

SAP Landscape Management 3.0 and IBM Power Systems Servers

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 Analytics

Power Systems



IBM Redbooks

**SAP Landscape Management 3.0 and IBM Power
Systems Servers**

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Note: Before using this information and the product it supports, read the information in “Notices” on page v.

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Preface

This IBM® Redpaper publication is part of a series of technical documentation to help the enablement of SAP on Linux for IBM Power Systems servers and IBM System Storage™ servers.

This book describes how by using SAP Landscape Management (SAP LaMa) 3.0 software that clients gain full visibility and control over their SAP and non-SAP systems, including the underlying physical, virtual, and cloud infrastructures. With SAP LaMa, you can automate repetitive tasks to manage critical applications across complex, hybrid IT landscapes.

This publication helps you to better control IT costs and increase business agility, for example, by freeing staff to focus on more strategic work rather than manual, error-prone tasks.

The target audiences of this book are architects, IT specialists, and systems administrators deploying SAP LaMa 3.0 whom often spend much time and effort managing and provisioning SAP software systems and landscapes.

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Introducing SAP Landscape Management 3.0 and IBM Power Systems servers

This document is part of a series of technical documentation for SAP on Power Systems servers and IBM System Storage servers.

The target audience is architects or administrators deciding on purchasing and deploying SAP Landscape Management 3.0 (SAP LaMa) on IBM Power Systems servers.

This chapter contains the following topic:

- ▶ Introduction

1.1 Introduction

Clients often spend much time and effort managing and provisioning SAP software systems and landscapes.

By using SAP LaMa software, clients gain full visibility and control over their SAP and non-SAP systems, including the underlying physical, virtual, and cloud infrastructures. With SAP LaMa, you can automate repetitive tasks to manage critical applications across complex, hybrid IT landscapes so that you can better control IT costs and increase business agility, for example, by freeing staff to focus on more strategic work rather than manual, error-prone tasks.

IBM PowerVC is an advanced virtualization and cloud management offering. Built on OpenStack, it provides simplified virtualization management and cloud deployments for IBM AIX®, IBM i, and Linux virtual machines (VMs) running on IBM Power Systems servers. You can use the offer to build a private cloud on the Power Systems servers and improve administrator productivity. It can further integrate with multi-cloud environments through higher-level cloud orchestrators.

SAP LaMa provides a built-in integration with IBM PowerVC so that the SAP Basis administrator can holistically manage critical SAP applications. The SAP Basis administrator gets a complete overview of the full landscape of storage, servers, logical partitions (LPARs), and SAP Application Server and Database Instances, and they can efficiently manage and operate those components in a Power Systems and Storage System landscape.

Chapter 2, “SAP Landscape Management 3.0” on page 3 provides information about integration aspects with Power Systems technologies.



SAP Landscape Management 3.0

This section describes the SAP Landscape Management (SAP LaMa) 3.0 integration aspects with IBM Power Systems technologies.

This chapter contains the following topics:

- ▶ Overview
- ▶ Introducing typical use cases with SAP LaMa
- ▶ Setting up an SAP LaMa environment
- ▶ Running SAP System Copy in SAP LaMa
- ▶ Outlook

2.1 Overview

This section gives an overview of SAP LaMa and focuses on key aspects for integration with IBM Power Systems technologies.

SAP LaMa is an application that runs on top of an SAP NetWeaver Application Server (SAP NetWeaver AS) for Java. It provides a centralized and simplified framework for managing SAP and non-SAP solutions and systems, including SAP HANA and SAP S/4HANA systems. The goal of SAP LaMa is to simplify the management of hybrid SAP landscapes that are deployed either on-premises bare-metal or virtualized servers, or in the cloud.

SAP LaMa enables the automation of repetitive, day-to-day administration tasks for the SAP Basis administrators, which include complex provisioning operations like copying SAP systems or installing SAP application servers. By using SAP LaMa and its front end, SAP Basis administrators have simplified access to the infrastructure elements that are required for fulfilling their tasks.

SAP recently added many extensions to SAP LaMa as a standard solution for managing and operating SAP HANA powered landscapes. Advanced SAP HANA operations like performing system replication setup, takeovers, failbacks, system copies, system refreshes, and minimizing business downtime during SAP HANA maintenance activities can be managed with SAP LaMa (*LaMa4HANA*).

SAP LaMa relies on the SAP Host Agent and SAP Adaptive Extensions for monitoring and management of the operating system (OS). Those components must be installed on each host that is managed by SAP LaMa. The SAP Host Agent package includes all required elements for centrally monitoring and managing any kind of OSs that are covered in the SAP NetWeaver support matrix, which you can see in the [SAP Product Availability Matrix \(PAM\)](#). The SAP Host Agent is complemented by SAP Adaptive Extensions. By using those methods, SAP LaMa performs various operations on the host, such as:

- ▶ Perform operations on SAP HANA systems and tenant databases.
- ▶ Discover SAP HANA systems.
- ▶ Provision SAP HANA tenant databases.
- ▶ Monitor SAP HANA systems and tenant databases.
- ▶ Reexport Network File System (NFS).
- ▶ Manage virtual host names and IBM Storage by using SAP Adaptive Extensions (SAPACOSPrep) for the IBM PowerLinux platform.

Three main integration points for SAP Partner Technologies are available for SAP LaMa:

- ▶ Virtualization and Cloud Management
- ▶ Storage Management
- ▶ Orchestration

IBM provides adapters for Virtualization Management and Storage Management that are directly integrated with the SAP LaMa software. These adapters convert the generic SAP LaMa calls to platform-specific commands that are then run by the appropriate infrastructure component. The integration with IBM PowerVC allows virtualization monitoring and management of IBM Power Systems servers and logical partitions (LPARs), including the provisioning of new LPARs. By using IBM PowerVC to make the virtualization data available, all the dependencies on which the SAP systems are installed and the physical server on which they are running can be identified and visualized. When using IBM back-end storage that is storage area network (SAN)-attached to the LPAR by using N-Port ID Virtualization (NPIV) and managed by IBM PowerVC, then adaptively installed SAP systems can be relocated between different LPARs, and “Storage-based” System Copy/Clone can be run.

For Orchestration, SAP LaMa provides a REST API that you can use to get or update information from or to SAP LaMa or to trigger actions in SAP LaMa remotely. This API is a generic interface because there is no IBM specific extension that is available. Clients can define their own custom operations and processes and trigger them externally.

Table 2-1 lists the communication layers between SAP LaMa and the managed components (SAP instances and infrastructure).

Table 2-1 Communication layers for SAP LaMa and managed components

Method	Description
Remote Function Call (RFC)	SAP LaMa triggers RFCs in the SAP system for running SAP Basis system management tasks (for example, Post Copy Automation (PCA) task lists).
SAP Instance Agent (sapstartsrv)	Start, stop, and get the status of the SAP Instance.
SAP Host Agent (saphostexec) and Adaptive Extensions	Runs commands on the OS level to mount or unmount file systems, acquire or release IP addresses, and define custom commands. Perform database actions and monitoring (sapdbctr1).
Virtualization Adapter (IBM PowerVC)	Full visibility across server and virtualization, and mapping with SAP application topology. Automated provisioning of LPARs. Trigger live migrations from one system to another. Power off and power on LPARs. Gather information about hosts and OSs statuses and details.
Storage Adapter (IBM PowerVC)	Gather details about the storage volumes of the SAP system and instances. Perform storage mapping (attach and detach storage volumes to and from a host). Manage consistency groups and snapshots for the volumes that are required for SAP System Copy and Clone scenarios.

Figure 2-1 illustrates the different communication paths.

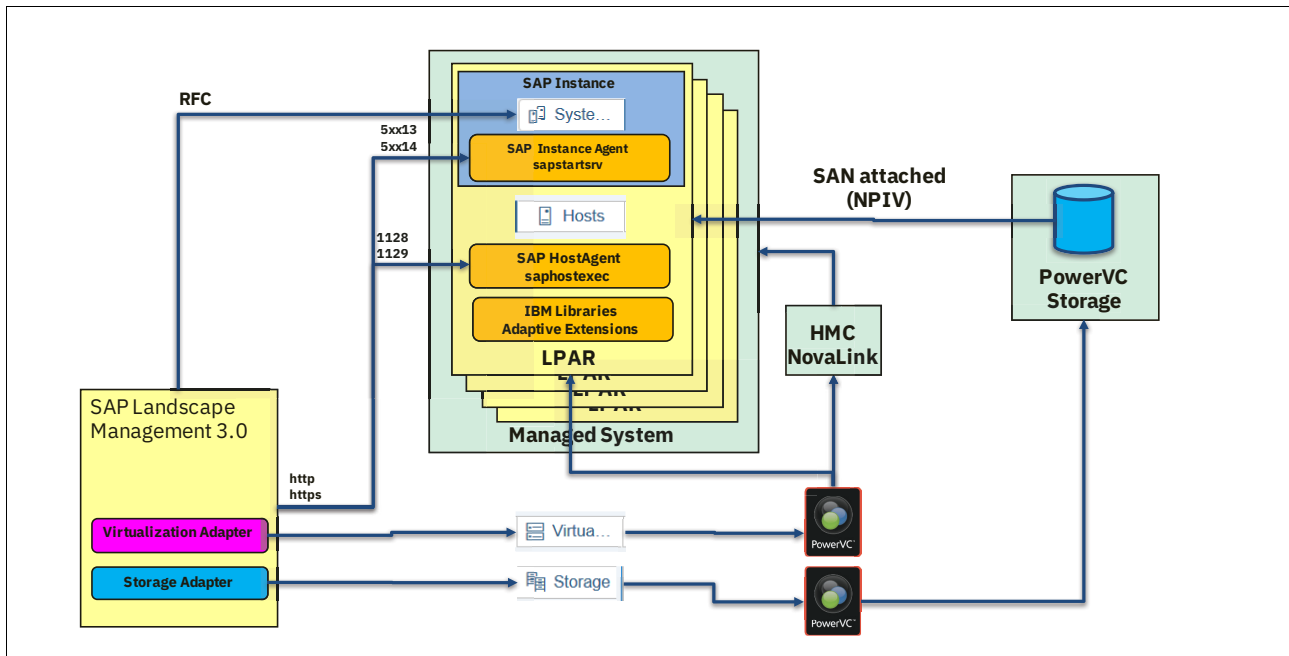


Figure 2-1 Communication between SAP LaMa and the managed components

With SAP LaMa capabilities like Custom Provisioning and Custom Hooks and Operations, you can extend standard workflows and create specific customer actions. SAP LaMa offers a *custom cloning* capability that you can use to create a system clone or system copy by integrating storage cloning procedures that are in at the client environment. Such an approach can be integrated into SAP LaMa: Pre-defined substeps in the *standard* workflow for the pre-clone, clone, and post-clone phases are replaced by custom-defined scripts or web service calls. The calls run on the source and target systems during the custom provisioning flow.

The web services and scripts must be registered as a *provider implementation definition* that references the script and web services execution that is triggered by the SAP Host Agent on the source or target system during the workflow step. The provider implementation definition references the location of the script or command to run on the LPAR, including all the parameters and arguments that are transferred from SAP LaMa to the script. For more information, see [SAP Note 1465491 - Provider Implementation Definition](#) and [SAP Landscape Management 3.0, Enterprise Edition](#).

Then, you can create a custom provisioning process. In the custom provisioning process, you can replace a standard process step with the step that is referenced in the provider implementations. It is specified *when or under which circumstances* the custom step is run in an SAP LaMa operation.

Provider implementation definitions can be used in the context of custom hooks or custom operations. Custom hooks allow you to add more pre-, post-, or error processing steps to the standard workflows that are defined in SAP LaMa. Custom operations allow the triggering of user-defined activities directly from the SAP LaMa GUI or as part of mass operations. For example, the SAP Basis administrators can run certain custom-defined scripts with privileged permissions on the hosts without needing root access.

2.2 Introducing typical use cases with SAP LaMa

This section describes typical use cases that clients implement for the management of SAP systems. The example use cases focus on SAP systems that are deployed to an IBM Power Systems environment with Linux OS:

1. Management of complex SAP landscapes that are composed of several SAP systems that are running on-premises or in different public clouds.
2. SAP HANA landscape management.
3. Relocation of adaptively installed SAP systems.
4. SAP System Clone, SAP System Copy, and SAP System Refresh (including refreshes of DB Server-only).
5. Virtualization monitoring of IBM Power Systems servers and LPARs.
6. Virtualization management of IBM Power Systems servers and LPARs.
7. OS provisioning and OS image handling.
8. Provisioning of SAP Application Servers.
9. Extensibility with user-defined operations and workflows.

This section contains a short description of these use cases. Its subsections describe specific requirements for the implementation of use cases 3, 4, 5, 6, and 7. All other use cases are not specific to an IBM Power Systems environment and are described in the SAP LaMa documentation in detail.

2.2.1 Use case 1: Managing complex and distributed SAP landscapes

An SAP landscape is composed of several SAP systems that are running on-premises or in different public clouds. SAP LaMa centralizes the management of different entities of the landscape within one user interface. The provided management view includes on-premises and cloud landscapes, physical hosts, virtual machines (VMs) (LPARs), OSs (hosts), SAP systems, and SAP instances. SAP LaMa provides functions to run basic operations (like start or stop) on SAP systems and SAP instances. These operations can be triggered also on groups of elements (mass operations).

2.2.2 Use case 2: Managing SAP HANA landscapes

SAP LaMa provides several options for management of SAP HANA landscapes:

- ▶ New SAP HANA tenant move with near-zero downtime maintenance
- ▶ Support for SAP HANA system and tenant rename
- ▶ End-to-end automation for SAP HANA system replication setup
- ▶ End-to-end automation for SAP HANA takeover and failback procedures
- ▶ Support for SAP HANA multitarget replication
- ▶ Near zero downtime maintenance for SAP HANA primary and secondary sites (such as SAP HANA upgrades, OS upgrades, or hardware maintenance)

Figure 2-2 illustrates new high availability (HA) and disaster recovery (DR) options with SAP HANA 2.0, which can be managed with SAP LaMa.

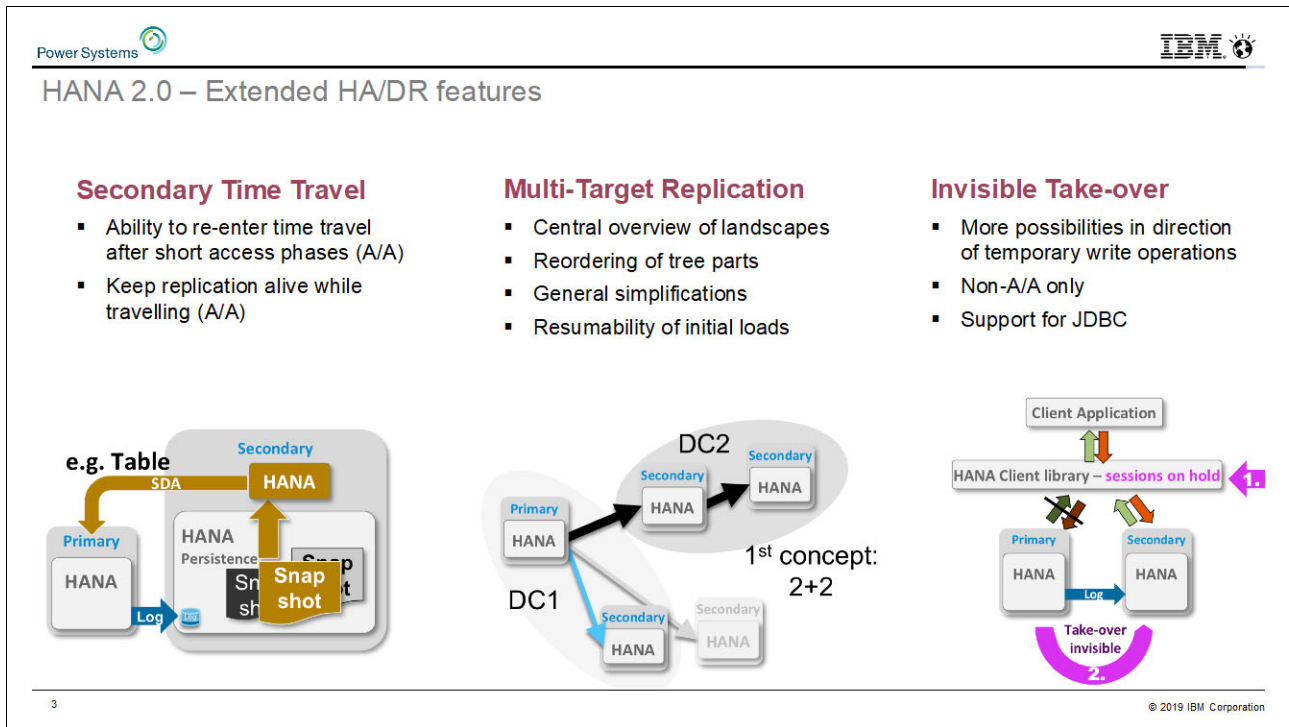


Figure 2-2 Extended HA and DR features in SAP HANA 2.0

2.2.3 Use case 3: Relocating adaptively installed SAP systems

SAP LaMa provides functions to move an entire SAP system or one of its instances from one host to another host. The SAP system or instance must be stopped on the source host and then restarted on the target host. The relocation is a combination of a detach task (*unprepare*) followed by an attach task (*prepare*) on the host. Detach and attach tasks invoke the IBM PowerVC storage adapter, so all the SAP system storage must be managed by IBM PowerVC. For this use case, IBM PowerVC is configured as storage adapter in SAP LaMa. Mass operations may relocate multiple SAP systems or instances immediately.

The end-to-end process invokes and automates the following steps:

1. Stop the SAP system or SAP instance.
2. Unprepare the SAP system or SAP instance on the source host. During this step, the following actions take place:
 - The SAP instance agent stops and unregisters from the host.
 - File systems (defined in the mount config) of the system or instance unmount.
 - The virtual IP addresses of the system or instance release from the network adapter on the source host.
 - Storage volumes reflecting the file systems unmap from the source host by using IBM PowerVC.

3. Prepare the SAP instance or system on the target LPAR. During this step, the following actions take place:
 - Storage volumes reflecting the file systems map to the target host by using IBM PowerVC.
 - All file systems (defined in the mount config) of the system or instance mount.
 - The virtual IP addresses of the system or instance are acquired in the network adapter of the target host.
 - The SAP instance agent registers on the host and starts.
4. Start the SAP system or instances on the target LPAR.

For this use case, the SAP systems or instances must be adaptively installed:

- ▶ Virtual IP addresses must be decoupled from the SAP instance from the host. Name resolution (forward and backward) for the virtual IP address and the associated virtual host name must be ensured on all involved hosts (source and target LPAR) and on the SAP LaMa system.
- ▶ The SAP instance requires an adaptive storage layout so that all required storage entities (volumes and file systems) of the SAP instance can be accessed on both the source and target LPARs. Access to the volumes in the storage system must be based on virtual Fibre Channel (NPIV) for both source and target LPARs.

2.2.4 Use case 4: SAP System Clone, SAP System Copy, and SAP System Refresh (including a refresh of the DB server)

SAP LaMa provides functions to copy an entire SAP system or the DB instance. The target system is either newly created (SAP System Clone or SAP System Copy) or an existing SAP system is refreshed with the actual content from another system. The system runtime environment is either identical to the source system (SAP System Clone) or the run time is changed to a new host name, new SAP system ID (SID), or new SAP instance number.

Figure 2-3 and Figure 2-4 illustrate the difference between SAP System Clone, SAP System Copy, and SAP System Refresh.

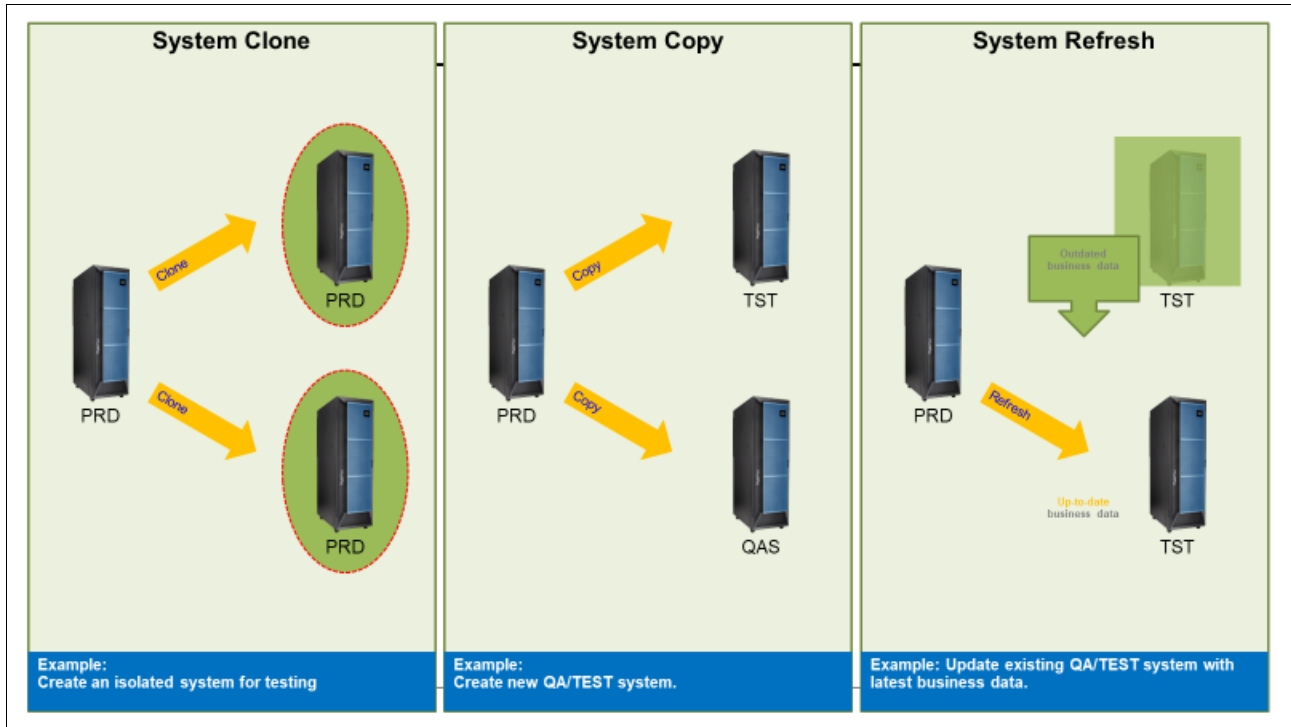


Figure 2-3 SAP System Clone, SAP System Copy, and SAP System Refresh

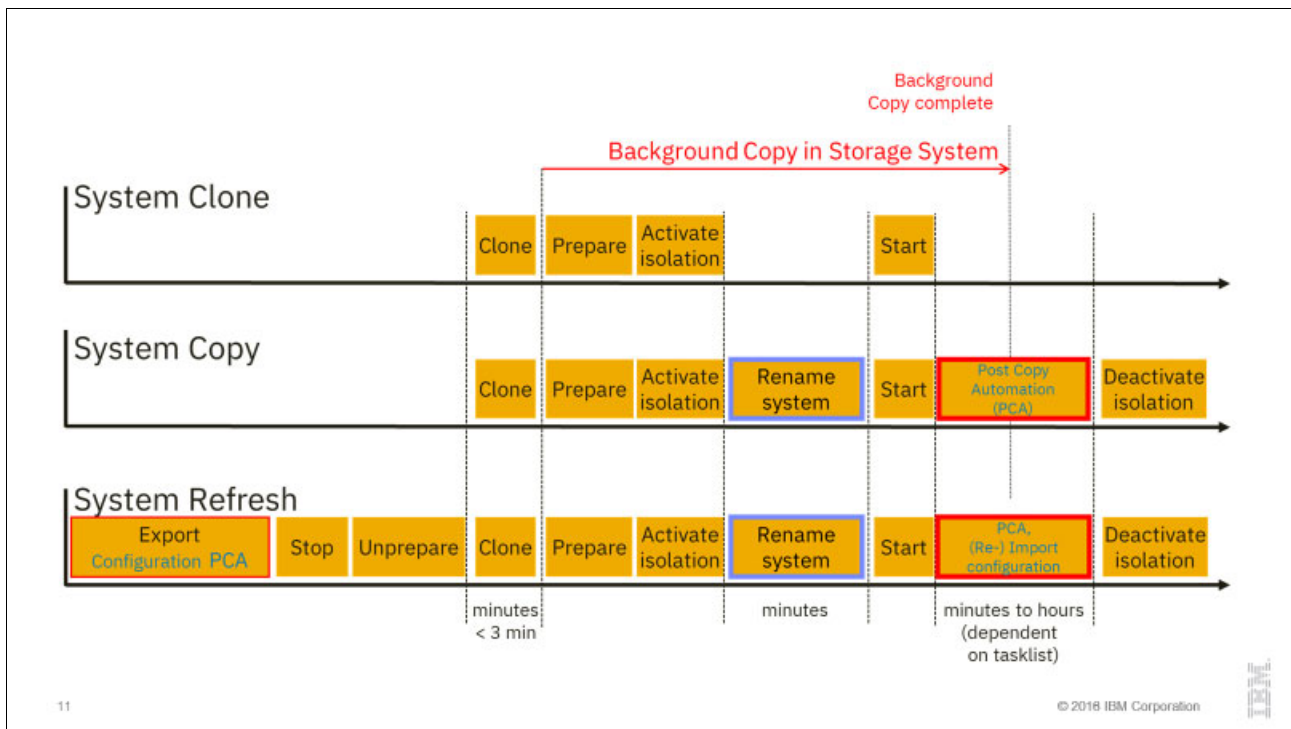


Figure 2-4 SAP LaMa execution steps for SAP System Clone, SAP System Copy, and SAP System Refresh

All storage volumes that are in the scope of the clone or copy process must be in one storage system and managed by IBM PowerVC. For this use case, the SAP systems or instances must be adaptively installed (see 2.2.3, “Use case 3: Relocating adaptively installed SAP systems” on page 8).

During the execution of this use case, SAP LaMa calls actions in the storage system by using IBM PowerVC to:

- ▶ Retrieve information about storage volumes of the SAP system or instances.
- ▶ Attach or detach storage volumes to and from the hosts in scope.
- ▶ Create consistency groups and snapshots for the volumes in scope.
- ▶ Verify the progress of the background copy.
- ▶ Target the host to import the cloned disk images and mount the file systems.

More preparation steps are required in SAP LaMa to enable those scenarios:

- ▶ Configure IBM PowerVC as a storage adapter.
- ▶ Define infrastructure elements in SAP LaMa configuration networks, user management, name server, and assignment (see 2.2.5, “Use case 5: Virtualization monitoring of Power Systems servers and LPARs” on page 11).
- ▶ Define SAP Software Provisioning Manager (SWPM) repositories for SAP System Copy and SAP System Refresh in SAP LaMa (see 2.2.5, “Use case 5: Virtualization monitoring of Power Systems servers and LPARs” on page 11).
- ▶ Configure discovered hosts and SAP instances (see 2.2.7, “Use case 7: Operating system provisioning and image handling” on page 12 and 2.2.8, “Use case 8: Provisioning SAP Application Servers” on page 13 (for example, enter RFC Users, configure network fencing exceptions, and so on)).
- ▶ Activate SAP System Clone, SAP System Copy, and SAP System Refresh in the SAP LaMa configuration for SAP system as an allowed use case (see 2.2.8, “Use case 8: Provisioning SAP Application Servers” on page 13).

2.2.5 Use case 5: Virtualization monitoring of Power Systems servers and LPARs

During the execution of this use case, SAP LaMa communicates with the virtualization manager and IBM PowerVC adapter to retrieve the monitoring data of IBM Power Systems physical servers and LPARs. SAP LaMa extends the landscape picture with information about the underlying IT infrastructure. SAP LaMa users see:

- ▶ Which physical server a particular SAP system is running.
- ▶ Which SAP systems are running on the same physical server.
- ▶ How many CPU and memory resources are available and how they are used (from the view of the hypervisor).

2.2.6 Use case 6: Virtualization management of Power Systems servers and LPARs

SAP LaMa triggers operations on IBM PowerVC to activate or deactivate an LPAR or to shut down the OS on it. SAP LaMa can also trigger an online relocation to another system by using Live Partition Mobility (LPM). For all these tasks, SAP LaMa monitors the execution process of the triggered operation and refreshes monitoring data. For this use case, IBM PowerVC is configured as the virtualization adapter in SAP LaMa. SAP LaMa users can perform the following actions:

- ▶ Activate an inactive LPAR.
- ▶ Deactivate an active LPAR.
- ▶ Shut down the OS on an active LPAR.
- ▶ Relocate an active LPAR to another IBM Power System server.

2.2.7 Use case 7: Operating system provisioning and image handling

SAP LaMa triggers operations on IBM PowerVC (which is configured as a virtualization adapter) to provision a new OS from an image that is available in the IBM PowerVC repository. The Power System servers where the new LPAR is created can be explicitly specified or are evaluated at run time due to the placement policy in IBM PowerVC. Further characteristics are defined by using a provisioning template that is chosen during the deployment process.

More preparation steps are required as follows:

1. Prepare image templates in IBM PowerVC:
 - a. Install a golden image on an LPAR for capture (or capture an existing LPAR that meets the prerequisites).
 - b. Capture golden images in IBM PowerVC.
 - c. Define compute templates in IBM PowerVC.
2. Deploy the LPARs:
 - d. Request IP addresses and host names for the new LPARs.
 - e. Create DNS entries for the host names of the new LPARs.
 - f. Deploy the new LPARs (provision a virtual host in SAP LaMa).

Defining content for the golden image for managed SAP systems

For this task, see “General Installation Information for Your Operating System” in [SAP Note 2369910 - Installation of SAP Systems Based on the Application Server ABAP of SAP NetWeaver 7.0 to 7.03 on UNIX: SAP MaxDB](#) and the references that are mentioned in it. From an SAP LaMa perspective, a few extra items must be considered for the Linux OS.

During an SAP System Copy, SAP LaMa uses the TCP/IP filtering capabilities that are bundled with the OS to isolate the target SAP system. To avoid impacting any other system or interface, outbound communication is blocked during a system copy, and is released only after the PostCopy Automation tasks complete. On Linux, those TCP/IP filters are included in the `iptables` packages (`iptables` must be part of the image).

SAP LaMa uses the SAP Host Agent on the OS to gather monitoring data and run actions on the host. Some specific actions are not included in the base SAP Host Agent package but are part of the SAP Adaptive Extensions package. Both SAP Host Agent and SAP Adaptive Extensions must be installed in the image. You can download SAP Host Agent and the SAP Adaptive Extensions for the OS from the [SAP Software Download Center](#). Also, see the following SAP Notes for installation details:

- ▶ [SAP Note 1031096 - Installing Package SAPHOSTAGENT](#)
- ▶ [SAP Note 1759181 - Installation of SPAACEXT.SAR](#)

Note: These packages either need to be installed within the golden image before it is captured in IBM PowerVC or a pre-installation script must be created.

2.2.8 Use case 8: Provisioning SAP Application Servers

SAP LaMa can install SAP NetWeaver ASs on an existing system. In such a case, SAP LaMa triggers the SWPM on an LPAR to invoke the SAP application server installation.

As a prerequisite, the installation media (SWPM, InstMaster, SAP Kernel, and Database Client) must be extracted to a directory that can be attached to the LPAR (for example, by using NFS). Create a root directory for the repository, and copy the installation content to individual subdirectories. In the Infrastructure Repositories, add a configuration for the SWPM Configuration for Application Server Installation.

The profiles and global directories (`/sapmnt/<SID>`) of the SAP system must be available on the LPAR where the application server will be installed.

2.2.9 Use case 9: Extensibility with user-defined operations and workflows

SAP LaMa can be considered a framework for landscape management. In addition to predefined functions, SAP LaMa can extend the management software with user-defined operations and workflows and tailor the management software for specific needs. SAP LaMa provides the following extension points:

Custom Tabs	Define your own tabs in the SAP LaMa GUI to start more tools.
Custom Services	Detect, manage, and integrate more applications.
Custom Operations	Define your own action buttons in the SAP LaMa GUI.
Custom Hooks	Extend the functions of predefined activities (pre-, post, and error handling).
Custom Provisioning	Provide your own storage replication technology or integrate backup and restore.
Custom Links	Invoke a custom URL with context information.
Custom Validations	Define your own validations to pro-actively scan for problems.
Automation Studio	Create custom processes.

2.3 Setting up an SAP LaMa environment

At first, the SAP systems in scope must be enabled. To enable the environment for all the use cases, certain prerequisites must be fulfilled for the managed environment. The managed environment consists of the following components:

- ▶ SAP LaMa management system
- ▶ IBM PowerVC server

Figure 2-5 illustrates the steps that are required for the setup of the environment.

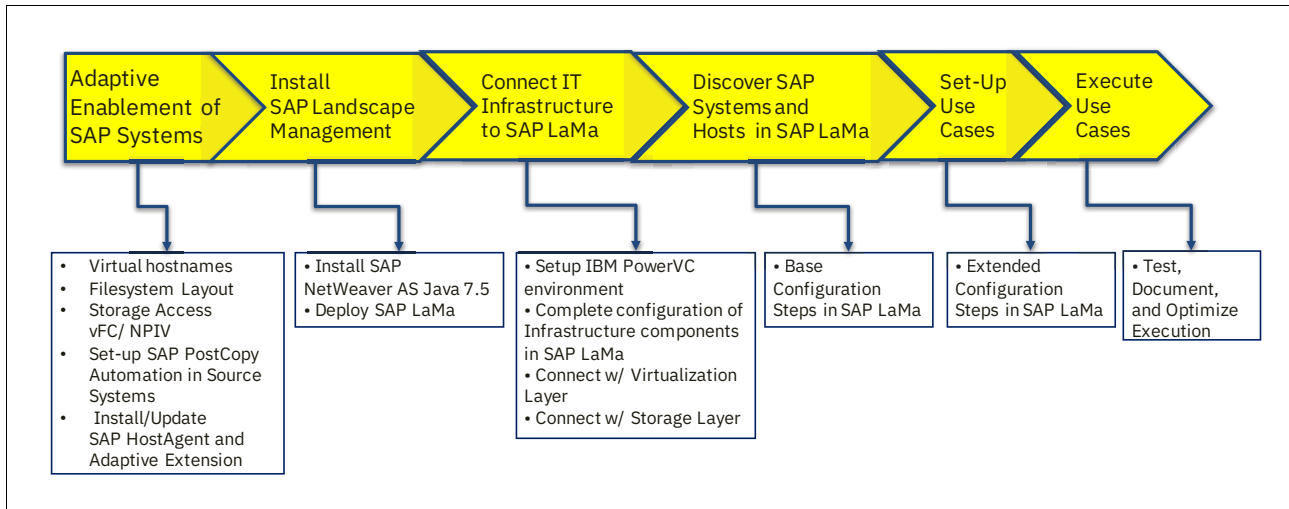


Figure 2-5 Roadmap for setup of SAP LaMa environment

2.3.1 Enabling SAP systems

This section describes the steps to enable SAP systems.

Preparing the managed hosts

On each LPAR that will be integrated into and managed with SAP LaMa, you must run the following preparation steps on the OS level:

- ▶ Installing the SAP Host Agent and SAP Adaptive Extensions.
- ▶ Prepare firewall fencing for target hosts.

Installing the SAP Host Agent and SAP Adaptive Extensions on all LPARs

Check or install the SAP Host Agent and the SAP Adaptive Extensions on all LPARs that are part of the environment.

Checking the version of the SAP Host Agent

As the root user, run the following command:

```
cd /usr/sap/hostctrl/exe
./saphostexec -version
```

The available version of the SAP Host Agent at the time of writing is SAP Host Agent 7.21 SP40.

If an update is required, complete the following steps:

1. Download the current patch of SAPHOSTAGENT.SAR for the OS platform (IBM AIX, Linux on Power Little Endian, or Linux on Power Big Endian) from the [SAP Support Software Download Portal](#).

On the website, select **Support Packages and Patches** → **By Category** → **SAP Technology Components** → **SAP Host Agent 7.21**.

2. Choose the appropriate OS platform:

As the root user, copy the downloaded SAPHOSTAGENT<SP-version>.SAR archive to a temporary directory, and then run the SAP Host Agent **upgrade** command:

```
/usr/sap/hostctrl/saphostexec -upgrade -archive <path to downloaded SAPHOSTAGENT<SP-version>.SAR>
```

Checking the version of the SAP Adaptive Extensions

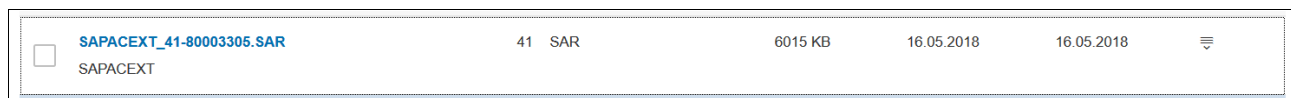
To check the version of the SAP Adaptive Extensions, see [SAP Note 1808793 - SAP Adaptive Extension Improvements and Fixes](#).

In addition to the SAP Host Agent, the IBM libraries and scripts for integrating the IBM components into the SAP LaMa are required. The libraries are delivered as part of the SAPACEXT package. The package contains the following parts:

- ▶ IBM AIX or Linux platform library (libsaposprep.o or libsapacosprep.so). The library includes OS-specific functions for activating and deactivating virtual IP addresses and handling of IPsec and iptables firewalls.
- ▶ IBM storage library (libsapacosprep_ibm.o or libsapacosprep_ibm.so). The library includes OS-specific functions for mounting and unmounting file systems.

To install, upgrade, or roll back SAP Adaptive Extensions, see [SAP Help Portal](#).

Download the appropriate packages for the OS, which in this case is Linux on IBM Power LE, as shown in Figure 2-6.



<input type="checkbox"/>	SAPACEXT_41-80003305.SAR	41	SAR	6015 KB	16.05.2018	16.05.2018	☰
	SAPACEXT						

Figure 2-6 SAP software download for SAP Adaptive Extensions

The libraries are extracted to the directory `/usr/sap/hostctrl/exe`. More files are extracted to `/usr/sap/hostctrl/exe/operations.d` and `/usr/sap/hostctrl/exe/operations.d/IBM`. Create an extra directory for the trace and log files of the scripts in all the systems. The default location for the trace and log files is `/usr/sap/hostctrl/exe/operations.d/IBM/traces`. Ensure that the files under `operations.d` belong to the root user and are only writeable by the root user.

Checking and creating the trace directory

Create a directory for the trace and log files of the scripts in all the systems. The default location for the trace and log files is `/usr/sap/hostctrl/exe/operations.d/IBM/traces`.

Checking the iptables packages on the target LPARs

SAP LaMa uses the TCP/IP filtering capabilities that are bundled with the OS to isolate the target SAP system after the system copy (unless the PostCopy Automation is completed). On Linux, the TCP/IP filters are included in the iptables packages. Those packages must be installed in the OS for the target LPARs.

Preparing the SAP system

The SAP NetWeaver systems must be adaptively installed. An adaptively installed SAP NetWeaver system has the following attributes:

- ▶ Installed with a suitable file system layout that decouples the SAP instance from the server.
- ▶ Can independently relocate the different instances (database, central services, and primary application server) to different target LPARs.
- ▶ Installed by using virtual IP addresses.
- ▶ SAP-related OS users and groups have UIDs and GIDs that are identical and unique across the entire landscape.

Suitable file system layout

Figure 2-7 illustrates an example file system layout for a central SAP S/4HANA system.

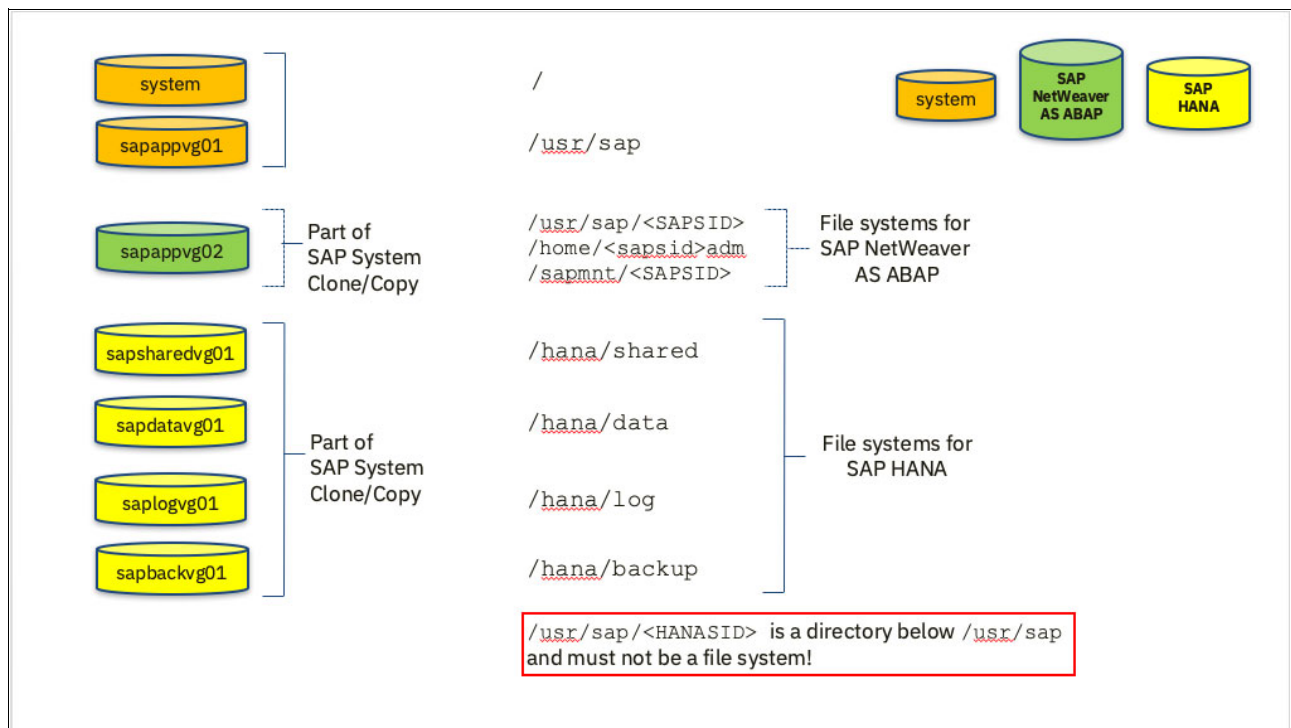


Figure 2-7 File system layout for SAP HANA that is suitable for SAP System Copy

The root file system / and the file system /usr/sap belong to the host and are not part of any relocation or SAP System Clone or SAP System Copy scenario. The SAP Host Agent and SAP Adaptive Extensions are installed in directories under the /usr/sap file system tree. The /usr/sap is either a file system or directory within the system disk that eventually is deployed to an extra volume. However, the file system /usr/sap always belongs to the host.

The SAP NetWeaver AS Advanced Business Application Programming (ABAP) has the components SAP Central Service and SAP priMary Application Server. They are installed in the directory trees under /usr/sap/<SAPSID>, and require the SAPMOUNT share /sapmnt/<SAPSID>.

The SAP HANA database is installed in /hana/shared, with the data volumes in /hana/data, log volumes in /hana/log, and a backup directory that is named /hana/backup. For recovery reasons, it is best practice to separate the different areas into different disk volumes.

For an SAP System Copy and SAP System Refresh scenario, it is important that `/usr/sap/<HANASID>` is a directory and not a file system.

Virtual IP addresses

Ensure that SAP instances are installed with their own virtual host names. The SAP instances must be decoupled from the host name of the OS on which they are running. All virtual IP addresses must be resolvable by using DNS for SAP LaMa and all participating hosts. There must be a unique relationship between a (virtual) host name and its IP address. Do not use a DNS alias, but assign a unique virtual host name with its own IP address.

Note: All host names and virtual host names must be resolvable uniquely for both SAP LaMa and the LPARs by using a *DNS A record* and not a *DNS CNAME*.

Managing a central user

Ensure that required SAP OS users are (or will become) available and that the OS user IDs and OS group IDs are unique and consistent across the landscape. Possible options can be Lightweight Directory Access Protocol (LDAP), Network Information Service (NIS), or other customer-specific solutions.

Installing SAP LaMa Enterprise Edition in the source system

For information about this topic, see [SAP Note 19121110 - Install SAP Landscape Management Enterprise Edition License](#).

PCA task lists are used to manage all the steps that must be run before an SAP System Refresh or after an SAP System Copy or SAP System Refresh procedure.

PCA is part of the SAP LaMa Enterprise Edition software. The PCA content is integrated in the SAP NetWeaver (AS ABAP) software packages and is deactivated per default. For more information, see [ABAP Post-Copy Automation Installation Guide](#). You can also use task list `SAP_INSTALL_PCAI_ENT` to install the add-on `PCAI_ENT 1.0`, which enables the execution of ABAP PCA task lists.

2.3.2 Installing the SAP Landscape Management software

A detailed description of an SAP LaMa installation is out of scope for this publication. For more information, see the appropriate documentation from SAP.

Before you start the installation, you must install an SAP system that is based on SAP NetWeaver AS Java. Download the appropriate installation guide and software packages for the target OS and database platform combination to install the SAP NetWeaver Java System. For more information, see [SAP Note 2350235 - SAP Landscape Management 3.0 - Enterprise Edition](#).

After SAP NetWeaver AS Java is installed, the SAP LaMa software must be deployed. SAP LaMa software is delivered as a set of SCA files that contain the Java archives that are shown in Table 2-2. Deploy those SCA files by using the SAP Software Update Manager, which is as described in the [SAP Landscape Management 3.0, Enterprise Edition Installation Guide](#).

Table 2-2 SCA installation files

SCA file	Description
VCM	This SCA file contains all functional coding and is the main component of SAP LaMa.
VCMCR4E	This SCA file contains open source and third-party libraries that are required to use the search functions or to generate and display reports in SAP LaMa.
VCMNT	This SCA file activates the enterprise functions within SAP LaMa.

After the software is deployed, perform the initial setup by using the configuration wizard, as described in the “Post-Installation” section of [SAP Landscape Management 3.0, Enterprise Edition Installation Guide](#). For more information, see the following SAP sections in that document:

- ▶ [Initial Setup Using the Configuration Wizard](#)
- ▶ [Landscape Configuration](#)
- ▶ [Landscape Preparation](#)

2.3.3 Installing and configuring an IBM PowerVC environment

The installation and configuration of IBM PowerVC is out of scope for this publication. The assumption here is that IBM PowerVC is installed and configured, and all server and storage infrastructure components (HMC, Storage, SAN, and so on) are attached to it. For more information about how to set up an IBM PowerVC environment, see [IBM PowerVC](#). You can also refer to *IBM PowerVC Version 1.3.2 Introduction and Configuration*, SG24-8199.

Creating an admin user for SAP LaMa on IBM PowerVC

An IBM PowerVC user with *administrator privileges* is required because SAP LaMa uses this access to run monitoring and management tasks in IBM PowerVC.

Creating a project for SAP LaMa in IBM PowerVC

A *project*, sometimes referred to as a *tenant*, is a unit of ownership. Most resources in IBM PowerVC, such as VMs, volumes, and images, belong to a specific project. Only users with a role assignment for a project can work with the resources belonging to that project. The `ibm-default` project is created during installation, but IBM PowerVC supports the creation of more projects for resource segregation. As a best practice, use an IBM PowerVC project and add only those resources to that project that are visible in SAP LaMa.

Preparing LPARs and storage volumes in IBM PowerVC after onboarding

If LPARs and their storage volumes were created by using tools outside of IBM PowerVC, they must be imported first. The importation is a default procedure that is described in [IBM Knowledge Center](#). The following post-configuration steps are required:

- ▶ LPAR: Ensure that LPAR has at least one network adapter and an IP address. The IP address is used for association between OS data (retrieved by SAP Host Agent) and LPAR data that is gathered by IBM PowerVC. Add the IP address to the LPAR configuration in IBM PowerVC UI.
- ▶ Storage volume: Ensure that storage volume is assigned to a storage template. This initial assignment is done by using the IBM PowerVC CLI, as described in [How to set the storage template when managing existing volumes](#).

2.3.4 Preparing SAP NetWeaver AS Java for communication with IBM PowerVC

This section describes the steps that are needed so that SAP NetWeaver may communicate with IBM PowerVC.

Checking and updating the SSL library within the SAP NetWeaver AS Java server

IBM PowerVC requires the usage of secure communication protocols TLS V1.1 or TLS V1.2 for any external communication. Older protocol versions have security exposures, so they are no longer supported and are disabled. Check that the SAP NetWeaver AS Java engine where the SAP LaMa code is running supports those required TLS versions.

For more information, see SAP Note 2284059: Update of SSL library within NW Java server [SAP Note 2284059 - Update of SLL library within NW Java server](#) and SAP Note 2569156 - How to get and validate SSLContext.properties file [SAP Note 2569156 - How to get and validate SLLContext.properties file](#).

Changing the SSLCipherSuite in the SAP NetWeaver engine

Add the cipher suites to the property file `SSLConfig.properties`, as described in [SAP Note 2284059 - Update of SLL library within NW Java server](#). Add the following lines:

```
cipherSuite=TLS_DHE_RSA_WITH_AES_128_GCM_SHA256  
cipherSuite=TLS_DHE_RSA_WITH_AES_128_CBC_SHA256
```

Importing the IBM PowerVC certificate into a truststore of SAP NetWeaver AS Java

A communication setup that uses *server certificates* provides the most secure level of communication between SAP LaMa and IBM PowerVC. In this case, the IBM PowerVC certificate is used and the host name that is contained in the certificate is verified against the host name of the public key (which is stored in the SAP NetWeaver AS Java keystore), which is defined within the SAP LaMa virtualization manager definition.

The IBM PowerVC server certificate must be imported first into the keystore of the underlying SAP NetWeaver AS Java engine. For more information about how to import the public key of the self-signed IBM PowerVC certificate into the keystore, see [Using the AS Java Key Storage](#). Check that the host name in the certificate is valid and matches the host name of the IBM PowerVC server. The host name that is referenced in the SAP LaMa virtualization adapter configuration also must correspond to the host name in the certificate. Remember the name of the certificate store view of SAP NetWeaver AS Java because this name is required during the IBM PowerVC adapter definition in SAP LaMa.

By default, IBM PowerVC uses a self-signed X.509 certificate to secure its web interface and REST APIs. Self-signed certificates are not signed by an independent certificate authority (CA). If there are enhanced security requirements, then the default self-signed certificate can be replaced with a new CA-signed certificate.

You can learn to how to obtain and set up CAs by referring to [IBM Knowledge Center or Securing IBM PowerVC web interface with self-signed or CA-signed certificates](#).

Export the certificate file `/etc/pki/tls/certs/powervc.crt` from the IBM PowerVC server and import it into the keystore of the SAP NetWeaver AS Java by using the NetWeaver Administrator (NWA) tool. For more details, see Figure 2-8 and Figure 2-9.

To import the public key, complete the following steps:

1. Log in to NWA and select **Configuration** → **Certificates and Keys**, as shown in Figure 2-8.

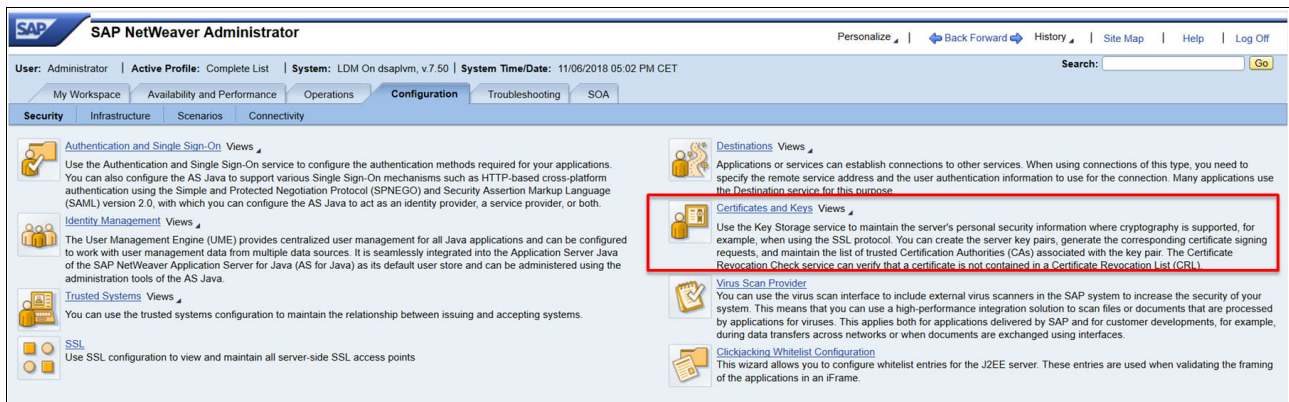


Figure 2-8 NetWeaver Administrator: Certificates and Keys

2. Select the appropriate keystore, for example, TrustedCAs, as shown in Figure 2-9.

	TrustedCAs	USER	Template view that contains trusted server certificates
--	------------	------	---

Figure 2-9 TrustedCA view

This keystore view name is entered in to the Virtualization Manager or Storage Manager definition later.

3. Import the public key that was exported from the IBM PowerVC server into the keystore (Figure 2-10).

The screenshot shows the 'Details of view "TrustedCAs"' in SAP NWA. It features a table with columns for Status, Name, Entry Type, Algorithm, Valid From, and Valid To. The 'powervc' certificate is highlighted in yellow. Below the table, the 'Details of entry "powervc"' are displayed, including creation date, version, algorithm, key size, subject name, issuer name, serial number, signature algorithm, validity period, public key fingerprint, certificate fingerprint, and certificate extensions.

Status	Name	Entry Type	Algorithm	Valid From	Valid To
✔	EntrustPersonalServerCA	CERTIFICATE	RSA	Tue Oct 12 21:24:30 CEST 1999	Sat Oct 12 21:54:30 CEST 2019
✔	EntrustServerCA	CERTIFICATE	RSA	Tue May 25 18:09:40 CEST 1999	Sat May 25 18:39:40 CEST 2019
✔	powervc	CERTIFICATE	RSA	Wed Jan 17 13:38:43 CET 2018	Mon Jan 17 13:38:43 CET 2028
✔	tc_trust_class_2_ii	CERTIFICATE	RSA	Thu Jan 12 15:38:43 CET 2006	Wed Dec 31 23:59:59 CET 2025
✔	tc_trust_class_2_L1_CA_XI	CERTIFICATE	RSA	Tue Nov 03 15:08:26 CET 2009	Wed Dec 31 22:59:59 CET 2025

```

CERTIFICATE entry:
Creation date       : Thu Mar 08 17:06:57 CET 2018 (8 Mar 2018 16:06:57 GMT)
Version            : ver.3 X.509
Algorithm          : RSA
Key Size           : 2048 bits
Subject name       : CN=10.3.25.105
Issuer name        : CN=10.3.25.105
Serial number      : 14059022180290716067
Signature Algorithm : sha256withRSAEncryption (1.2.840.113549.1.1.11)
Validity:
not before        : Wed Jan 17 13:38:43 CET 2018 (17 Jan 2018 12:38:43 GMT)
not after         : Mon Jan 17 13:38:43 CET 2028 (17 Jan 2028 12:38:43 GMT)
Public key fingerprint : DD:EE:D0:37:E8:8B:40:20:F3:E1:74:57:84:74:1D:90
Certificate fingerprint(MD5): 5A:B8:84:70:37:46:1D:54:BC:AB:A9:60:05:F8:08:9E
Certificate extensions :
[critical]
BasicConstraints: CA: no
KeyUsage: digitalSignature | keyEncipherment | keyCertSign
[non critical]
SubjectAltName: ipAddress: 10.3.25.105
AuthorityKeyIdentifier: KeyIdentifier: B7:BA:1A:54:CE:F4:57:47:9C:A8:DB:30:12:FD:4E:A1:37:77:E3:E4
SubjectKeyIdentifier: B7:BA:1A:54:CE:F4:57:47:9C:A8:DB:30:12:FD:4E:A1:37:77:E3:E4
ExtendedKeyUsage: KeyPurposeId 0: TLS Web server authentication
  
```

Figure 2-10 SAP NWA: Details of the TrustedCA view

2.3.5 Configuration steps in SAP LaMa

Before you can run the use cases, you must perform a set of configuration steps in SAP LaMa:

1. Describe all network configurations in the SAP LaMa configuration.
2. Set the OS user management settings.
3. Choose the assignment for the OS.
4. Define an SWPM repository for System Rename execution.
5. Define IBM PowerVC as a storage manager or virtualization manager.

In the following sections, these steps are described in more detail.

Networks

The properties for all networks, which are used by virtual or physical host names on managed SAP systems, must be defined in the SAP LaMa network definition. Network-based properties include a network name, the network subnet mask, and the broadcast address for the network.

Advanced configuration settings include the IP address of the gateway server, the DNS zone name, and an *IP range* if SAP LaMa assigns IP addresses and updates DNS entries for virtual host names during an SAP System Clone or SAP System Copy action. In that case, select the **Auto Assign IP Address** option in the System Copy roadmap (Figure 2-29 on page 35). During SAP System Copy execution, SAP LaMa selects an available IP address from the predefined IP range.

The range is defined by the “Update IP range” field of the network configuration:

- ▶ IP addresses are in dotted quad notation.
- ▶ The lower and upper parts of a range must be in each range and are separated by “-” or “.”.
- ▶ Multiple IP ranges can be separated by “;”.

The SAP LaMa network configuration is shown in Figure 2-11.

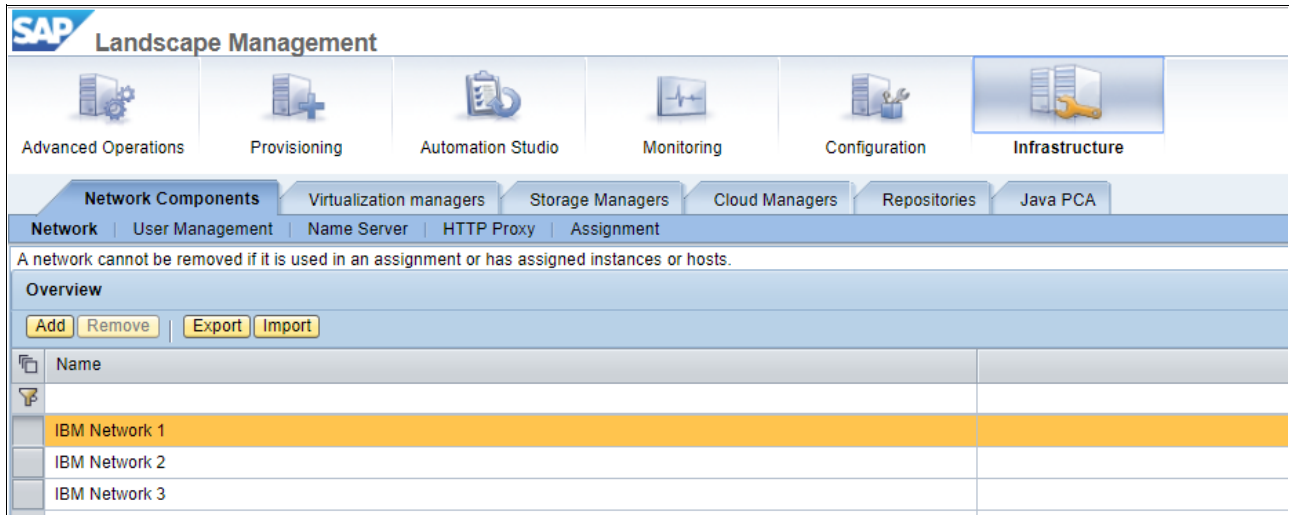


Figure 2-11 SAP LaMa network definition

For more information, see [SAP Note 1572841 - Setup of name server update of SAP LVM](#), which describes the DNS name server integration with SAP LaMa.

User management

This step specifies how OS users and group handling for the SAP systems is managed. OS users that are required but do not exist on the target system are automatically created by SAP LaMa on the target system during a system copy or clone operation. SAP LaMa provides functions for managing users and groups by using LDAP or NIS. These settings must be configured.

Communication with LDAP or NIS software is done by the SAP Host Agent. Configuring LDAP and NIS in LaMa is out of scope of this publication, but it is described in [SAP Landscape Management 3.0 Enterprise Edition](#).

Name server

SAP LaMa provides functions for automatic management of DNS entries by using a DNS update. You can set up the DNS management connection. The communication is set up by using the SAP Host Agent. This configuration is out of scope of this publication, but is described in [SAP Landscape Management 3.0 Enterprise Edition](#).

Another option is to ensure that the DNS entries that are used for IP addresses and host names exist.

Assignment

After you configure the network, user management, and name server handling, associate these configurations. Then, SAP LaMa take the appropriate actions according to the different networks.

Defining SWPM repositories (AIX and LINUX_PPC64_LE) in SAP LaMa

In use cases that are based on SAP System Copy and SAP System Refresh, SWPM is required. SWPM is used to rename copied SAP System sources.

Ensure that the required SWPM software version is either locally available on the target system or can be mounted by using NFS from a central repository.

In this step, the required SWPM versions are specified according to the OS and NetWeaver releases (Figure 2-12).

The screenshot shows the SAP Landscape Management interface. The top navigation bar includes 'Advanced Operations', 'Provisioning', 'Automation Studio', 'Monitoring', 'Configuration', and 'Infrastructure'. Below this, there are sub-tabs for 'Network Components', 'Virtualization managers', 'Storage Managers', 'Cloud Managers', 'Repositories', and 'Java PCA'. The 'Repositories' tab is active, displaying a 'Repository Overview' table with one entry: 'Software Repositories'. Below this, the 'Configurations' section is visible, showing a table with columns for 'Provisioning Type', 'Release', 'OS Type', 'OS Architecture', and 'Name'. The table contains four rows of SWPM configurations for system copy, with OS types AIX, Linux, and OTHER.

Type	Name	Host Name	Mount Poi
• Software Repositories			

Provisioning Type	Release	OS Type	OS Architecture	Name
SWPM configuration for system copy	7.0x	AIX		SysCopy for NW 7.0 AIX
SWPM configuration for system copy	7.0x	Linux		SysCopy for NW 7.0 LNX
SWPM configuration for system copy	7.X	Linux		SysCopy for NW 7.X PowerLNX (LAMA)
SWPM configuration for system copy	7.X	OTHER		SysCopy for NW 7.X PowerLNX (LOCAL)

Figure 2-12 SAP LaMa Repository definition

Defining IBM PowerVC as a virtualization adapter in SAP LaMa

Complete the following steps:

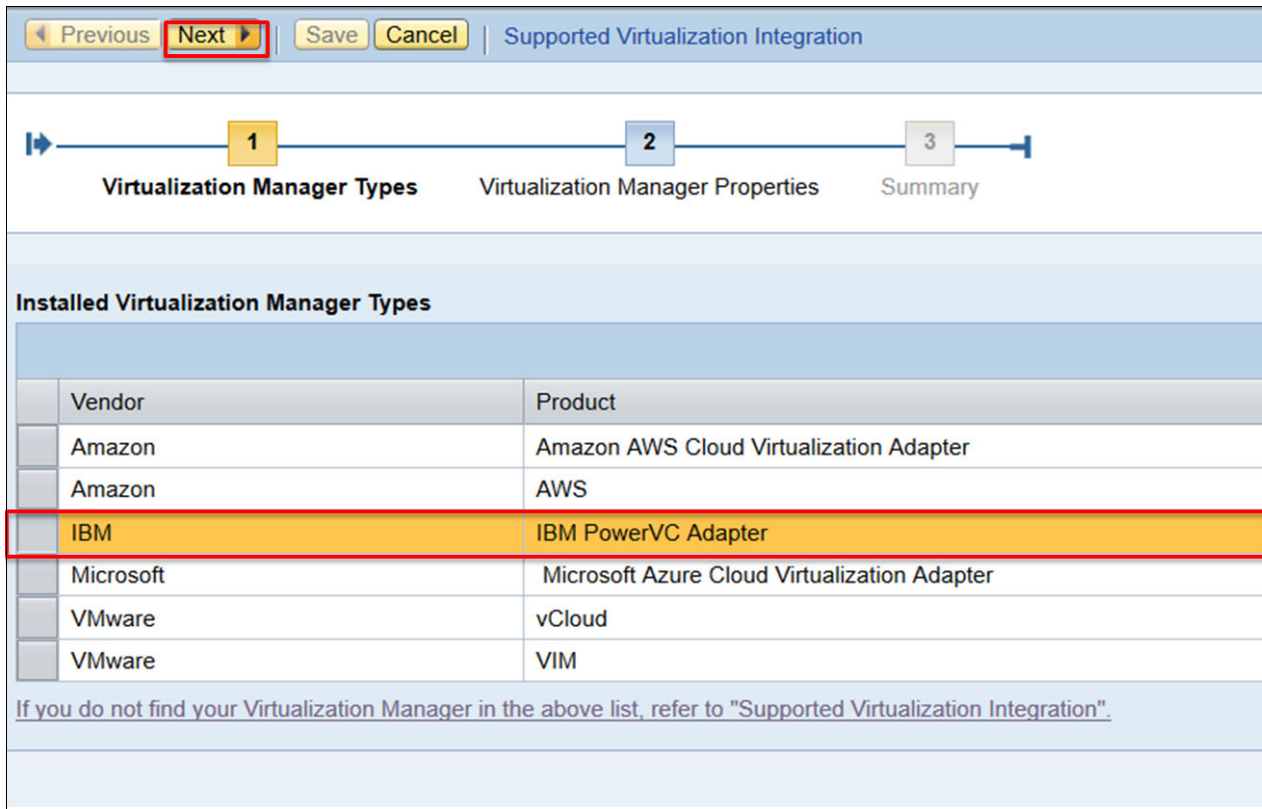
1. Log in to the SAP LaMa system and select **Infrastructure** → **Virtualization managers** (Figure 2-13).

The screenshot shows the SAP Landscape Management interface. The top navigation bar includes 'Advanced Operations', 'Provisioning', 'Automation Studio', 'Monitoring', 'Configuration', and 'Infrastructure'. Below this, there are sub-tabs for 'Network Components', 'Virtualization managers', 'Storage Managers', 'Cloud Managers', 'Repositories', and 'Java PCA'. The 'Infrastructure' tab is selected, and the 'Virtualization managers' sub-tab is also selected and highlighted with a red box.

Figure 2-13 SAP LaMa Virtualization manager

2. Select **Add** to add a virtualization manager.

3. Select **IBM PowerVC Adapter** (Figure 2-14) and click **Next**.



Previous **Next** Save Cancel | Supported Virtualization Integration

1 2 3
Virtualization Manager Types Virtualization Manager Properties Summary

Installed Virtualization Manager Types

Vendor	Product
Amazon	Amazon AWS Cloud Virtualization Adapter
Amazon	AWS
IBM	IBM PowerVC Adapter
Microsoft	Microsoft Azure Cloud Virtualization Adapter
VMware	vCloud
VMware	VIM

If you do not find your Virtualization Manager in the above list, refer to "Supported Virtualization Integration".

Figure 2-14 Selecting IBM PowerVC Adapter

4. Enter the configuration details (Figure 2-15).

Supported Virtualization Integration

1 Virtualization Manager Types 2 Virtualization Manager Properties 3 Summary

Basic Properties

Label:* PowerVC Label for storage manager

User Name:* lama Admin User in PowerVC for SAP LaMa

Password:* Password for Admin User in PowerVC (will be stored in SAP LaMa)

URL:* https://10.3.25.105 PowerVC Base URL

Monitoring Interval (Seconds):* 600 Refresh interval for monitoring data

Additional Properties

Name	Value
HTTPS Security	Use server certificate - strong checking HTTPS security level (e.g. strong = use a stored certificate (standard), use a stored certificate with weak hostname check, ignore server certificate).
Certificate Truststore	TrustedCAs String
PowerVC Project	LAMA Project name in PowerVC – default project ibm-default, or create a custom project for SAP LaMa in PowerVC
PowerVC Domain	Default String
Use LPAR names as hostnames	<input checked="" type="checkbox"/> If enabled, SAP LaMa assumes that LPAR name matches host name of the installed operating system.

Test Configuration Connection successful: Connected to IBM PowerVC (https://10.3.25.105) as 'lama'.

Figure 2-15 IBM PowerVC Virtualization Manager Properties

5. Click **Test Configuration**, and then click **Save**.

Defining IBM PowerVC Storage Manager

The configuration of the IBM PowerVC Storage Manager is done in a way that is similar to the virtualization manager definition that is described in “Defining IBM PowerVC as a virtualization adapter in SAP LaMa” on page 23 (Figure 2-16).

Overview

Buttons: Add, Remove, Export, Import | Supported Storage Integration

Label	Vendor	Product	Version
ATS_SVC_PVC	IBM	IBM PowerVC Storage Adapter	3.0.3
NetApp-LaMa3	NetApp	SAP Storage Adapter for Netapp Clustered Data ONTAP.	3.0SP03

Rows: 2 total, 2 shown, 1 selected | Selected: ATS_SVC_PVC

Details

Buttons: Edit, Test Configuration

Basic Properties

Label: ATS_SVC_PVC
 User Name: root
 Password:
 URL: https://ix3246.wdf.sap.corp
 Monitoring Interval (Seconds): 10,800

Additional Properties

Name	Value	Type	Mandatory
HTTPS Security	Ignore server certificate	String	<input checked="" type="checkbox"/>
Certificate Truststore	TrustedCAs	String	<input type="checkbox"/>
PowerVC Project	lama	String	<input checked="" type="checkbox"/>
PowerVC Domain	Default	String	<input checked="" type="checkbox"/>

Figure 2-16 IBM PowerVC Storage Manager definition

2.3.6 Discovering managed systems and hosts in SAP LaMa

All SAP systems, their instances, and all the corresponding hosts must be discovered in SAP LaMa. One possibility is running a discovery where SAP LaMa communicates with SAP Host Agent instances running on these hosts. For this communication, you use sapadm user credentials. The discovered entities (SAP systems, SAP instances, and OS hosts) can be logically grouped.

To start discovery, complete the following steps:

1. Select **Configuration** → **Systems** and click **Retrieve new Instances and Hosts**. In the window that is shown in Figure 2-17, specify the detection method (for example, SAP Host Agent) and the entity types to discover (for example, instances and hosts). Depending on the landscape, enable a trigger to detect special entities (for example, shadow or stand-alone DBs, or SAP diagnostic agents).

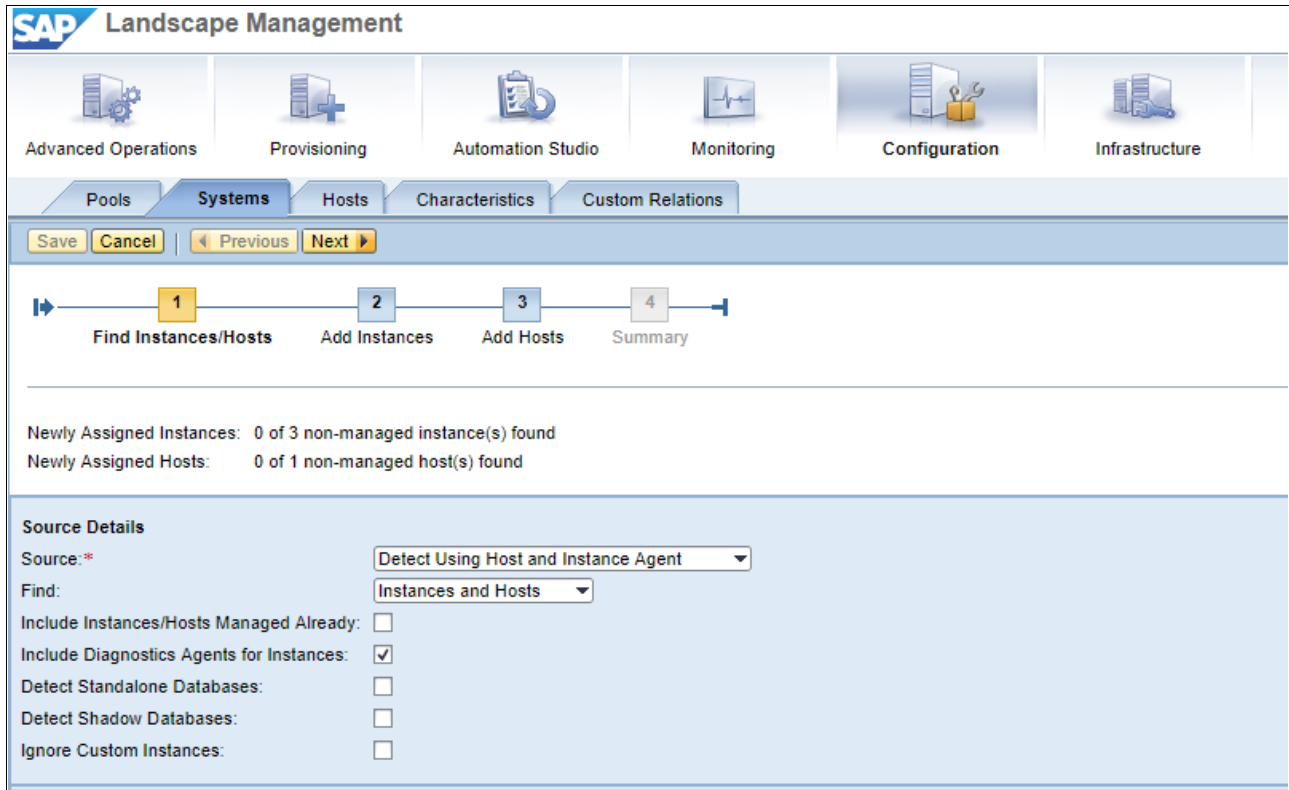


Figure 2-17 SAP LaMa discovery

- Specify the list of OS hosts that will be scanned (by host name or IP address), the SAP Host Agent port that is used in the landscape, and credentials for communicating with SAP Host Agent, SAP instance agents, and with the SAP DB. Click **Next**, and the discovery process runs (Figure 2-18).

Detect Using Host Agent and Instance Agent

Detect Timeout [seconds]: | **Expert Mode**

Host Names Used for Detection

Host Names (Separated by ','):

Common Host Agent Settings for All Host Names Used

Host Agent Port:

Use Secure Communication (HTTPS):

Authentication Type:

User Name:

Password:

Instance Agent Settings

The settings specified below will be used for all SAP instances found.
If you specify the wrong parameters, some instances might not be detected. This can be corrected later by
For more information, see SAP Note [1474866](#).

Use Secure Communication (HTTPS):

Authentication Type:

Instance Agent Port Pattern:

Common Database Administrator Settings

The credentials specified below will be used for all database services found.
If no credentials or incorrect credentials are specified, the monitoring of the database instances may fail later.
This can be corrected later by going to the instance configuration, editing these database instances, and clicking the **Save** button.

DB Admin User Name:

DB Admin Password:

Figure 2-18 Discovery details

- As result, a list of discovered SAP instances and hosts appear. Assign the instances to SAP systems (for example, by clicking **Auto Assign**) and group the hosts into SAP LaMa pools (see Figure 2-19 and to Figure 2-20). Click **save**, and the entities become managed by SAP LaMa.

Find Instances/Hosts **Add Instances** Add Hosts Summary

Newly Assigned Instances: 3 of 3 non-managed instance(s) found
 Newly Assigned Hosts: 0 of 1 non-managed host(s) found

Assign Instances to Systems

To add new instances/hosts, first assign them, and then choose "Next".

- Non-managed instances can be assigned to existing systems or to new systems.
- If the action "Auto Assign" is chosen, all instances with the same SID and system host name are assigned to the same system.
- If the host name of a instance is incorrect, select this instance, set the action to "Modify Host Names", enter a host name under "New Host Name", and choose "Modify Host Names".

Action: Auto Assign to New or Existing Systems **Auto Assign** Unassign Pool for New Systems: IBM AIX Remove

Instance	Host Name	Communication Host Name	Managed	System	Pool
H02 System database (ABAP): MASTER : SAP HANA 00, Is36002db	Is36002db	Is36002db	<input type="checkbox"/>	L02: NetW...	IBM AIX
L02 Central services (ABAP): 01, Is36002ci	Is36002ci	Is36002ci	<input type="checkbox"/>	L02: NetW...	IBM AIX
L02 AS instance (ABAP): 02, Is36002ci	Is36002ci	Is36002ci	<input type="checkbox"/>	L02: NetW...	IBM AIX

Figure 2-19 Assigning services to an SAP system

Find Instances/Hosts Add Instances **Add Hosts** Summary

Newly Assigned Instances: 3 of 3 non-managed instance(s) found
 Newly Assigned Hosts: 1 of 1 non-managed host(s) found

Assign Resources to Pools

To add new hosts, assign them first and choose "Next".

- Non-managed hosts can be assigned to existing pools.
- If the action "Auto Assign" is chosen, all hosts are assigned to the same pool as the corresponding system (if a system can be determined).
- Attributes such as "OS Version" can be missing due to an outdated host agent or wrong credentials. Once this is fixed they are retrieved later automatically.

Action: Auto Assign to Pools **Auto Assign** Unassign Remove Managed

Host	Managed	Pool	Operation System	OS Version	CPU Type	Address Space
Is36002	<input type="checkbox"/>	IBM PLNX	OTHER	SLES12	OTHER	64

Figure 2-20 Assigning a pool

2.3.7 Configuring SAP hosts in SAP LaMa for copy use cases

For SAP System Clone, SAP System Copy, and SAP System Refresh use cases, you must do more configuration of host entities (see 2.3.1, “Enabling SAP systems” on page 14). Edit the configuration of the SAP hosts and enter the following settings (Figure 2-21):

1. Set SAP hosts to *AC enabled*.
2. Set an SAP host that acts as a target for SAP System Clone or SAP System Copy to *Isolation ready*.
3. Retrieve network interfaces that are used by SAP systems running on these hosts and assign them to the networks that are configured in SAP LaMa.
4. Retrieve *Host-Specific Storage Properties*.
5. Save the configuration.

Configuration - Is36002

← Previous Next → Save Cancel Import

1 Basic configuration 2 Host properties 3 Mass Configuration

System Provisioning
Isolation Ready:

Adaptive Enablement
AC-Enabled:

Capabilities
SAPS Provided:

Network Assignment
DHCP and dynamic DNS used for IP address assignment:
Does host perform NAT for other IP addresses?:

Add Remove Retrieve & Add Interfaces from Host Agent Timeout [seconds]: New Interface ID: Add Interface ID

Interface ID	Network
eth0	IBM Network 3

Host-Specific Storage Properties
Timeout [seconds]: Retrieve from Host

Partner ID	Property Name	Property Value
ibm	OSINFO	SUSE
ibm	OSTYPE	Linux
ibm	VIRRTYPE	NONE
ibm	WWPNS	C0507608B6F90124,C0507608B6F90126

Figure 2-21 Host properties

2.3.8 Configuring SAP systems in SAP LaMa for copy use cases

For SAP System Clone, SAP System Copy, and SAP System Refresh use cases, you must do more configuration of SAP instances and SAP systems (see 2.3.1, “Enabling SAP systems” on page 14). Edit the configuration of each SAP instance and check the following settings (Figure 2-22, Figure 2-23 on page 32, Figure 2-24 on page 32):

- ▶ Check that the SAP DB communication credentials are complete and valid (relevant for SAP DB instances only).
- ▶ Each SAP instance is *AC Enabled*.
- ▶ Check that the *Required Host Type* is correct.
- ▶ Deactivate **OS Managed Mounts (Automounter)** and click **Retrieve Mount List**. Check that the list contains only SAP instance-related mount points. Remove all the other retrieved mount points.

The screenshot displays the 'Basic configuration' step of the SAP instance configuration wizard. The configuration is for a 'System database (ABAP)' instance. Key settings include:

- General:** Managed and Operational checkboxes are checked. The instance type is 'System database (ABAP)'.
- Pool Assignment:** The pool is assigned to 'IBM PLNX'.
- Additional Information:** The version is '2.00.033.00.1535711040'. There is a 'Retrieve Version' button.
- Diagnostics Agent:** The 'Manage Diagnostics Agent' checkbox is unchecked.
- Instance Agent Configuration:** 'Use Secure Communication (HTTPS)' is unchecked. The port is '50013'. The authentication type is 'User Name/Password (Basic)' with user 'h02adm'.
- SystemDB Database Manager Configuration:** User name is 'SYSTEM'.
- SystemDB Database Administrator Configuration:** User name is 'SYSTEM'.
- Database Manager Configuration:** Manager user name is 'SYSTEM'.
- Database Administrator Configuration:** Administrator user name is 'h02adm'.
- Instance Name:** Set to 'HDB00'.
- Configuration Directory:** Set to '/hana/shared/H02/sapdbctrl-config'.

Figure 2-22 SAP instance settings: Basic configuration

Configuration - L02 - System database (ABAP): MASTER (active): H02, SAP HANA 00, Is36002db.wdf.sap.corp

← Previous Next → Save Cancel Import

1 Basic configuration 2 Instance properties 3 Mount points 4 Mass configuration

Disclaimer:
Please acknowledge that by enabling and using the relocate functionality it is the customer's sole responsibility to ensure that the customer has all necessary third party license rights required to relocate the affected software, and the customer has obtained all such license rights including the right to relocate the software prior to using this functionality.

Adaptive Enablement

Installed with Virtual Host Name:
 AC-Enabled:
 Configure Mount Data for System Provisioning:

Virtual Host Names and Networks

Virtual Host Name	Network	Primary	Type
Is36002db.wdf.sap.corp	IBM Network 3	<input checked="" type="radio"/>	Default
Is36002ci.wdf.sap.corp	IBM Network 3	<input type="radio"/>	Client Connect Address

Requirements

Required SAPS:
 Required Memory [MB]:
 Preferred Host:

Required Host Type

Retrieve from Host Agent Timeout [seconds]:

Operating System	Operating System Version	CPU Type	Address Space
AIX	6.1	PPC	64
Linux	SLES11	X86_64	64
Linux	SLES12	OTHER	64
Linux	SLES12	PPC	64

Exclusively Consumed Resources

Consumes all resources:

Figure 2-23 SAP instance settings: Instance properties

Configuration - L02 - System database (ABAP): MASTER : H02, SAP HANA 00, Is36002db

← Previous Next → Save Cancel Import

1 Basic configuration 2 Instance properties 3 Mount points 4 Mass configuration

OS Managed Mounts (Automounter):

Add Clone Remove Sort ▲ Move Up ▼ Move Down Extract Mount Points Retrieve Mount List Timeout [seconds]:

Storage Type	Mount Point	Export Path	Mount Options	FS/SRID Type	Partner ID	System-wide
DFS	/hana/data/H02	60050764008100D300000...	rw,relatime,attr2,inode64,no...	svc	ibm	<input type="checkbox"/>
DFS	/hana/log/H02	60050764008100D300000...	rw,relatime,attr2,inode64,no...	svc	ibm	<input type="checkbox"/>
DFS	/hana/shared/H02	60050764008100D300000...	rw,relatime,attr2,inode64,no...	svc	ibm	<input type="checkbox"/>
DFS	/var/lib/hdb	60050764008100D300000...	rw,relatime,attr2,inode64,no...	svc	ibm	<input checked="" type="checkbox"/>

Figure 2-24 SAP instance settings: Mount points

Edit the configuration of the SAP system and check the following items:

- ▶ The SAP system can be used for cloning, copying, renaming, or other use cases depending on the relevant scenario.
- ▶ For copying, renaming, and refreshing scenarios, SAP PCA is triggered, so configure RFC configuration for these cases (Figure 2-25 on page 33).

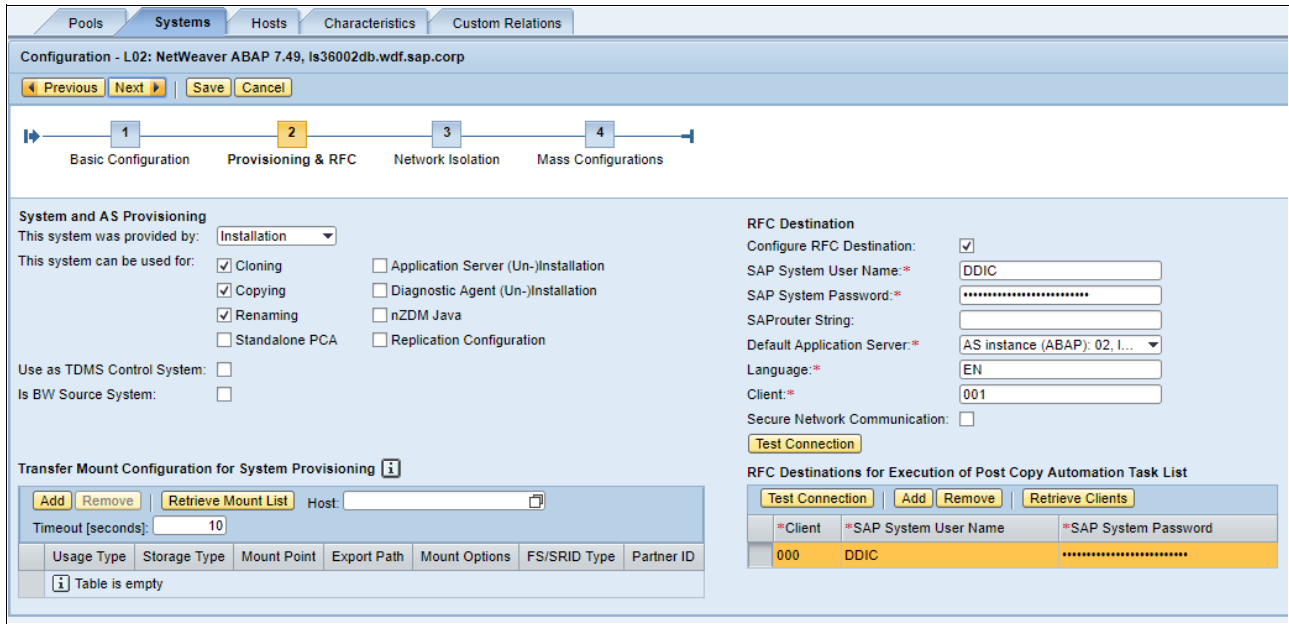


Figure 2-25 Instance settings (RFC user)

2.4 Running SAP System Copy in SAP LaMa

This section describes how to copy an SAP system in SAP LaMa. Other use cases (SAP System Clone and SAP System Refresh) are run in a similar way. The only difference is the requested configuration input in process windows. To initiate an SAP System Copy process, complete the following steps:

1. Click **Provisioning**, select the SAP source system, and click **Copy System** (Figure 2-26).

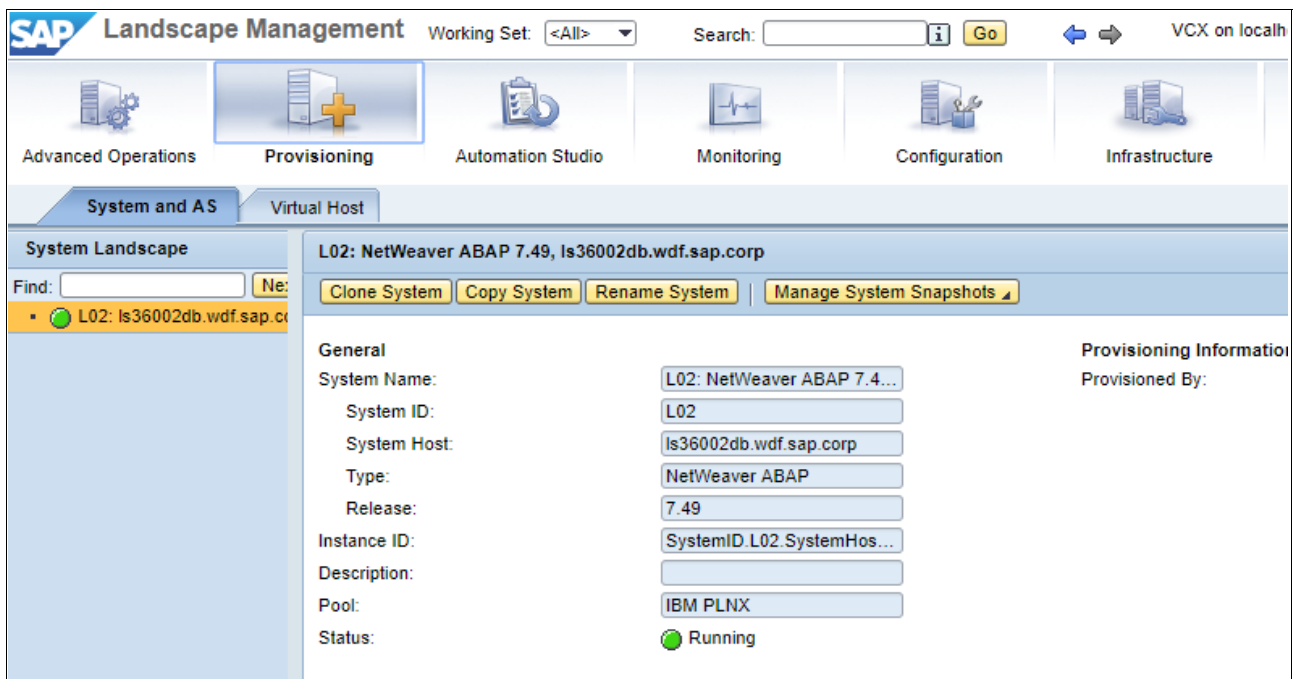


Figure 2-26 SAP System Copy roadmap

- Specify data for the SAP target (SAP target SID, SAP target DB SID, and SAP LaMa pool for the target system). Provide the credentials for communicating with the system (Figure 2-27).

The screenshot shows the 'System Copy - L02: NetWeaver ABAP 7.49, Is36002db.wdf.sap.corp' wizard. At the top, there are navigation buttons: 'Previous', 'Next', 'Finish', 'Start System Copy', 'Create Blueprint', and 'Remote Execution'. Below this is a progress bar with six steps: 1. Basic (highlighted), 2. Hosts, 3. Host Names, 4. Instance Number, 5. Storage, and 6. Consistency. The main area is titled 'Basic Data of Target System' and contains the following fields:

- System ID:*
- Use Different Database Name:
- HANA SID:*
- Pool:*
- Set Master Password for OS and DB Users
- The master password is used as the default password in all steps. If passwords differ, they can be changed in the steps.
- Password:*
- Confirm Password:*
- Description:

Figure 2-27 SAP System Copy roadmap: Basic data

- Choose the host for the SAP target (Figure 2-28). This SAP host must be managed by SAP LaMa and configured as *AC Enabled* and *Isolation ready*. For more information and requirements, see 2.3.1, “Enabling SAP systems” on page 14.

System Copy - L02: NetWeaver ABAP 7.49, ls36002db.wdf.sap.corp

Navigation: Previous | Next | Finish | Start System Copy | Create Blueprint | Remote Execution | Cancel

Progress: 1 Basic | **2 Hosts** | 3 Host Names | 4 Instance Number | 5 Storage | 6 Consistency | 7 Users

Host Selection of Target System Show Source Data

Instance	Type	Target Host
System database: MASTER (configured) : SAP HANA 00	Use existing host	ls36012.wdf.sap.corp
Central services: 01	Use existing host	ls36012.wdf.sap.corp
AS instance: 02	Use existing host	ls36012.wdf.sap.corp

Figure 2-28 SAP System Copy roadmap: Selecting the target hosts

- Specify the virtual host names for the SAP target instances (Figure 2-29). Virtual host names can be shared among the instances of the same system (if they are in the same host).

System Copy - L02: NetWeaver ABAP 7.49, ls36002db.wdf.sap.corp

Navigation: Previous | Next | Finish | Start System Copy | Create Blueprint | Remote Execution | Cancel

Progress: 1 Basic | 2 Hosts | **3 Host Names** | 4 Instance Number | 5 Storage | 6 Consistency | 7 Users | 8 Rename | 9 Isolation

Virtual Host Names and Networks Add Remove

Target				
Host Name	Auto IP Address	IP Address	Network	Instance
ls36012db	<input checked="" type="checkbox"/>		IBM Network 3	System database: MA
ls36012ci	<input checked="" type="checkbox"/>		IBM Network 3	Central services: 01
ls36012ci	<input checked="" type="checkbox"/>		IBM Network 3	AS instance: 02

Figure 2-29 SAP System Copy roadmap: Defining the virtual host names

5. Define the instance numbers for the instances (Figure 2-30).

The screenshot shows the 'System Copy - L02: NetWeaver ABAP 7.49, ls36002db.wdf.sap.corp' wizard. The progress bar indicates that step 4, 'Instance Number', is the current step. Below the progress bar, the 'SAP Instance Numbers' table is displayed.

SAP Instance	Instance Number
System database: MASTER (configured) : H02, SAP HANA 00	00
Central services: 01	01
AS instance: 02	02

Figure 2-30 SAP System Copy roadmap: Defining the SAP instance numbers

6. Check the storage configuration (Figure 2-31). You can change the proposed names for OS volume groups and OS logical volumes.

System Copy - L02: NetWeaver ABAP 7.49, Is36002db.wdf.sap.corp

1 Basic 2 Hosts 3 Host Names 4 Instance Number **5 Storage** 6 Consistency 7 Users 8 Rename 9 Isolation 10 ABAP PCA

Storage Volumes

Copy Target Selection

Name	Operation	Target		
		Name	Full Copy	Storage System
Storage Manager: ATS_SVC_PVC				
Volume Group: sapL02vg		sapL12vg	<input checked="" type="checkbox"/>	
Volume: volume-Is36002_sapvg-9b26e05e-782e	Create New Volume		<input checked="" type="checkbox"/>	is37san1
Logical Volume: daalv		daalv		
Logical Volume: usrsapL02lv		usrsapL12lv		
Logical Volume: transL02lv		transL12lv		
Logical Volume: sapmntL02lv		sapmntL12lv		
Logical Volume: homeL02lv		homeL12lv		
Volume Group: dataH02vg		dataH12vg	<input checked="" type="checkbox"/>	
Volume Group: logH02vg		logH12vg	<input checked="" type="checkbox"/>	

Storage Manager Details

Label:
 Vendor:
 Product:
 Version:

Monitoring Time:

Figure 2-31 SAP System Copy roadmap: Checking the storage definitions

- Specify the database consistency for the SAP source system (online or stop the SAP source system first) in case it is possible to define run time when the snapshot is triggered (Figure 2-32).

System Copy - L02: NetWeaver ABAP 7.49, ls36002db.wdf.sap.corp

Basic
 Hosts
 Host Names
 Instance Number
 Storage
 Consistency

Database Consistency ⓘ

Online: Clone Running DB
 Online: Backup/Suspend IO Mode Timeout [seconds]:
 Offline: Stop and Restart System
 Offline: Database already stopped
 Database was stopped during system snapshot

Scheduled Execution of Cloning Step ⓘ

Schedule execution of cloning step
 Execution Date (UTC):
 Execution Time (UTC):
 Latest Server Time (UTC):

Figure 2-32 SAP System Copy roadmap: Consistency

8. Define the OS users that are required for the SAP target system. Here, the users are created by LDAP. Use the configuration of users and groups (Figure 2-33).

System Copy - L02: NetWeaver ABAP 7.49, ls36002db.wdf.sap.corp

Previous Next Finish Start System Copy Create Blueprint Remote Execution Cancel

1 Basic 2 Hosts 3 Host Names 4 Instance Number 5 Storage 6 Consistency 7 Users 8 Rename 9 Isolation 10 ABAP PCA 11 Summary

User and Group Management

		Target
User ID	User Name	User Name
h12adm	h12adm	h12adm
l12adm	l12adm	l12adm

User Details and Assigned Groups

Target User Details

User ID:

User Name:

Password:

Confirm Password:

Home Directory:

Login Shell:

User ID Number:

Additional Attributes

Name	Target Value
shadowExpire	-1

Target Group Assignment

Add Remove

Group Name	Primary	Group ID
sapsys	<input checked="" type="radio"/>	cn=sapsys.o

Figure 2-33 SAP System Copy roadmap: OS users and groups

- View the SWPM settings. SWPM is started during the copy process and renames the SAP system to a new SID (Figure 2-34).

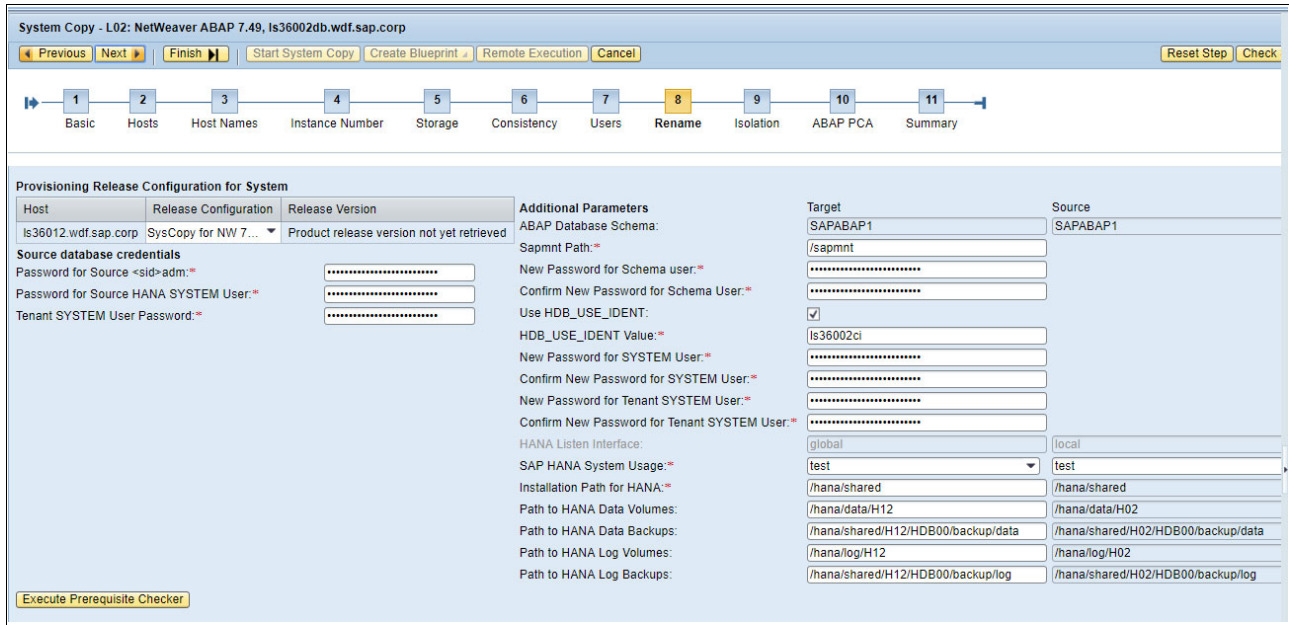


Figure 2-34 SAP System Copy roadmap: System rename settings

During the copy process, the target SAP system must be isolated to ensure SAP landscape consistency. For the isolation, SAP LaMa uses iptables in the SAP target host.

- Define allowed outgoing connections, which are not blocked but remain open during the isolation process (for example, the RMC port that is used for communicating with the HMC). See Figure 2-35.

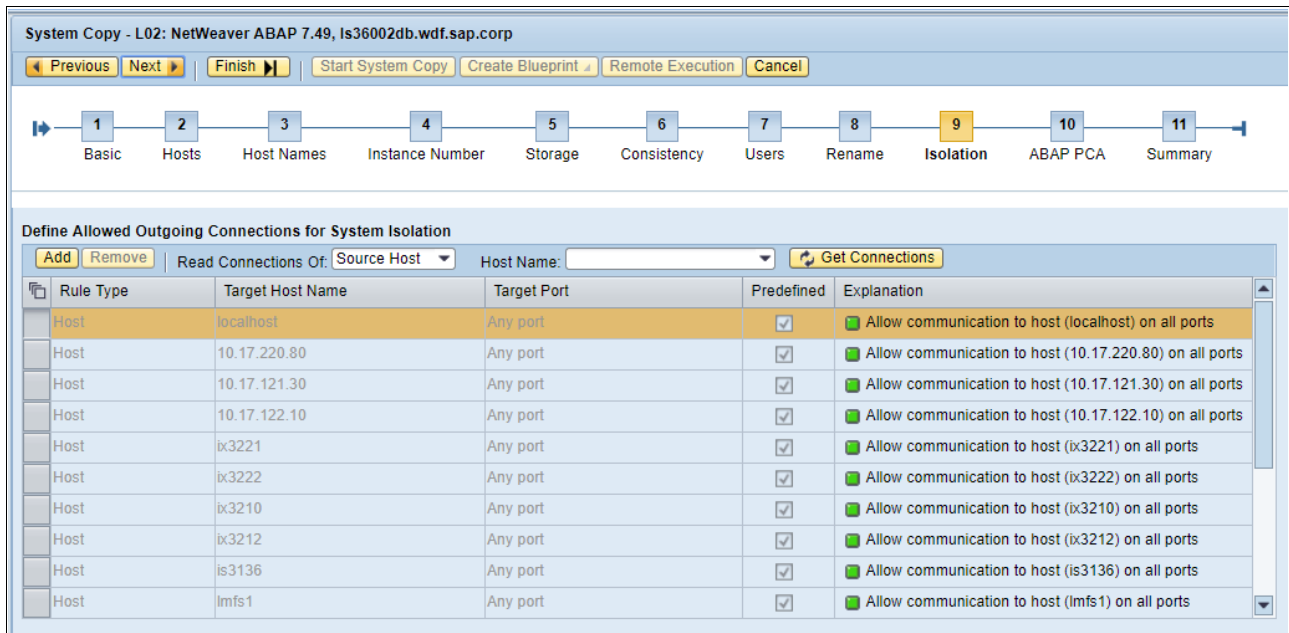


Figure 2-35 SAP System Copy roadmap: Fencing

To ensure SAP landscape consistency, the copied SAP system must be *clean*. To achieve this state, SAP SWPM must do certain tasks on the OS level (configured in step 8), and SAP PCA must do certain tasks in the SAP system itself.

11. Specify a PCA task list for the various SAP clients (Figure 2-36).

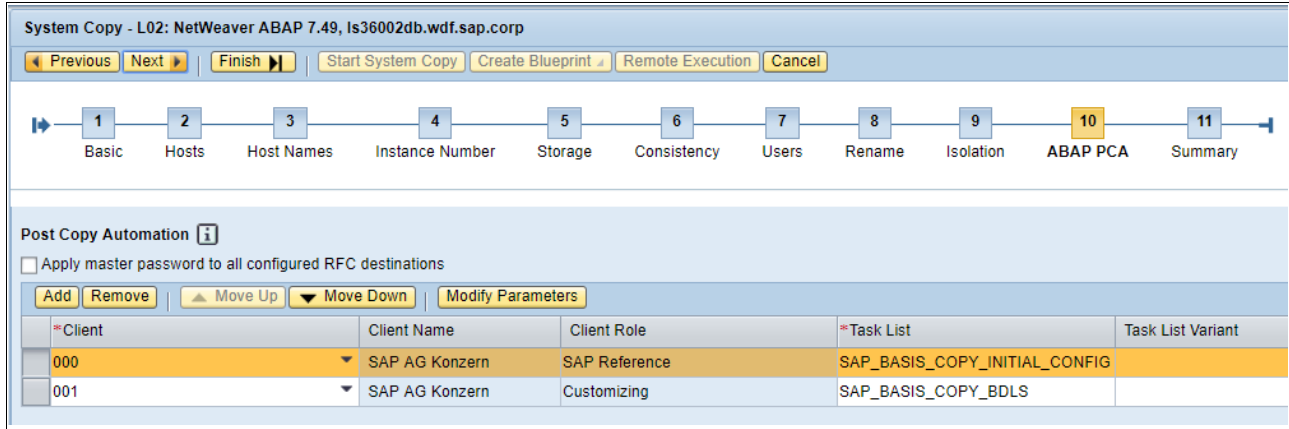


Figure 2-36 SAP System Copy roadmap: PCA settings

12. Either start the SAP system copy directly, create a blueprint and start the configured process later, or obtain a URL to trigger the process remotely (Figure 2-37).

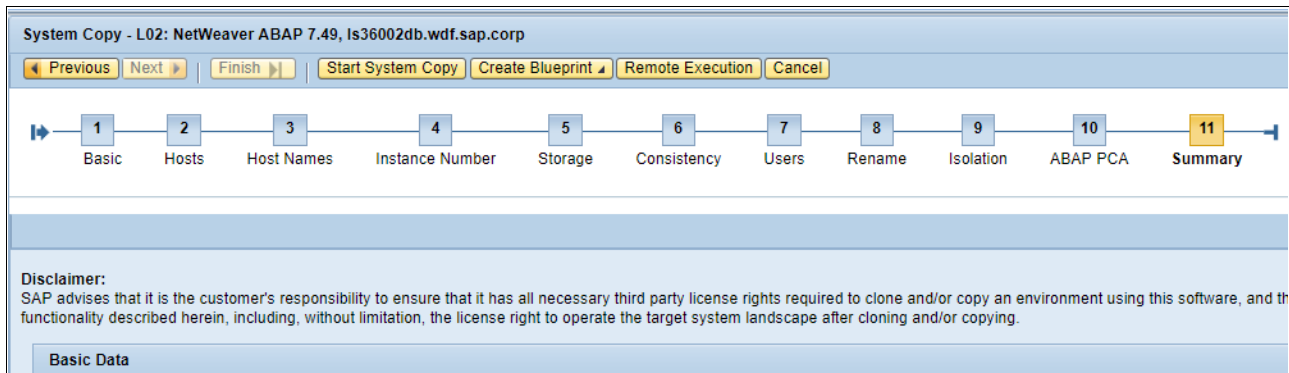


Figure 2-37 SAP System Copy roadmap: Summary

13. After starting the SAP system, select **Monitoring** → **Activities** to monitor the progress. Check the process status of each single step of this activity. You can click the step name to provide detailed logging information (see Figure 2-38 and Figure 2-39 on page 43).

The screenshot shows the SAP Landscape Management interface. The top navigation bar includes 'Advanced Operations', 'Provisioning', 'Automation Studio', 'Monitoring', 'Configuration', and 'Infrastructure'. The 'Monitoring' tab is active, and the 'Activities' sub-tab is selected. Below the navigation bar, there is an 'Overview' section with buttons for 'Cancel', 'Hold', 'Release', 'Continue', 'Retry', 'Remove', 'Filtering', and 'Export'. A table lists activities with columns for ID, Status, Progress, Description, and Note. The first activity, ID 7197, is highlighted and selected. Below the table, there is a 'Summary' section with a 'Steps' sub-tab. A 'Support Details' button is visible. The 'Steps' view shows a table with columns for ID, Successor IDs, Predecessor IDs, Hook for ID, Status, Step Time, Duration, and Operation. The steps are numbered 1 through 10, and all are marked as 'Completed'.

ID	Status	Progress	Description	Note
7197	Completed	100%	System Copy	
6882	Completed	100%	Monitor-ATD-AS	
6878	Completed	100%	Monitor-ATD-AS	
6864	Completed	100%	Monitor-ATD-AS	
6862	Completed	100%	Monitor-ATD-AS	

Rows: 177 total, 177 shown, 1 selected Selected: Activity ID - 7197

ID	Successor IDs	Predecessor IDs	Hook for ID	Status	Step Time	Duration	Operation
1	2			Completed	0:00	0:00	Create Target System
2	3,5,7,8	1		Completed	0:00	0:35	Prepare Clone Volumes
3	4	2		Completed	0:36	0:46	Stop
4	5	3		Completed	1:22	1:26	Stop
5	6	2,4		Completed	2:48	0:25	Prepare DB copy
6	7	5		Completed	3:14	0:34	Finalize Source DB
7	13,18,19,21,26,30,31,32,33,34,35,8,9	2,6		Completed	3:48	0:28	Clone Volumes
8	10,11,13,18,19,21,26,30,31,32,33,34,35	2,7		Completed	4:17	0:55	Post Clone Volumes
9	12	7		Completed	4:17	1:22	Start
10	13	8		Completed	5:14	0:40	Update Mount Configuration

Figure 2-38 Monitoring view: Steps (1 of 2)

Log ID	Status	Time (UTC)	Duration	Instance/Virtual Element	Host/Parent Virtual Element
7,484	Successful	2019-05-06 12:21:05	0:40	L12, Is36012db.wdf.sap.corp	Is36012.wdf.sap.corp
7,483	Successful	2019-05-06 12:21:30	0:45	L02 AS instance (ABAP):_02_Is36002ci.wdf.sap.corp	Is36002.wdf.sap.corp
7,482	Successful	2019-05-06 12:20:07	0:55	L12, Is36012db.wdf.sap.corp	Is36012.wdf.sap.corp
7,481	Successful	2019-05-06 12:20:08	1:22	H02 System database (ABAP): MASTER (active): SAP HANA 00_Is36002db.wdf.sap.corp	Is36002.wdf.sap.corp
7,480	Successful	2019-05-06 12:19:38	0:28	L02: NetWeaver ABAP 7_49_Is36002db.wdf.sap.corp	Is36012.wdf.sap.corp

ID	Time (UTC)	Entry Time	Message Code	Severity	Message
15	2019-05-06 12:20:07	0:28	LVM	Information	Operation Status is 'COMPLETED'!
14	2019-05-06 12:20:07	0:28	IBM	Information	Step finished with status 'COMPLETED'.
13	2019-05-06 12:20:07	0:28	IBM	Information	Snapshot with ID '9a915fa2-8ed0-489c-86f7-396222a303ef' has status 'Available'.
12	2019-05-06 12:20:07	0:28	IBM	Information	STEP: Wait for snapshot becoming status 'Available'.
11	2019-05-06 12:19:46	0:07	LVM	Information	Operation Status is 'EXECUTING'!
10	2019-05-06 12:19:46	0:07	IBM	Information	Step finished with status 'EXECUTING'.
9	2019-05-06 12:19:46	0:07	IBM	Information	STEP: Wait for snapshot becoming status 'Available'.
8	2019-05-06 12:19:42	0:03	LVM	Information	Triggered operation with ID 'StorageOperationId [id=MultiStorageManagerAdapterResponseId, type=com.sap.tc.vcm.storage.adapter.multi.MultiStorageOperationResponsePayload]'
7	2019-05-06 12:19:42	0:03	IBM	Information	Step finished with status 'EXECUTING'.
6	2019-05-06 12:19:42	0:03	IBM	Information	STEP: Wait for snapshot becoming status 'Available'.
5	2019-05-06 12:19:42	0:03	IBM	Information	Step finished with status 'COMPLETED'.
4	2019-05-06 12:19:42	0:03	IBM	Information	STEP: Wait '10' so PowerVC updates its internal data.

Figure 2-39 Monitoring view: Steps (2 of 2)

2.5 Outlook

SAP and IBM continuously develop more features for this solution, such as container support, HANA, and operational enhancements to reduce planned downtime. This section describes more use cases of SAP LaMa on IBM Power Systems servers with or without IBM System Storage.

2.5.1 SAP containerized applications

SAP is committed to the strategic trend of containerization. Containers are becoming a fundamental building block for modern application development. For example, SAP HANA Express Edition, which is a streamlined version of the SAP HANA platform, is available as a Docker container image for Linux and Intel processor-based platforms. You can use SAP HANA Express Edition to build and deploy modern applications that use up to 32 GB of memory so that developers can perform application development on their personal computers or in the cloud.

However, SAP NetWeaver Systems and SAP HANA databases usually are installed in bare-metal servers or VMs. These VMs remain in the data centers for many years, and must be managed and maintained by IT administrators.

One IBM Cloud key differentiator is that IBM Cloud uses Kubernetes to orchestrate container deployments, but IBM Cloud can also provision VMs for multicloud environments by using IBM Cloud Automation Manager. Cloud Automation Manager is part of IBM Cloud and can manage various cloud endpoints, including IBM PowerVC.

2.5.2 SAP HANA management

SAP and IBM introduced support for HANA scale-up copy, clone, and refresh functions and further basic management in 2018. Since then, the integration of SAP HANA has progressed and downtime-minimizing features have been general available in April 2019.

Related publications

The publications that are listed in this section are considered suitable for a more detailed description of the topics that are covered in this paper.

IBM Redbooks

The following IBM Redbooks publication provides more information about the topics in this document. This publication might be available in softcopy only.

- ▶ *IBM PowerVC Version 1.3.2 Introduction and Configuration*, SG24-8199

You can search for, view, download, or order this document and other Redbooks, Redpapers, web docs, drafts, and additional materials, at the following website:

ibm.com/redbooks

Online resources

These websites are also relevant as further information sources:

- ▶ IBM PowerVC documentation
<https://developer.ibm.com/powervc/>
- ▶ SAP Landscape Management (SAP LaMa) 3.0 Enterprise Edition
https://help.sap.com/viewer/lama_help
- ▶ SAP Support Software download portal
<https://support.sap.com/swdc>

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