | BIGINT        | Number of valid records processed for the entity instance                               |
| NUM_SUSPECTS                 | BIGINT        | Number of suspect records processed for the entity instance                             |
| NUM_BLANKS                   | BIGINT        | Number of blank records processed for the entity instance                               |
| NUM_HIGH_SIGNIFICANT_CHANGES | BIGINT        | Number of records with high significance changes for the entity instance                |

### 8.3.40 GEOCODE\_INFO\_CODES System View [Smart Data Quality]

Contains one row per info code generated by the geocode transformation process.

#### Structure

| Column            | Data type     | Description                                                                             |
|-------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME       | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME         | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME    | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| TABLE_NAME        | NVARCHAR(128) | Name of the table defined in the task plan for the operation                            |

| Column      | Data type     | Description                                                                |
|-------------|---------------|----------------------------------------------------------------------------|
| ROW_ID      | BIGINT        | Unique identifier of the row processed for this execution of the task plan |
| DATA_SOURCE | NVARCHAR(256) | Source where the data was produced                                         |
| INFO_CODE   | NVARCHAR(10)  | Information code generated by the geocode transformation operation         |

### 8.3.41 GEOCODE\_STATISTICS System View [Smart Data Quality]

Contains a summary of Geocode statistics.

#### Structure

| Column            | Data type     | Description                                                                             |
|-------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME       | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME         | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME    | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| NUM_RECORDS       | BIGINT        | Total number of records processed                                                       |
| NUM_ASSIGNED      | BIGINT        | Number of assigned records processed                                                    |
| NUM_UNASSIGNED    | BIGINT        | Number of unassigned records processed                                                  |

### 8.3.42 MATCH\_GROUP\_INFO System View [Smart Data Quality]

Contains one row for each match group.

## Structure

| Column            | Data type     | Description                                                                             |
|-------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME       | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME         | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME    | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| GROUP_ID          | INTEGER       | Group identification number                                                             |
| GROUP_COUNT       | INTEGER       | Number of records in the match group                                                    |
| SOURCE_COUNT      | INTEGER       | Number of sources represented in the match group                                        |
| REVIEW_GROUP      | NVARCHAR(1)   | Indicates whether the group is flagged for review                                       |
| CONFLICT_GROUP    | NVARCHAR(1)   | Indicates whether the group is flagged for conflict                                     |

### 8.3.43 MATCH\_RECORD\_INFO System View [Smart Data Quality]

Contains one row for each matching record per level.

## Structure

| Column            | Data type     | Description                                                                             |
|-------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME       | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME         | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME    | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| TABLE_NAME        | NVARCHAR(128) | Name of the table defined in the task plan for the operation                            |

| Column   | Data type | Description                                                                |
|----------|-----------|----------------------------------------------------------------------------|
| ROW_ID   | BIGINT    | Unique identifier of the row processed for this execution of the task plan |
| GROUP_ID | INTEGER   | Group identification number                                                |

### 8.3.44 MATCH\_SOURCE\_STATISTICS System View [Smart Data Quality]

Contains counts of matches within and between data sources.

#### Structure

| Column              | Data type     | Description                                                                                                  |
|---------------------|---------------|--------------------------------------------------------------------------------------------------------------|
| SCHEMA_NAME         | NVARCHAR(256) | Name of the schema where the task is located                                                                 |
| TASK_NAME           | NVARCHAR(256) | Name of the task                                                                                             |
| TASK_EXECUTION_ID   | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called                      |
| OPERATION_NAME      | NVARCHAR(128) | Name of the operation in the task plan                                                                       |
| SOURCE_NAME         | NVARCHAR(256) | Data source name                                                                                             |
| RELATED_SOURCE_NAME | NVARCHAR(256) | Related data source name                                                                                     |
| NUM_MATCH_DECISIONS | INTEGER       | Number of comparisons resulting in a match decision between records in each SOURCE_ID/RELATED_SOURCE_ID pair |

### 8.3.45 MATCH\_STATISTICS System View [Smart Data Quality]

Contains statistics regarding the run of the transformation operation.

## Structure

| Column                    | Data type     | Description                                                                             |
|---------------------------|---------------|-----------------------------------------------------------------------------------------|
| SCHEMA_NAME               | NVARCHAR(256) | Name of the schema where the task is located                                            |
| TASK_NAME                 | NVARCHAR(256) | Name of the task                                                                        |
| TASK_EXECUTION_ID         | BIGINT        | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME            | NVARCHAR(128) | Name of the operation in the task plan                                                  |
| NUM_RECORDS               | BIGINT        | Total number of records processed by the transformation operation                       |
| NUM_MATCH_RECORDS         | BIGINT        | Number of records that reside in match groups                                           |
| NUM_NON_MATCH_RECORDS     | BIGINT        | Number of non-matching records that do not reside in match groups                       |
| NUM_MATCH_GROUPS          | BIGINT        | Number of match groups identified                                                       |
| NUM_REVIEW_GROUPS         | BIGINT        | Number of match groups flagged for review                                               |
| NUM_NON_REVIEW_GROUPS     | BIGINT        | Number of match groups not flagged for review                                           |
| NUM_CONFLICT_GROUPS       | BIGINT        | Number of match groups flagged with conflicts                                           |
| NUM_COMPARISONS_PERFORMED | BIGINT        | Number of comparisons performed by the transformation operation                         |
| NUM_MATCH_DECISIONS       | BIGINT        | Number of comparisons resulting in a match decision                                     |

### 8.3.46 MATCH\_TRACING System View [Smart Data Quality]

Contains one row for each match decision made during the matching process.

## Structure

| Column      | Data type     | Description                                  |
|-------------|---------------|----------------------------------------------|
| SCHEMA_NAME | NVARCHAR(256) | Name of the schema where the task is located |



| <b>Column</b>      | <b>Data type</b> | <b>Description</b>                                                                      |
|--------------------|------------------|-----------------------------------------------------------------------------------------|
| TASK_NAME          | NVARCHAR(256)    | Name of the task                                                                        |
| TASK_EXECUTION_ID  | BIGINT           | Unique identifier for a particular run of a task plan created when START TASK is called |
| OPERATION_NAME     | NVARCHAR(128)    | Name of the operation in the task plan                                                  |
| TABLE_NAME         | NVARCHAR(128)    | Name of the table defined in the task plan for the operation                            |
| ROW_ID             | BIGINT           | Unique identifier of the row processed for this execution of the task plan              |
| RELATED_TABLE_NAME | NVARCHAR(128)    | Name of the table defined in the task plan for an operation                             |
| RELATED_ROW_ID     | BIGINT           | Unique identifier of the row processed for this execution of the task plan              |
| POLICY_NAME        | NVARCHAR(256)    | Name of the match policy that processed the related rows                                |
| RULE_NAME          | NVARCHAR(256)    | Name of the match rule that processed the related rows                                  |
| SCORE              | INTEGER          | Similarity score of the related rows                                                    |

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