Microsoft®

Microsoft® Host Integration Server 2009

Product Overview

White Paper

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Applies to: Host Integration Server 2009

Summary: Microsoft® Host Integration Server 2009 offers technologies and tools for enterprise organizations to integrate existing IBM host systems, programs, messages and data with new Microsoft server applications.

Look for information on Microsoft Host Integration Server 2009 on the Microsoft BizTalk® Server 2009 Web site (http://www.microsoft.com/biztalk/en/us/host-integration.aspx).

Contents

Introduction

Many enterprise organizations rely on heritage host server systems to run mission-critical workloads that support daily operations. These host systems include IBM mainframe System z, IBM midrange System i and System p, Hewlett-Packard UNIX (HP-UX), Sun UNIX (Solaris), and Linux servers. Commonly, these host systems run a variety of IBM system and application software, IBM server technologies and tools that form the base of enterprise IT investments.

A significant challenge to enterprise IT organizations is the need to continually re-invest in these heritage platforms, to extend these systems to new workloads, including: service-enablement, on-line transactions, messaging interchange, business intelligence, workflow and collaboration.
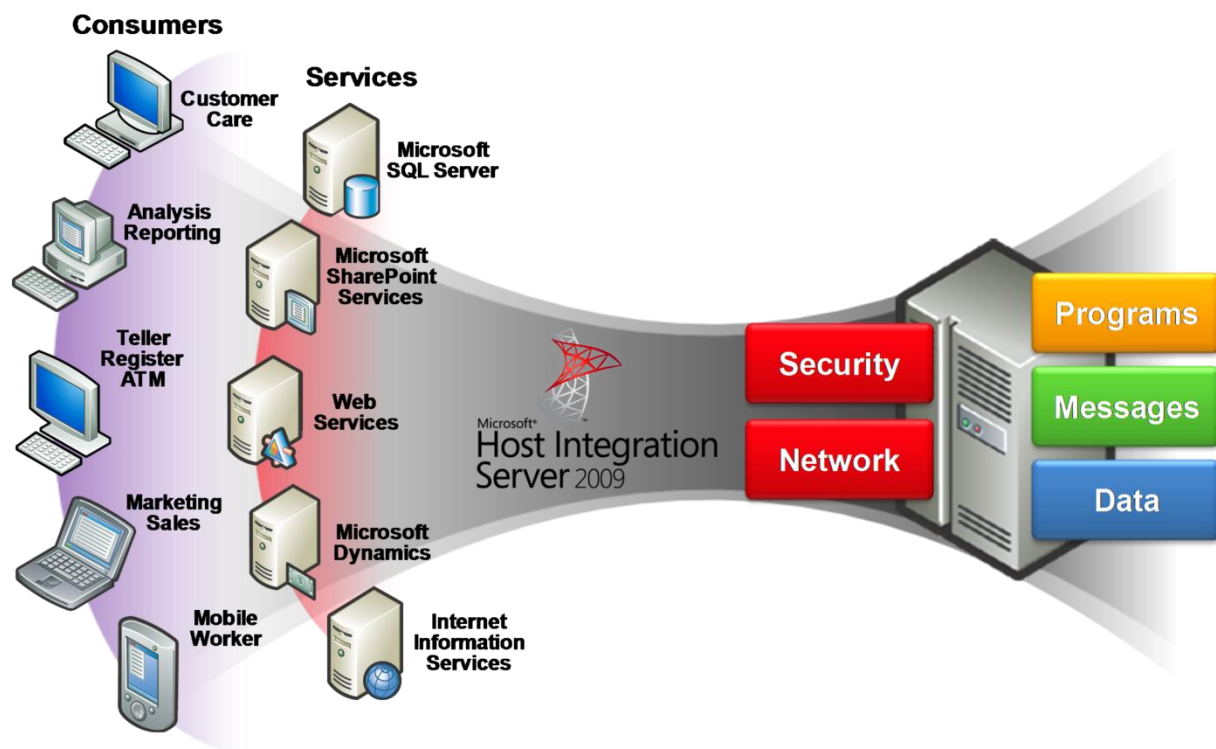

Figure 1: HIS 2009 allows enterprise IT to extend existing investments in IBM systems.

Microsoft recognizes the value of this investment in "IBM host systems" and offers technologies and tools for integrating these existing systems with new solutions based on devices, desktops, and servers running Microsoft Windows® operating systems and application software. Retaining mission-critical heritage investments and integrating these with new workloads, offers many benefits to enterprise IT.

- Enables enterprise developers to deliver new applications sooner, through improved productivity using Microsoft Visual Studio® 2008 and Microsoft .NET Framework 3.5, without requiring knowledge of host systems and infrastructure, when compared to IBM heritage development tools and technologies.

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- Empowers knowledge workers and decision-makers to analyze and report vital information faster, by directly accessing host data sources from business intelligence tools within Microsoft Office SharePoint® Server 2007 and SQL Server® 2008, without needing to schedule host developers to write programs to extract and convert heritage host data structures.

- Allows IT administrators to securely connect new systems more efficiently, by utilizing industry-standard high performance routing and transmission control protocols over modern internet protocols, reducing operating expenses and total cost of ownership (TCO), while supporting all existing and new computing workloads, when compared to heritage host network infrastructure.
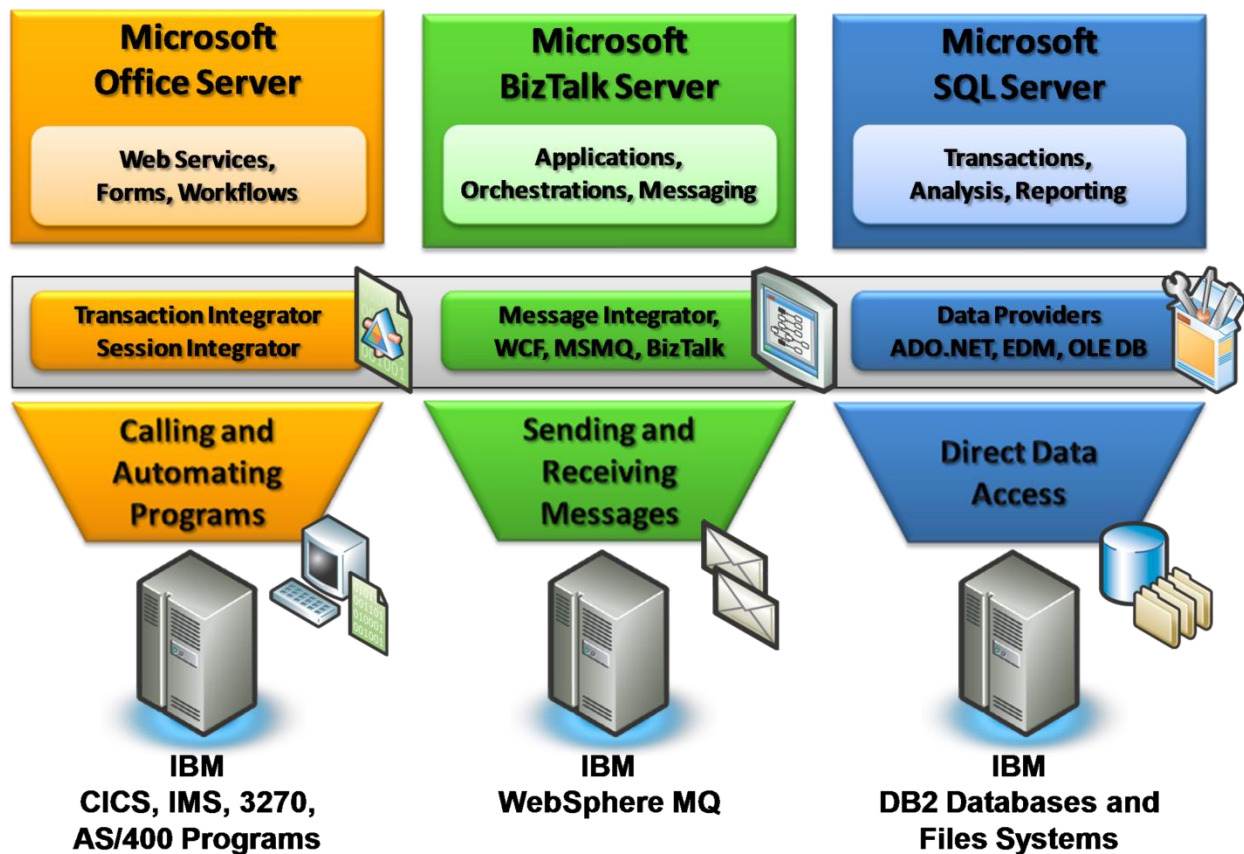

Figure 2: HIS 2009 enables enterprise developers to deliver new applications sooner.

Over the last twenty years, Microsoft has improved its host integration technologies and tools based on enterprise customer needs. Today, Microsoft host integration technologies, tools, and adapters are delivered in a variety of Microsoft products: SQL Server 2008, Identify Lifecycle Manager 2007, and BizTalk Server 2009.

Integrating Host Programs

Host Integration Server 2009 offers technologies and tools designed to enable enterprise IT organizations to service-enable, Web-enable, and otherwise modernize their existing investments in IBM host programs. Most enterprises run a combination of commercial packaged and custom-developed host programs, written in a broad range of programming languages (Assembler, COBOL, PLI, RPG, REXX, C, Java, JCL and CL). These host programs run on server operating systems, such as z/VM, z/TPF, z/VSE, z/OS, i5/OS, as well as in Java runtimes on AIX and Linux. On mainframe and midrange host servers, the programs run within one of these host subsystems: IBM Time Sharing Option (TSO); Transaction Processing Facility (TPF); Information Management System (IMS); Customer Information Control System (CICS); i5/OS; and third-party program processing subsystems.
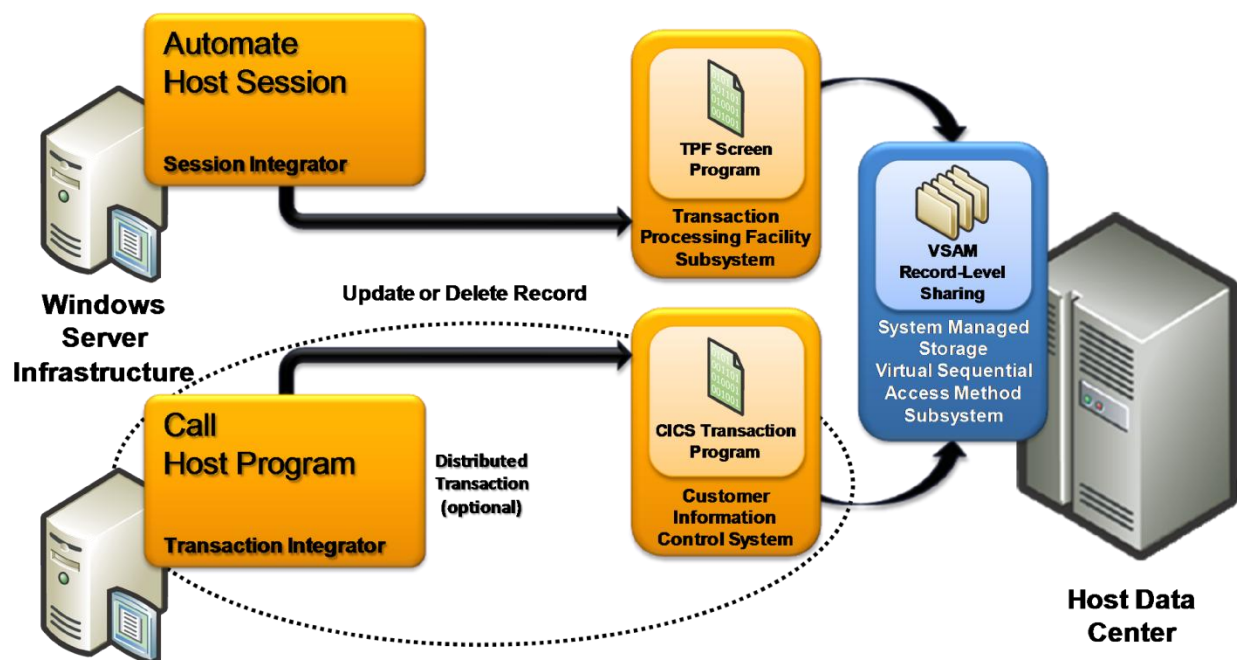

Figure 3: HIS 2009 can call host transaction programs and automate screen-based programs.

Host Integration Server 2009 offers a set of technologies for automating, calling, and emulating host programs. Using the core SNA Software Development Kit, enterprise developers can develop emulation programs for common SNA Application Programming Interfaces (APIs), such as Application Program-to-Program Communications (APPC), Common Program for Communications (CPI-C) and Common Service Verbs (CSV). If the program is terminal screen-based, designed for user interaction through a 3270 terminal, or then HIS 2009 Session Integrator technology can automate end user input to modernize this type of host program. However, if the program is callable and part of a distributed architecture, such as CICS distributed link model programs, then HIS 2009 Transaction Integrator technology can automate calling this type of host program.

Transaction Integrator (TI) allows enterprise developers to publish and extend business rules in host mainframe (CICS and IMS) and midrange (AS/400) programs using Visual Studio 2008

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and .NET Framework 3.5. With TI, enterprise developers can efficiently publish XML Web services, integrate existing business logic in new Windows Form and Web Form applications, without knowing proprietary SNA programming and networking.
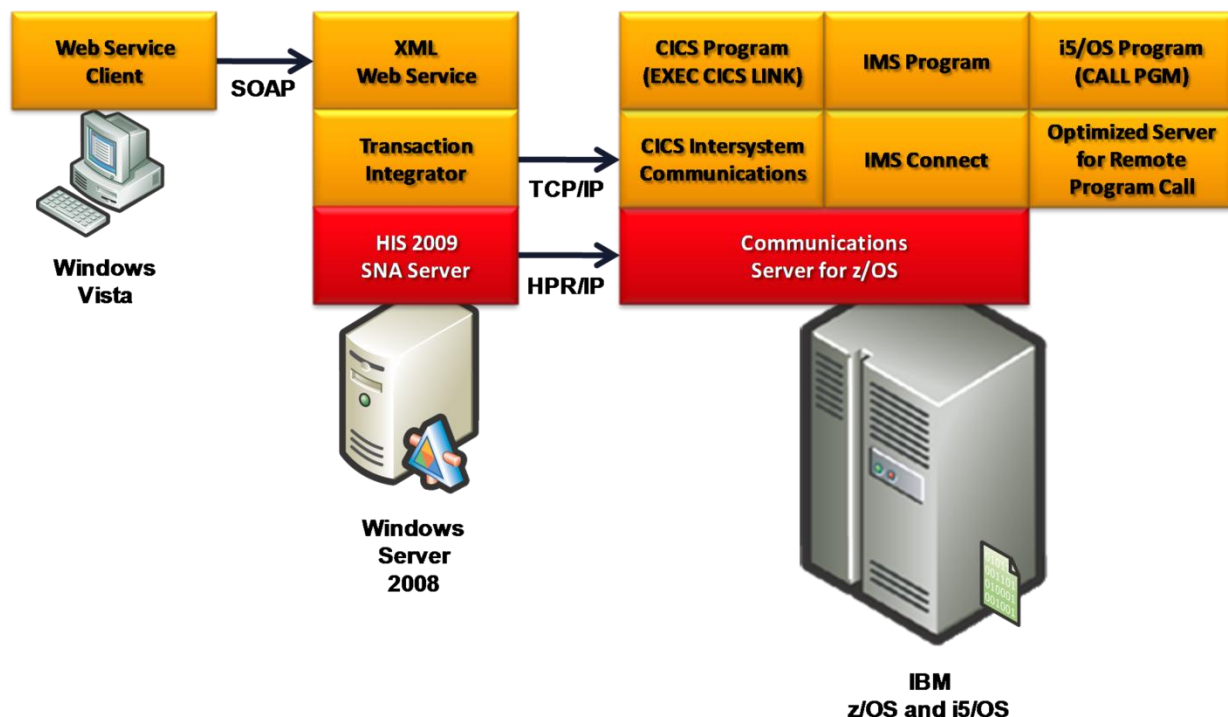

Figure 4: Transaction Integrator connects Microsoft server applications to host programs.

Transaction Integrator connects to the host computer as a peer system, using protocols and formats that are native to the remote environment. TI offloads the host system from performing non-native data and code page conversions, preserving the integrity and performance of vital line-of-business systems. Transaction Integrator is composed of a Visual Studio 2008 plug-in designer, Management Console snap-in deployment and administration tool, data and code page conversion engines, communications state machine and pluggable runtime network transports.

Transaction Integrator supports both .NET Framework and Component Object Model architectures. With HIS 2009, a number of the new enhancements for TI are available only with .NET. TI operates in two modes: Windows-initiated processing (WIP) and host-initiated processing (HIP).

- Using WIP, enterprise developers can connect Windows Form and Web Form applications to existing host server programs, to re-use existing business logic and data in new applications, and build new on-line transaction processing solutions. Also using WIP, enterprise developers can service-enable host server programs, as XML Web services and WCF Services, allowing standards-based modernization of host programs.

- Using HIP, enterprise administrators can allow existing host client programs to securely connect to new Microsoft server applications, using familiar host programming models and communications infrastructure, providing flexibility to offer solutions based on batch processing and bi-directional data movement.

With TI, enterprise developers can connect to host programs running under Information Management System (IMS), Customer Information Control System (CICS), and i5/OS.

- IBM CICS for z/OS V2.3, V3.1, and V3.2

- IBM IMS V9.1 and IMS V10, with IMS Connect 2.2

- IBM i5/OS V5R4 and i6/OS V6R1

Transaction Integrator for Windows-initiated processing offers a deployment option to generate either XML Web services or WCF services from within the TI administration tool, enabling a no-coding-required means to web-enable host mainframe CICS and IMS transactions or AS/400 callable programs. The TI runtime and Visual Studio 2005 design tool have been extended to support dynamic discriminators on unions of REDEFINEs or OVERLAYs, allowing enterprise developers to re-use complex host business rules to access data stored in nested VSAM records, IMS/DB tables, and AS/400 physical files.
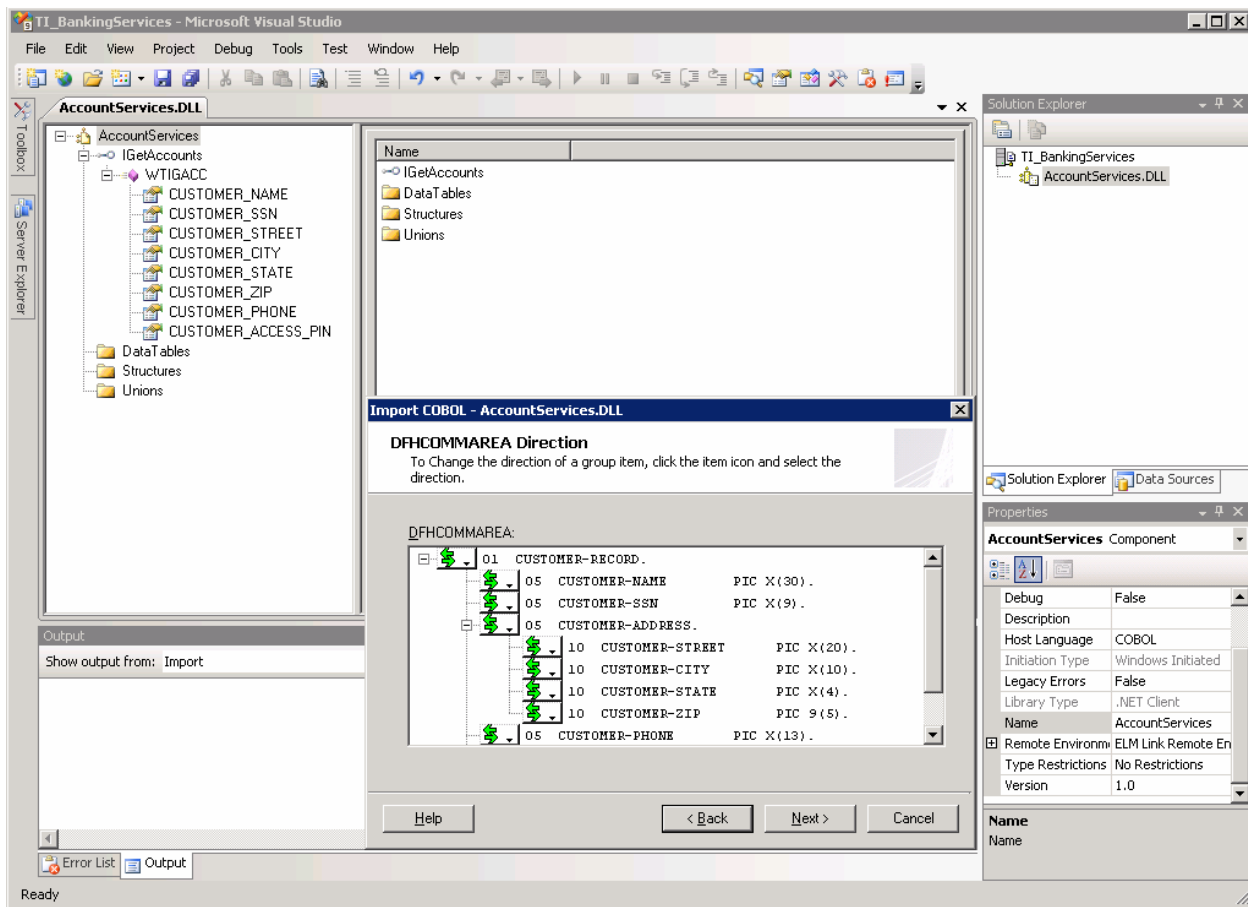

Figure 5: Transaction Integrator Designer includes an efficient COBOL Import Wizard.

TI Designer

The process begins with an enterprise developer adding a TI Designer project to a new or existing solution in Visual Studio 2008. The solution can be to develop an XML Web service, WCF service, Windows Form, Web Form, or other application that supports the .NET Framework. The enterprise developer adds a new TI WIP component, selecting the host environment (CICS, IMS, AS/400) and networking (SNA or TCP/IP). At this point, the developer can define the Windows client interface manually, matching it semantically to the remote host program. However, most developers will utilize the source code import wizard (COBOL, COBOL/400, RPG) to automate the process of defining the client program inputs, outputs, returns, and data structures. The result is a client proxy definition for a .NET component, that includes mappings between interface, Common Language Specification and host data types, allowing TI at runtime to convert data and invoke the host program as a peer—on behalf of the calling client Windows program.

Once defined and customized, the developer persists the .NET or COM representation of the host program in a .NET assembly or COM+ type library. The next step is to publish this assembly or type library to a runtime context, such as an ASP.NET application or COM+ package using the TI administration tools.

TI Manager

The Management Console snap-in TI Manager tool combines TI Windows-Initiated Processing (WIP) and Host-Initiated Processing (HIP) into one view, allowing administrators to efficiently define and manage WIP and HIP component applications. IT administrators and enterprise developers utilize TI Manager to define TI WIP configurations, composed of two high-level items: Remote Environments and Objects.

Remote Environments

TI remote environment are definitions of the foreign subsystem to which TI will connect at runtime, including the platform, communications model, network address, security context, program library, and program name. Transaction Integrator supports required IBM host programming models, including these popular types.

Network	CICS	IMS	AS/400	Programming Model
TCP/IP	X			Transaction Request Message (TRM) Link
TCP/IP	X			Enhanced Listener Message (ELM) Link
TCP/IP	X			Transaction Request Message (TRM) User Data
TCP/IP	X			Enhanced Listener Message (ELM) User Data
TCP/IP		X		IMS Connect
TCP/IP			X	Distributed Program Call (DPC)
HPR/IP	X			Link

Table 1: Transaction Integrator supports the necessary programming models.

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Typically, enterprise developers will utilize the CICS distributed program link model, which offers ease of mainframe coding. However, when performance and network efficiency are of utmost importance, then IT administrators will advocate Enhanced Listener Message programming model. Where state management is required for multi-step or long-running transactions, then enterprise developers will opt for TCP/IP persistent connections.
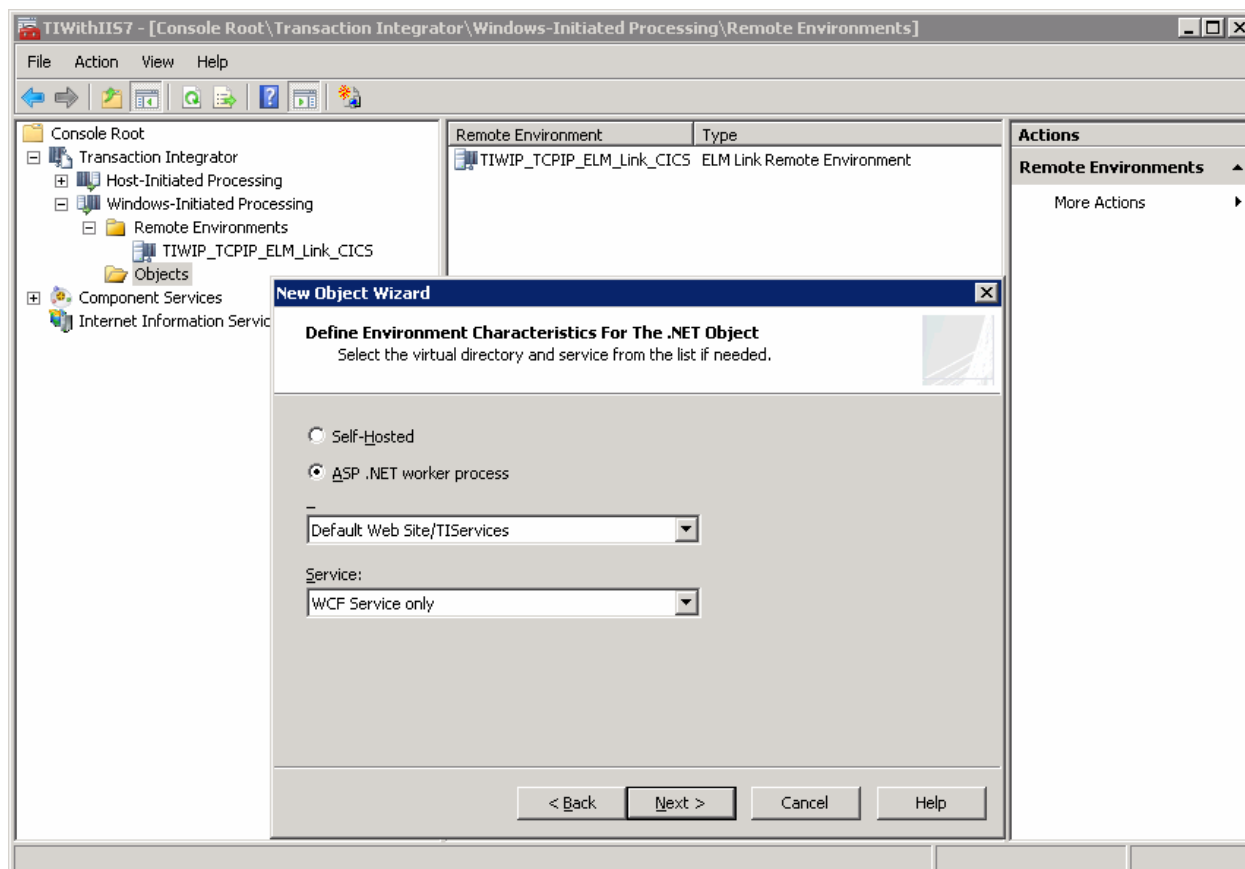

Figure 6: TI Manager offers a wizard to publish WCF services.

Objects

The IT administrator or enterprise developer associates a TI component Object definition, persisted as a .NET assembly or COM type library, with a defined TI Remote Environment, and then publishes the component for use in a number of runtime contexts. TI Manager can publish direct .NET callable components, which can be included in applications that support the .NET Framework. Also, TI Manager can publish XML Web service, by generating an ASMX file in an existing ASP.NET virtual directory. Further, TI Manager can publish a WCF service, to generate with an associated contract within an ASP.NET application.

Host-Initiated Processing

Transaction Integrator HIP is an uncommon technology that allows a Windows Server® computer to function as a peer to IBM mainframe and AS/400 computers. For example, CICS programmers can call into Windows COM+ or .NET server components, just as if they were

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another CICS transaction program by using familiar programming models such as CICS distributed program link (DPL). HIP enables developers to produce asynchronous solutions without using middleware such as MQSeries. For example, many batch processes must return a response to the requester in the form of bulk output such as a finished report. Using TI WIP, Windows clients can request a report that is returned from the host server via HIP at a later time.

TI HIP allows enterprises to more effectively move portions of their application logic or data onto the more cost-effective Windows Server and SQL Server platforms, while ensuring logical bidirectional application communication. TI for Host-Initiated Processing supports CICS, IMS and AS/400 host clients. TI HIP can be optimized to allow for persistent network connections, saving costs in terms of session startup, allowing IT professionals to efficiently deploy HIP into high volume deployment scenarios.
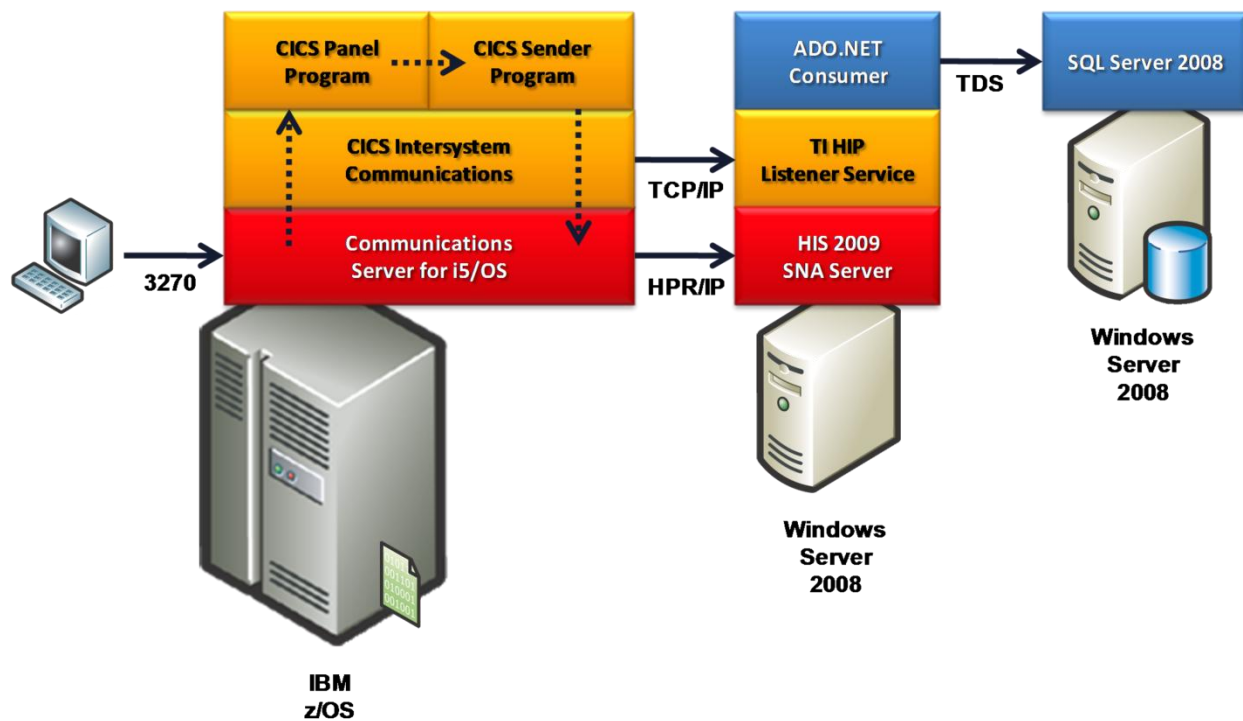

Figure 7: Transaction Integrator HIP connects host clients to Microsoft server applications.

Transaction Integrator Optimizations

To enable enterprise developers to deploy more efficient solutions, HIS 2009 Transaction Integrator contains a number of optimizations in the form of optional features and deployment choices. For example, persistent connections enable administrator to re-use network connections, based on client context keywords open, use, and close.

Client context provides a means for the client to influence the TI runtime. Developers choose whether to expose this parameter, when defining the component in TI Designer. For example, the developer may choose to send a client-specific user identifier and password combination to the host program through the client context.

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Many host datasets contain nested records that the host program interprets by single or multiple discriminant values, through the use of a COBOL REDEFINE or RPG OVERLAY clause. For example, a customer may be interpreted as containing an address or an order, based on a discriminant value that is context-specific to an application. At runtime, TI can convert a data record based on one or many redefined data areas. TI WIP includes features providing the developer with greater flexibility, including Client Context that provides an alternative to Explicit Call Back Security, while offering a means of overriding default values (Remote Environment, Program Name and Transaction Name). TI enables enterprise developers to re-route traffic from one CICS region to another, across logical partitions (LPARs), by using the remote environment (RE) override or dynamic remote environments.

In HIS 2009, TI offers a fully-managed mode of operation that increases performance over HIS 2006, wherein .NET components relied on COM-interoperability. This new features supports the more popular programming models, including CICS ELM Link and AS/400 DPC. As part of the samples in the HIS 2009 SDK, TI offers a preview of a new HTTP Transport for CICS, which also offers the potential of higher throughput when connecting directly to CICS via TCP/IP network connections, compared to the TRM and ELM link models over TCP/IP.

Reliable 2PC distributed transactions are popular in many on-line transaction processing environments that span multiple homogenous and heterogeneous systems. Transaction Integrator supports reliable 2PC-protected transactions when connecting to CICS and IMS via SNA LU6.2 networking. CICS and IMS interact with IBM Resource Recovery Services for z/OS. Concurrently, TI interacts with Microsoft Distributed Transaction Coordinator and offers an SNA LU6.2 Resynchronization Service to exchange transaction logs in case of network failure.

TI allows the developer to utilize Enterprise Single Sign-On for both Windows-Initiated Processing and Host-Initiated Processing scenarios. It is a best practice when using any HIS 2009 feature to employ ESSO to manage credentials. To help troubleshoot problems that span platforms, Transaction Integrator offers the ability to send soft server error messages to the host system through the Use Meta Data Include All Information option.

Session Integrator

The vast majority of host programs are terminal session-based, screen-oriented programs that run in TSO, CICS, IMS, and Transaction Processing Facility. The z/TPF subsystem is hosted by z/VM to support packaged and custom-developed reservation systems, used commonly by airlines, railroads, shippers, and hotels. Windows computers can interoperate with z/TPF through common integration approaches, including: 3270 terminal emulation software; WebSphere MQ messaging; and DB2 connectivity.

Typically, enterprise developers find host session-based programs difficult to modernize. Session Integrator includes "screen-scraping" runtime services and programming interfaces for developing new device applications using the .NET Framework or COM. SI allows enterprise developers to emulate and automate access to Logical Unit type 2 3270-based and Logical Unit type 0 LUA-based host mainframe programs, producing new solutions for customer care and retail operations.
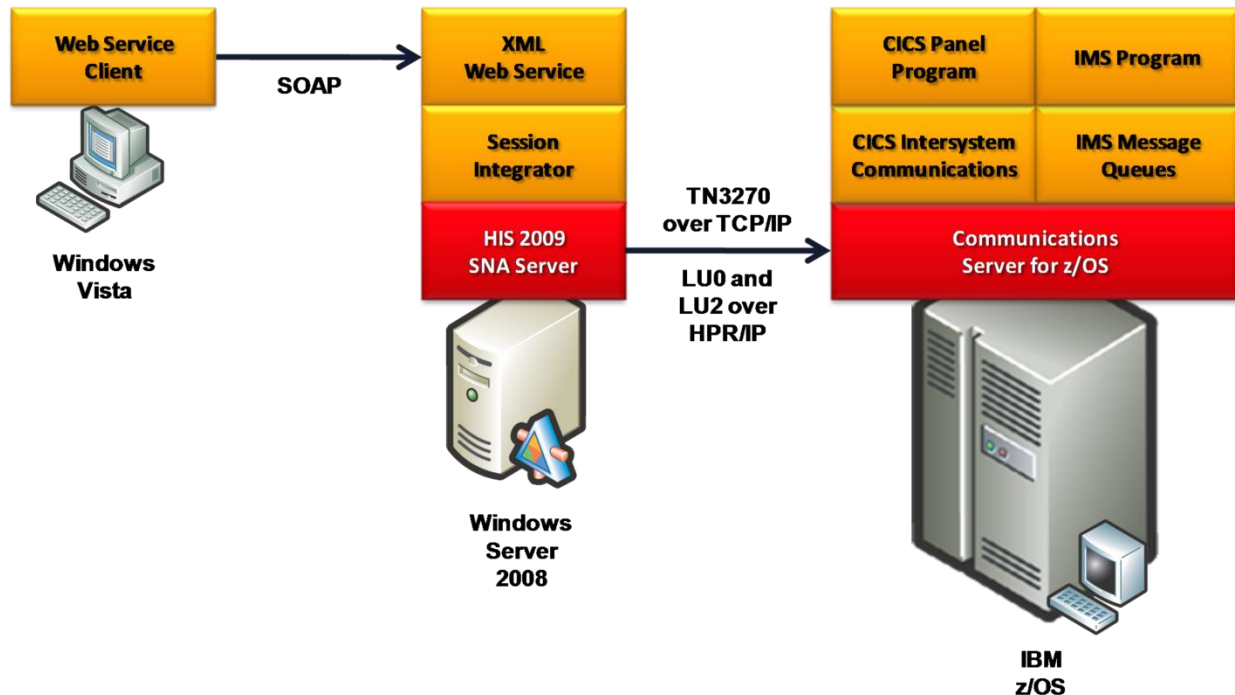
Figure 8: Session Integrator can automate host screen-based programs.

Session Integrator can connect to the host system across an SNA over IP (HPR/IP) or Data Link Control (DLC) network connection, through an upstream or intermediary HIS 2009 computer operating as an SNA gateway. Also, Session Integrator can connect TN3270 over TCP/IP directly to the host. Compared to competing solutions, Session Integrator offers tight integration with the core HIS SNA gateway service, offering greater potential for deploying highly scalable solutions, when connecting LU2-based and LU0-based applications. Enterprise developers can build more reliable and secure solutions by using the built-in code page conversion and support for Enterprise Single Sign-On.

Within the financial services and retail industries, enterprise organizations are modernizing out-dated point-of-sale devices, such as automated teller machines and cash registers, replacing these older devices with new Windows devices relying on Microsoft Host Integration Server and Microsoft infrastructure software. HIS 2009 offers a set of technologies, collectively called Session Integrator, for more efficiently building these modern devices on Windows server infrastructure.

Calling Batch Programs

HIS 2009 offers enterprise IT administrators with technologies for remotely calling IBM i5 (OS/400) Control Language (CL) batch programs, through an option in the Microsoft .NET Data Provider for Host Files, Microsoft OLE DB Provider for AS/400 and VSAM, and BizTalk Adapter for Host Files. When using these providers or adapters, then IT administrator can benefit from efficient network connectivity over a choice of SNA, HPR/IP or TCP/IP, with optional connection pooling for use with multi-step processes. Using ESSO, IT administrators can ensure secure

access to the remote host system, allowing only authorized users to call the host batch programs.

IBM Distributed Data Management server software, built into the IBM i5/OS, enables remote access from Windows server software to IBM batch programs. At runtime, the providers or adapter automatically convert the host command from UNICODE to EBCDIC. After successful execution, a return code can be processed by the client program, as part of a new workflow or service-enabled application.
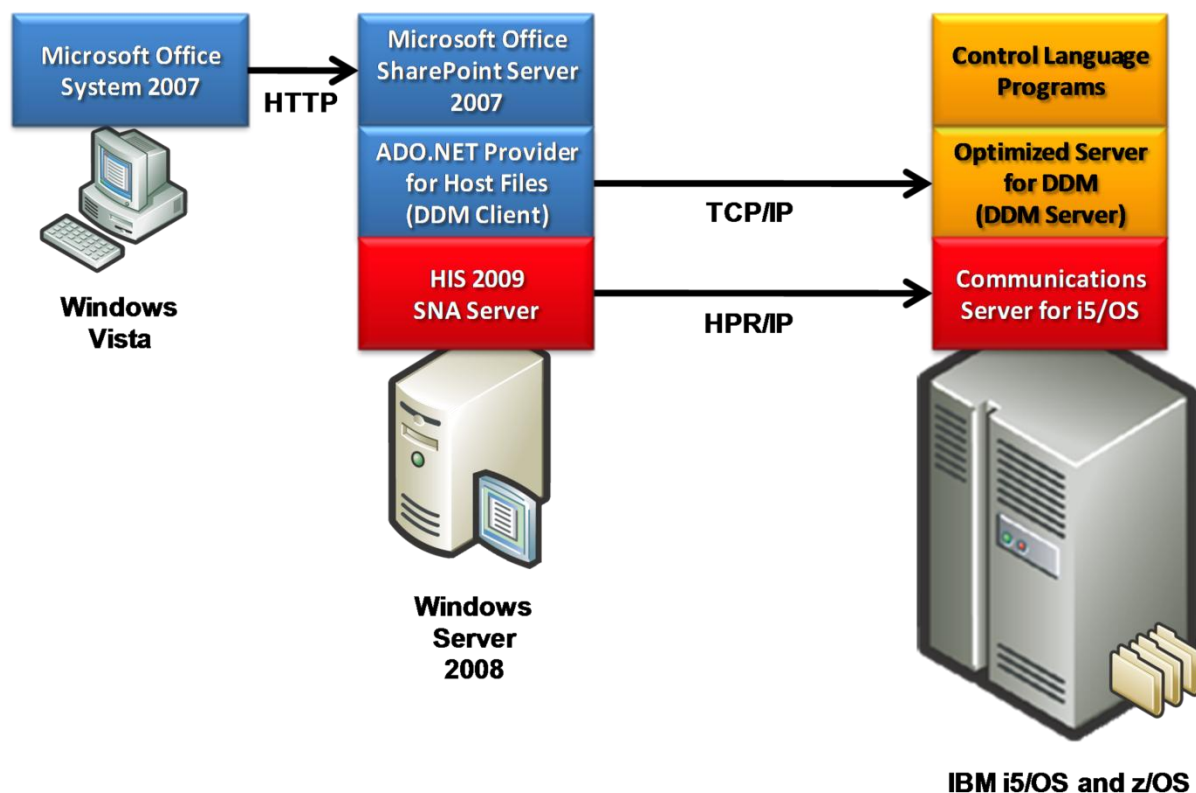

Figure 9: Calling a midrange IBM i batch program is easy using host file data providers.

To define connection, IT administrators use the common Microsoft Data Access Tool, Data Access Library, and Data Source Wizard that are part of the HIS 2009 data technologies and tools feature set. Database administrators can use remote program call from within Microsoft SQL Server 2008 tools that support ADO.NET providers or OLE DB providers, such as Integration Services and Query Processor. Knowledge workers can execute host batch jobs to initiate data extracts for compiling reports, from Microsoft Office System 2007 tools for ADO.NET providers or OLE DB providers, such as Excel®. Enterprise developers can include host batch programs in solutions based on XML document interchange and orchestration by using Microsoft BizTalk Server 2009 tools for BizTalk Adapters.

Integrating Host Messages

Many enterprise organizations utilize IBM WebSphere/MQ (MQSeries) for cross-platform messaging. In some industries, such as financial services, MQ has become a defacto standard in cross-organization messaging, replacing older electronic data interchange systems. For example, regional banks have agreed to utilize MQ for inter-bank transfers, based on the Society for Worldwide Interbank Financial Telecommunication (SWIFT) standard for secure financial messaging services.
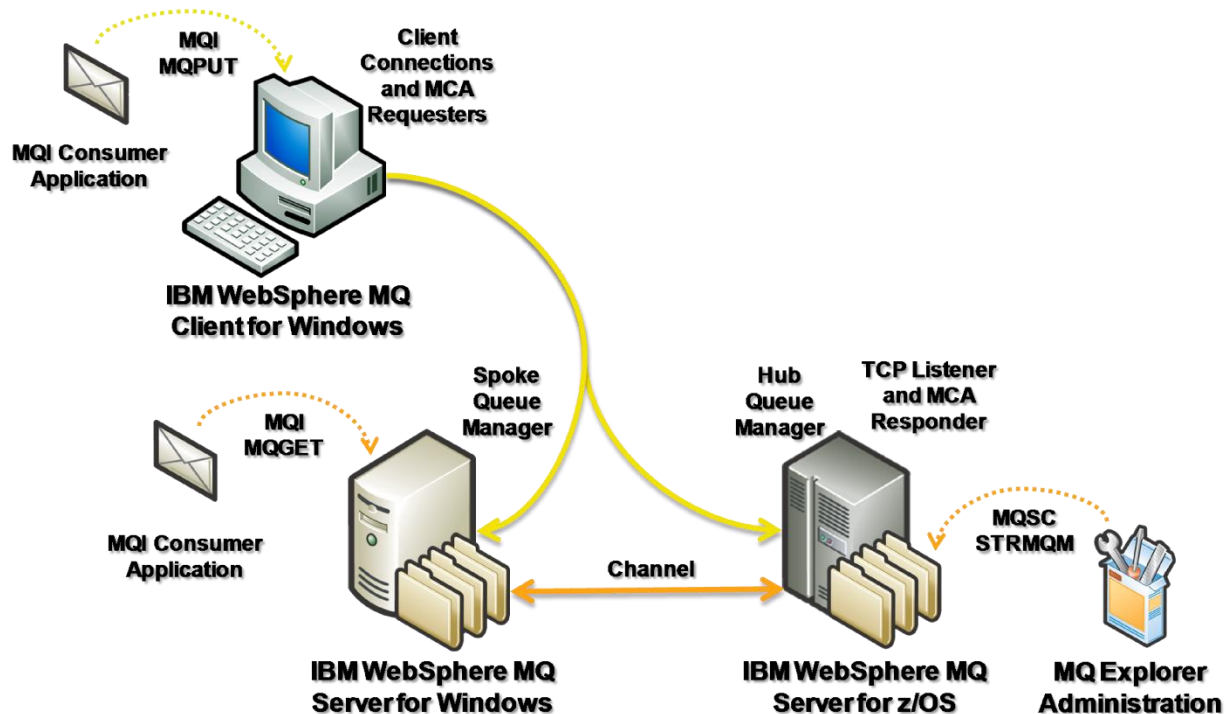

Figure 10: IBM WebSphere MQ infrastructure exists in many enterprise organizations.

HIS 2009 allows enterprise IT professionals and developers to integrate existing IBM WebSphere MQ infrastructure within Microsoft server software, including Microsoft Message Queue (MSMQ), BizTalk Server 2009, and Windows Communications Foundation applications. Microsoft supports currently supported IBM versions of WebSphere MQ on popularly-deployed platforms.

- IBM WebSphere MQ for z/OS V 6.0 and V7.0

- IBM WebSphere MQ for z/VSE V3.0

- IBM WebSphere MQ for iSeries V6.0 and V7.0

MSMQ-MQSeries Bridge

Although many enterprise organizations have standardized on WebSphere MQ for cross-platform interoperability, IT professionals and enterprise developers prefer to rely on Microsoft Message Queuing (MSMQ) when developing messaging solutions for deployment with

Microsoft server applications. HIS 2009 offers an MSMQ-to-MQSeries Bridge to satisfy the essential need to connect MSMQ to WebSphere MQ, without requiring any enterprise developer effort. IT professionals can install, configure, and administer the MSMQ-MQSeries Bridge, allowing enterprise developers on both sides to send and receive messages using their native messaging APIs, tools, networking, protocols, format and headers.

Sending Messages to MQSeries

To send a message from MSMQ to MQSeries, an IT professional defines an MSMQ foreign computer representing the MQSeries Queue Manager, and the MQSeries destination queue must already exist.

- o An MSMQ application issues an MSMQ MQCreateQueue() API call to create a foreign queue, located on the foreign computer and representing the MQSeries destination queue. Alternatively, you can create the foreign queue using MSMQ, and in Windows 2008 the foreign queue is a part of Managing Users and Computers.

- o The application calls MQOpenQueue() to open the foreign queue.

- o The application calls MQSendMessage() to send a message to the foreign queue. MSMQ routes the message and stores it temporarily on an MSMQ connector queue.

- o The MSMQ-MQSeries Bridge takes the message from the connector queue and converts the message properties to the MQSeries message structure. MSMQ-MQSeries Bridge routes the message to the MQSeries destination queue.

- o An MQSeries application issues an MQSeries MQGET() API call to receive the message from the MQSeries queue.

Receiving Messages from MQSeries

To send a message from MSMQ to MQSeries, you must define an MSMQ foreign computer representing the MQSeries Queue Manager, and the MQSeries destination queue must already exist.

The path for sending a message from MQSeries to MSMQ is basically the inverse of MSMQ to MQSeries, with a few differences. You must define appropriate MQSeries aliases, transmission queues and channels for the MSMQ destination queue and/or the MSMQ Server, and the MSMQ destination queue must already exist.

- An MQSeries application issues an MQOPEN() API call for a remote queue representing the MSMQ destination queue.

- The MQSeries application calls MQPUT() to send a message to the remote queue. MQSeries transmits the message and stores it temporarily on an MQSeries transmission queue located at the MQSeries Queue Manager.

- The MSMQ-MQSeries Bridge takes the message from the transmission queue and converts the message structure to MSMQ message properties. MSMQ-MQSeries Bridge transmits the message to the MSMQ destination queue.

- An MSMQ application issues an MSMQ MQReceiveMessage() API call to receive the message from the MSMQ queue.

MSMQ-MQ Series Bridge provides efficient integration between MSMQ-enabled applications and IBM WebSphere MQ-enabled applications.

WCF Channel for WebSphere MQ

WCF Channel for WebSphere MQ allows enterprise developers to send/receive MQ messages between WCF and heterogeneous programs, such as mainframe CICS and IMS, or homogenous applications, such as a peer WCF channel stack, across a WebSphere MQ infrastructure.
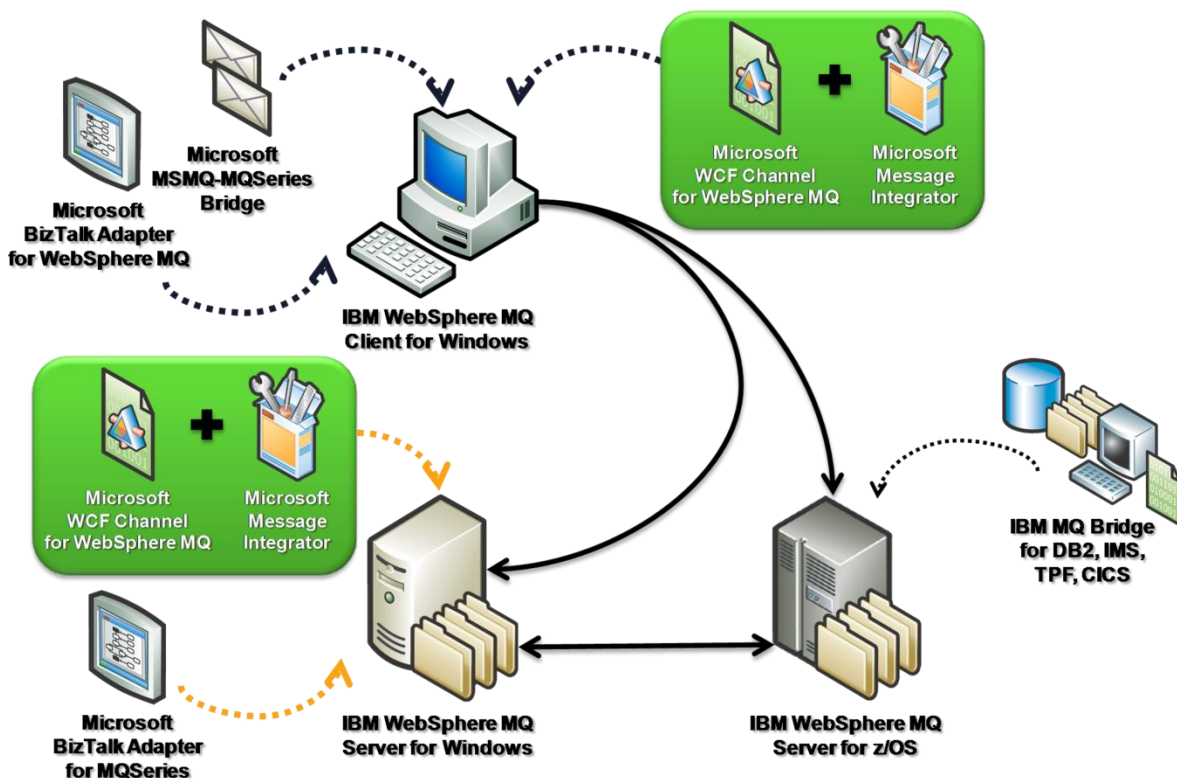

Figure 11: Microsoft offers added value to IBM WebSphere MQ infrastructure.

Message Integrator

Built on technology from TI, Message Integrator offers a Visual Studio 2008 plug-in designer to define metadata for converting the MQ message payload and a .NET interface for wrapping instances of the WCF Channel for WebSphere MQ, allowing message integration from any .NET-enabled application.

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Another solution for integrating with existing IBM WebSphere MQ infrastructure can be found in the BizTalk Adapter for WebSphere MQ, which enables BizTalk Server to exchange messages with line-of-business applications across the enterprise using IBM WebSphere MQ as a transport.

BizTalk Adapter for WebSphere MQ

Another option for integrating IBM WebSphere MQ infrastructure with new solutions based on Microsoft server applications is the set of Microsoft BizTalk Adapters for WebSphere MQ. Microsoft BizTalk Server 2009 includes a built-in adapter that uses IBM WebSphere MQ Server for Windows. Additionally, Microsoft BizTalk Adapters for Host Systems 2.0 includes a Microsoft BizTalk Adapter for WebSphere MQ that uses IBM WebSphere MQ Client for Windows.
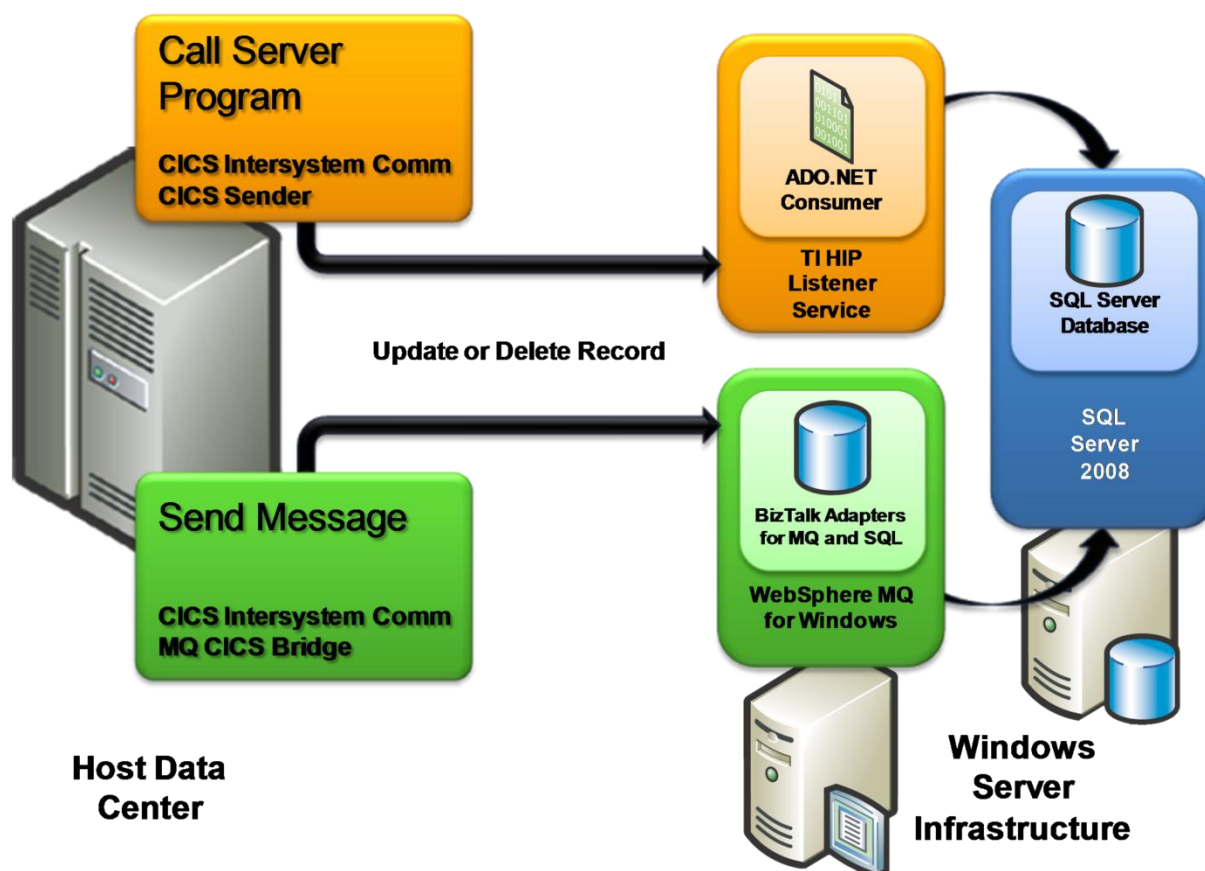

Figure 12: HIS 2009 TI HIP and WebSphere MQ enable host access to server applications.

Enterprise IT administrator and developers have a broad choice of options, when integrating with IBM WebSphere MQ. These options can be contrasted with other technologies offered by Microsoft Host Integration Server 2009, such as Transaction Integrator for host-initiated processing.

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Integrating Host Data

Knowledge workers produce information from computer data processing and storage systems, often relying on various host-based programs that apply business rules and workflow to processing data. The programs can consist of interactive 3270 screen-based, on-line transactional-based and off-line batch processing-based. Host file systems and database management systems catalog and store data, in host file data sets and members or database catalogs, schemas, tables and procedures.

Enterprise IT needs to provide broad access to this data through a variety of technologies, including office productivity applications, on-line forms, message bus and service architectures. Business decision makers demand direct and immediate access for time-sensitive results. Knowledge workers incorporate information into business processes and workflows. IT administrators publish information for multiple audiences with security and privacy.
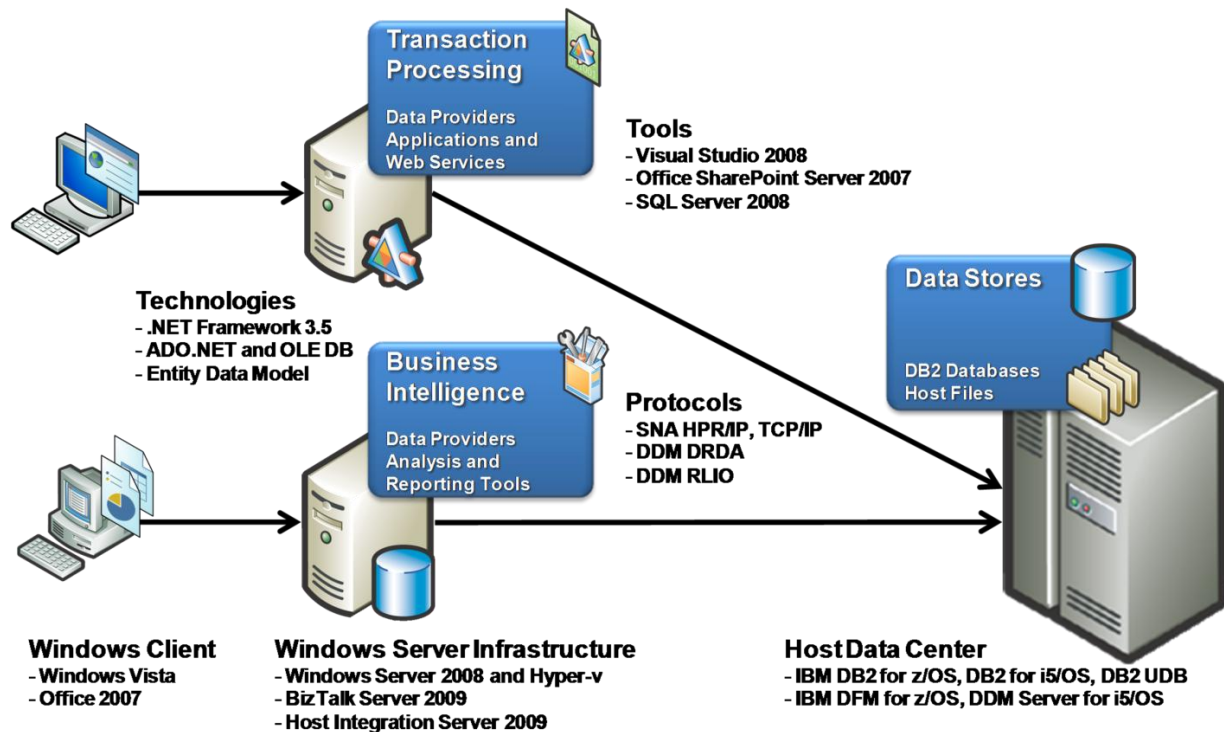

Figure 13: HIS 2009 data integration technologies and tools for IBM host data sources.

In most cases, enterprise IT must enable transformation based on catalogs and schemas, locale-specific encoding standards, and context-specific formats. Also, enterprise IT must provide redundant storage in centralized data warehouses for more efficient analysis and reporting, a result of which is the need for high speed extracts to high volume extracts while limiting impact to on-line systems.

Microsoft understands these requirements for providing enterprise access to vital host data. HIS 2009 data integration technologies and tools offer enterprise IT professionals and developers with direct access to vital information stored in IBM DB2 database management systems or

record-oriented host file systems from the Microsoft Office system and Microsoft server applications, such as Microsoft Office SharePoint Server 2007, BizTalk Server 2009, and SQL Server 2008. The data integration components are accessible by knowledge workers, IT professionals, and enterprise developers, as a set of data providers and tools that support both industry standards and popular data access architectures, including the .NET Framework.

For many years, IBM has offered enterprise organizations with architecture, services and tools for enabling cross-platform data integration. The fundamental technology is IBM Distributed Data Management (DDM) architecture, which IBM and many Independent Software Vendors (ISVs) support in their client and server products. IBM has built-in support for DDM in its mainframe Systems Managed Storage (SMS) products, its database products such as DB2, and its midrange AS/400 operating system i5/OS.
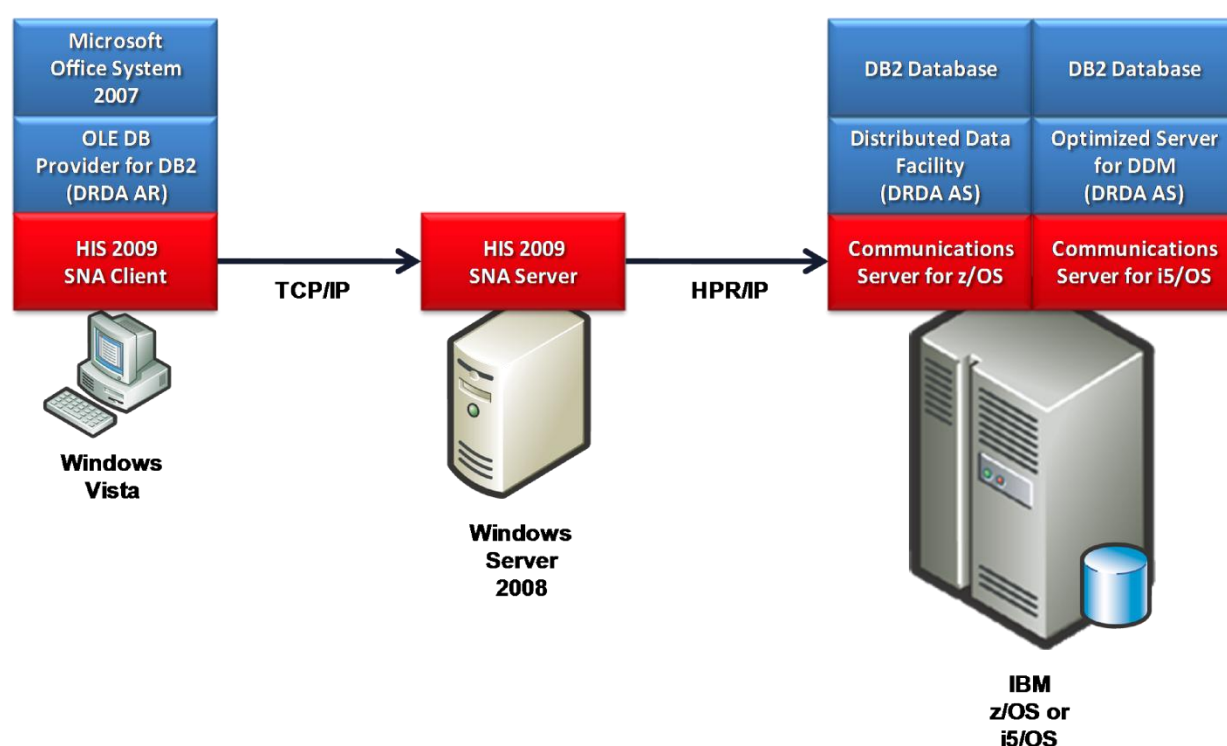

Figure 14: Microsoft Office System 2007 knowledge workers can access DB2 data.

Data Providers for DB2

Much of the operational data stored on mainframe and midrange host computers is accessed via a relational database management system. The most popular database on these host systems is IBM DB2. Distributed Data Facility is the key component of DB2 relational database systems that provides connectivity between DB2 clients and servers, as well as peer DB2 servers, based on DDM Distributed Relational Database Architecture. IBM i5/OS offers an optimized DRDA server, supporting DB2/400 access. IBM DB2 UDB includes a DRDA server and client. Relying on DDM DRDA, Microsoft HIS 2009 offers a DRDA client for remote connectivity and access to mainframe, midrange, and universal DB2 database servers. Microsoft HIS 2009 supports the most popular platforms and IBM supported versions of DB2.

- IBM DB2 for z/OS V8.1 and DB2 for z/OS V9.1

- IBM DB2 for i5/OS V5R4 and DB2 for i6/OS V6R1

- IBM DB2 UDB for Windows, AIX, HP-UX, Solaris, Linux V8.2, V9.1, V9.5

DRDA offers both Remote Unit of Work (RUW) and Distributed Unit of Work (DUW) access to host data. RUW is used for read-only and simple updating of database tables using SQL statements and stored procedures. DUW is used when updates span multiple DB2 instances or computer systems and supports the two-phase commit (2PC) protocol. The 2PC protocol ensures that changes to multiple databases will either succeed or fail in their entirety.
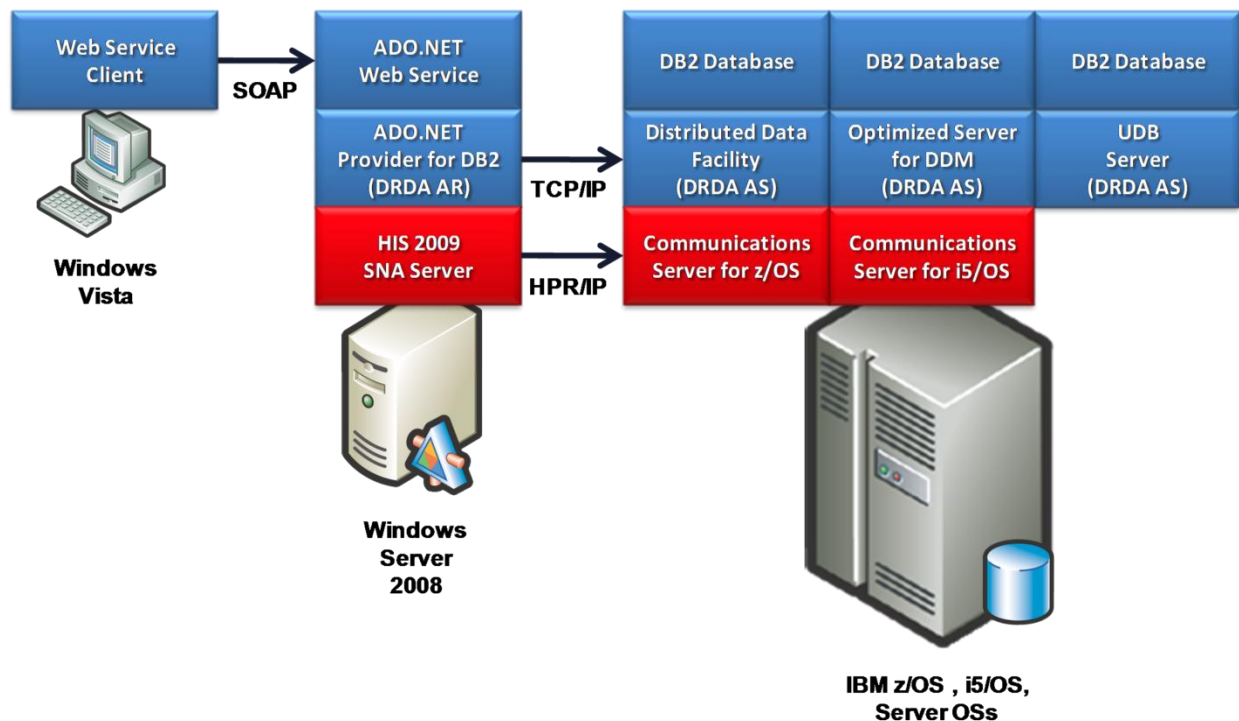

Figure 15: HIS 2009 Managed Provider for DB2 publishing an XML Web service to DB2.

Host Integration Server 2009 supports remote DRDA client access to DB2 via three data provider features, each of which sites directly on top of the Microsoft network protocol client or DRDA Application Requestor (AR) for DB2. :

- Microsoft .NET Data Provider for DB2

- Microsoft OLE DB Provider for DB2

- Microsoft ODBC Driver for DB2

When developing new Windows applications, the choice for most enterprises developers is the ADO.NET Data Provider for DB2. ADO.NET is the application-level interface for providing data access services in the Microsoft .NET platform. Enterprise developers can use ADO.NET to easily access data sources using the ADO.NET Framework (or managed) data providers. The

HIS managed provider supports common ADO objects, including data connections, data commands and data readers.

Visual Studio 2008 Tools

HIS 2009 extends the standard Visual Studio 2008 design tools, server explorer, query designer and data set designer, to allow enterprise developers to generate code based on intuitive drag-drop and menu-driven wizards. This allows COBOL, Java, and RPG programmers to more effectively make the transition from host programming to ADO.NET programming. Also, HIS 2009 installs the Data Access Tool with Data Source Wizard, a set of technologies that allow enterprise IT administrators and developers to manage and persist connection definitions to IBM DB2 databases (and host file systems) for use with the Microsoft data providers. The intuitive Data Source Wizard offers easy-to-use panels that walk a user through creating and testing their first connection to the remote data source.
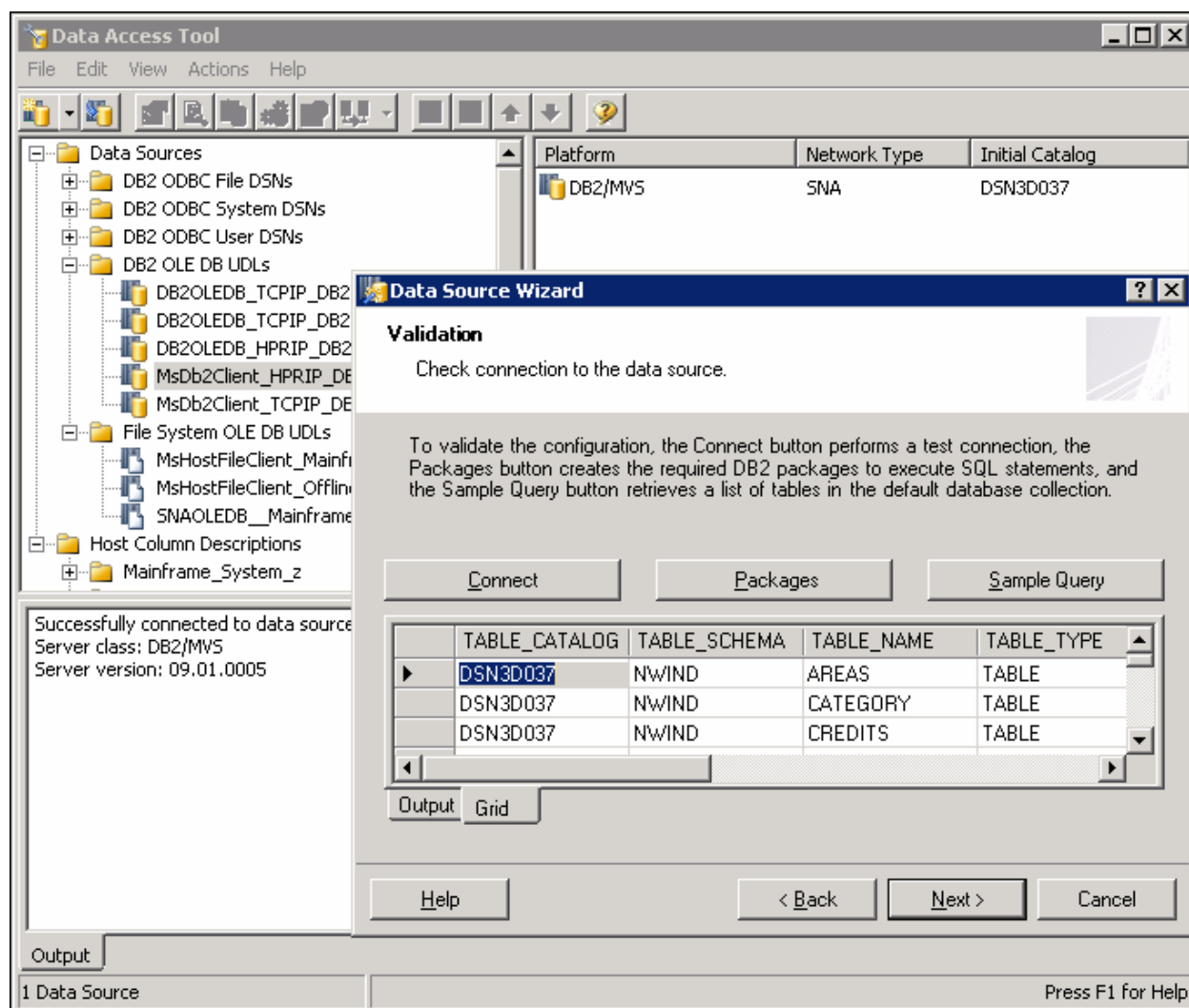

Figure 16: Data Access Tool includes an intuitive Data Source Wizard.

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SQL Server 2008 Tools

When enabling knowledge workers or building decision-support solutions, enterprise IT administrators, database administrators and enterprise developers will choose to use the Microsoft OLE DB Provider for DB2—based on its support for a broad range of the SQL Server 2008 and Microsoft Office System 2007 OLE DB-aware data consumer tools. To build a data warehouse, IT professionals can use read data from DB2 using Integration Services with either the Microsoft OLE DB Provider for DB2 or ADO.NET Provider for DB2.

To write data back to DB2, IT pros can utilize replication services or integration services. Another popular data consumer technology in SQL Server 2008 is Distributed Query Processor (DQP), which provides distributed concurrent access to multiple data sources. Using DQP, SQL Server administrators and developers can create heterogeneous queries that join tables in SQL Server with tables in DB2, Oracle, and any data source accessible by an OLE DB provider. Also, DQP can be used to create SQL Server views over DB2 tables so that developers can write directly to SQL Server and integrate both Windows-based and host-based data in their applications with ease.
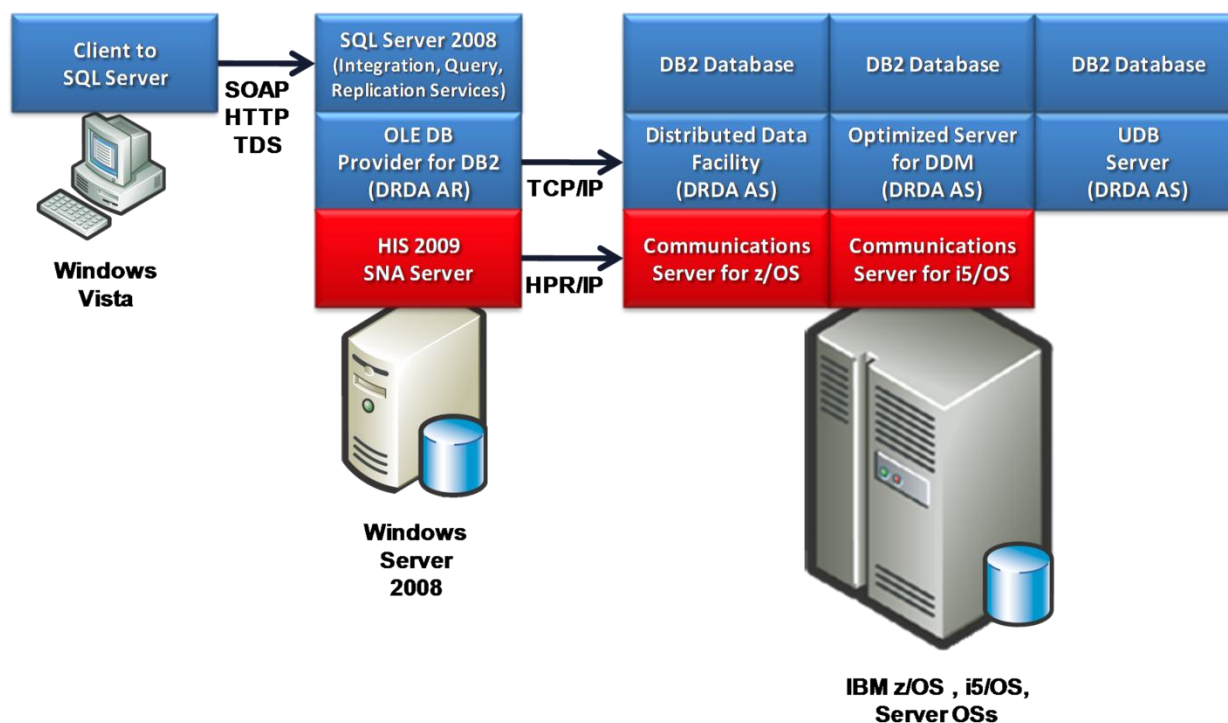
Figure 17: SQL Server 2005 connecting to DB2 for z/OS.

Entity Data Model

Enterprise developers need to extend existing data storage systems, integrating valuable information more efficiently in new applications, without requiring changes to the underlying data store. Microsoft ADO.NET Data Services and Entity Data Model (EDM) provide the data architecture components and tools to enable enterprise developers to deliver new solutions faster, while retaining the data integrity and security of enterprise data stores. Data services

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provide an isolation layer between the physical data in the data store and the logical data used by applications. Modeling provides a way to work on the information with context associated with a given data-aware application or set of applications.

With the ADO.NET Entity Framework and Microsoft Entity Provider for DB2, which sits on top of the Microsoft ADO.NET Provider for DB2, enterprise developers can create data access applications by programming against a conceptual application model instead of programming directly against the DB2 storage schema. Using EDM with the Entity Provider for DB2, enterprise developers can deliver solutions faster, while decreasing the amount of code and maintenance required for data-aware applications.

Data Providers for Host Files

Another rich source of vital information is the large amount of data stored in mainframe datasets and midrange physical files. IBM offers DDM servers for the mainframe and midrange file systems that support DDM Record-Level Input/output (RLIO) protocol and formats. Microsoft offers a DDM client for host files, which complies with this IBM standard.

- Data Facility Storage Management Subsystem is the core tools for managing mainframe System z datasets, including core technologies for sorting, archiving, and retrieving data. IBM DFSMS DFM offer an optional component called Distributed File Manager for z/OS (V1R8, V1R9, and V1R10) that operates as a DDM server, supporting the DDM record-level input/output (RLIO) protocol and formats.

- IBM i5/OS offers an optimized DDM server (i5/OS V5R4 and i6/OS V6R1), supporting DDM RLIO. Using DDM RLIO, Microsoft HIS 2009 offers a DDM client for remote connectivity and access to mainframe datasets and midrange file systems.

Host Integration Server 2009 supports remote DDM client access to host file systems via three features:

- Microsoft ADO.NET Provider for Host Files

- Microsoft OLE DB Provider for AS/400 and VSAM

- Microsoft ActiveX® Control for Host Files

These non-relational data stores consist primarily of program-described data. To read and write the embedded host records, the Microsoft data providers for host files use a local metadata map, which allows the data providers to intelligently open, navigate, read, write, and close host files, while retaining the integrity of those data stores. The managed provider supports sequential, keyed, and combined access to host data sets, using an IBM server-provided cursor over the host file. This allows for incremental data movement between the host and server tiers, where required to provide on-line access or reduce network traffic. Optionally, the Microsoft ADO.NET Data Provider for Host Files supports an off-line data reader that can open a local binary file, perhaps pushed down from the host by Transaction Integrator for host-initiated processing or file transfer utility or WebSphere MQ.

When developing solutions using the Microsoft ADO.NET Data Provider for Host Files, enterprise developers must define a local metadata map using a custom Visual Studio 2008 designer plug-in. To more easily create these maps, enterprise developers can use an import wizard to read COBOL and RPG data declarations (COBOL OCCURS, COBOL REDEFINE, and RPG OVERLAY) from program source code, helping the developer to map the host program-described data structures to ADO.NET DataSets.
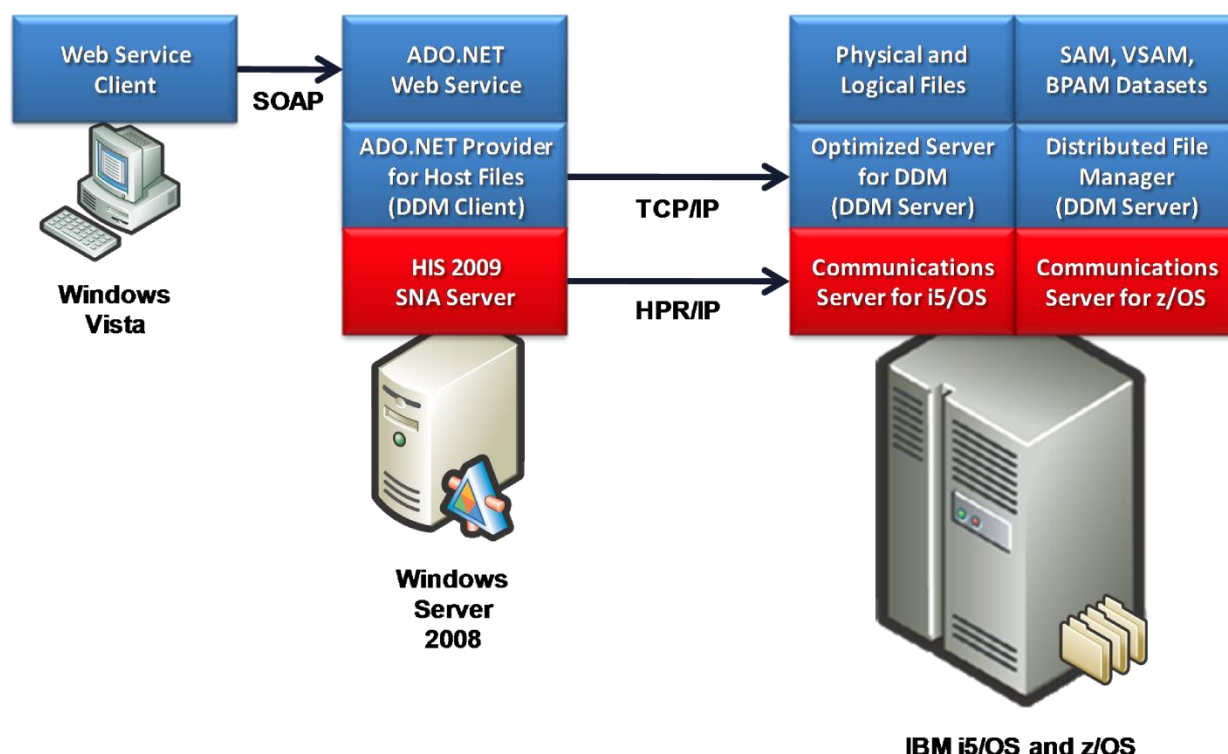

Figure 18: ADO.NET Data Provider for Host Files publishing an XML Web service to VSAM.

The OLE DB Provider for Virtual Storage Access Method (VSAM), which relies on the HCD files to define the metadata of the target data set or member, provides access to most types of mainframe-based VSAM files.

- Mainframe (z/OS) Sequential Access Method (SAM) data sets
    - Basic Sequential Access Method (BSAM) data sets
    - Queued Sequential Access Method (QSAM) data sets
- Mainframe (z/OS) Virtual Storage Access Method (VSAM) data sets
    - Entry-Sequenced Data Sets (ESDSs)
    - Key-Sequenced Data Sets (KSDSs)
    - Fixed-length Relative Record Data Sets (RRDSs)
    - Variable-length Relative Record Data Sets (VRRDSs)
    - VSAM Alternate Indexes to ESDSs or KSDSs
- Mainframe (z/OS) Basic Partitioned Access Method data sets
    - Partitioned PDS/E directories and members

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- Midrange (i5/OS) files
  - Single and multiple member Physical files (PF) and Keyed physical files (KPF)
  - Logical files (LF) over a PF or KPF

To greatly improve usability, the ADO.NET Data Provider for Host Files supports a basic structured query language (SQL) command interpreter for reading (SELECT) and writing (INSERT, UPDATE, and DELETE) host records. Also, the host file provider offers built-in data conversion from host data types, including nested records (and EBCDIC strings, to .NET Framework CLS data types and UNICODE. Using this provider, enterprise developers can directly publish vital information as XML web services or move data using SQL Server Integration Services for use by Microsoft server applications that support Web services as data sources, including Office SharePoint Server, InfoPath®, Excel, SQL Server Analysis Services and SQL Server Reporting Services.
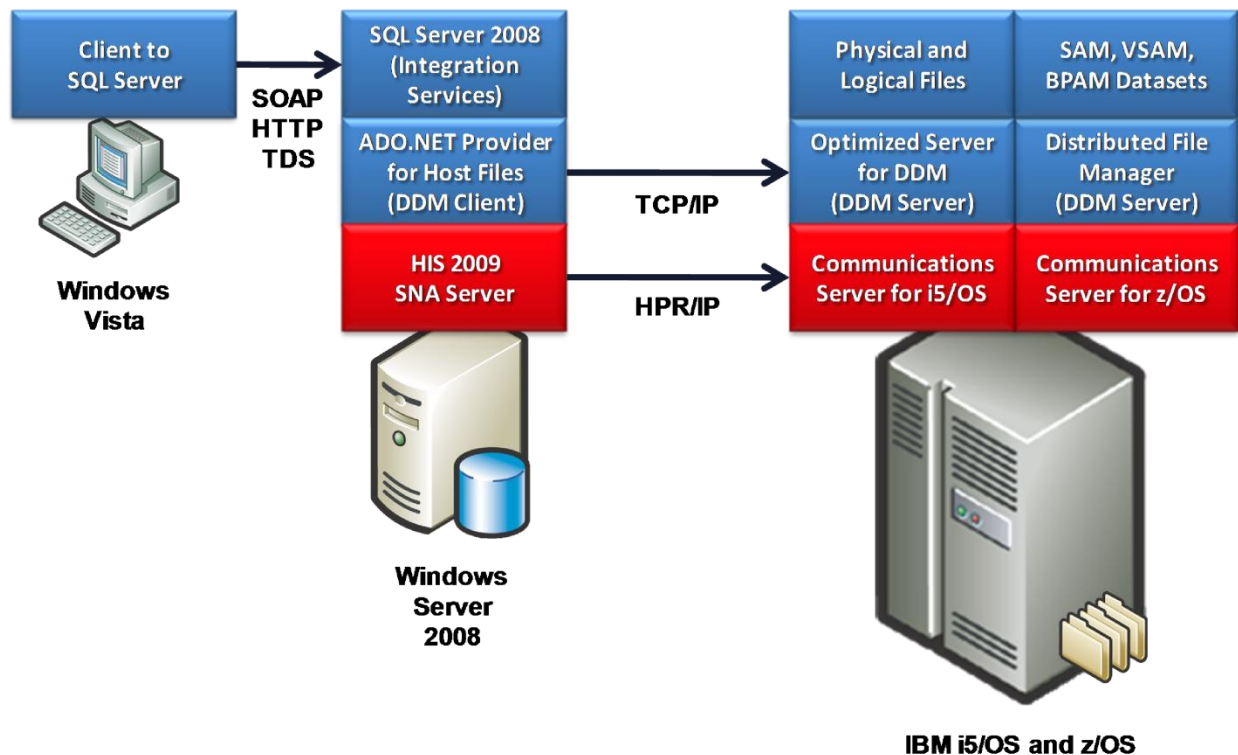

Figure 19: HIS 2009 TI and ADO.NET Provider for Host Files can both update host files.

Using Visual Studio, developers can build dynamic Web applications that integrate host non-relational data sources with Windows server applications, allowing knowledge workers to publish needed information for use by their organization's decision-makers. Where distributed transactional access to mainframe datasets, Transaction Integrator can be employed across an SNA LU6.2 network connection to CICS and IMS, to ensure the transaction succeeds or fails, in case of a network failure.
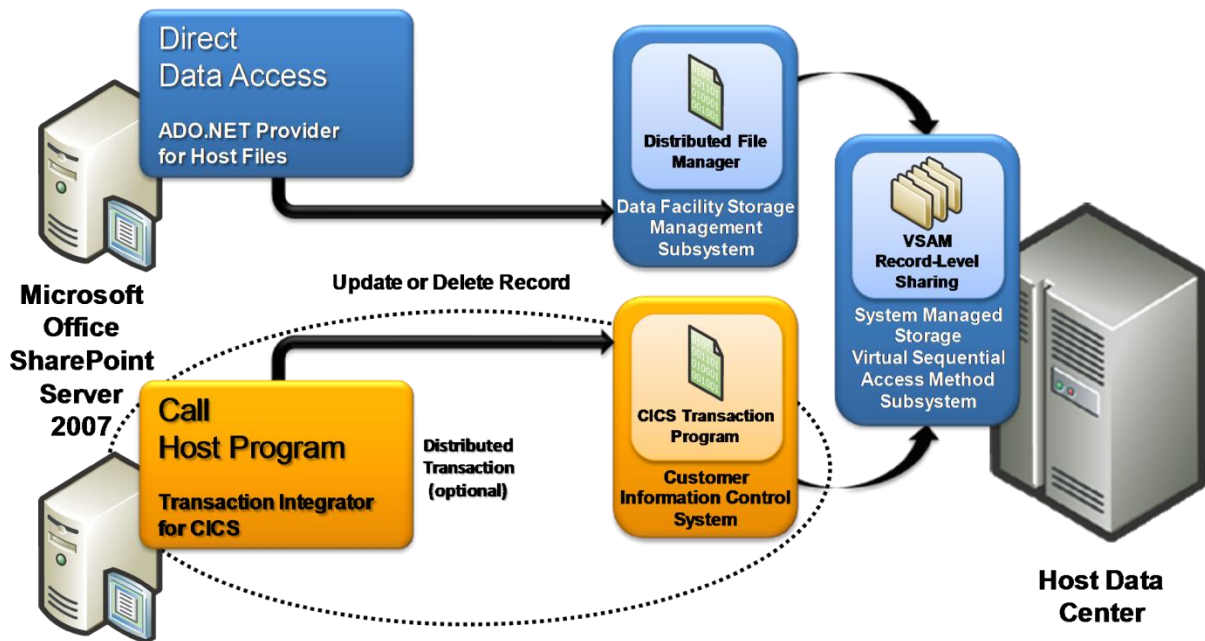
Figure 20: HIS 2009 TI and ADO.NET Provider for Host Files can both update host files.

Optimizations for Data Access

Enterprise IT departments can reduce the impact to the backend host systems when using the Microsoft HIS 2009 data access technologies, by employing one or more of these optimizations.

- Perform data type and code page conversions on the Windows computer, thereby off-loading the host from performing non-native conversions, including: precision numeric data types; string data types (EBCDIC, ANSI, ASCII, OEM PC, UNICODE) for single byte, mixed byte and double byte locales. Optionally, the data providers can be enabled to support both Arabic and Hebrew bi-directional layout conversion. Additionally, connection pooling can enhance client-side responsiveness; improve performance, while reducing host and Windows server application resources.

- IT professionals rely on built-in DDM server authentication, based on the Microsoft data provider presenting a user identifier and password combination at connection time. Additionally, when connecting to DB2, the managed and COM data providers for DB2 support Kerberos authentication and data encryption, as well as DB2 server authentication encryption and data authentication.

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Integrating Security Systems

A key problem within many enterprise organizations is cross-platform security system integration and management. Typically, mainframe and midrange host applications require their own host-based user identifier and password combinations, which are stored in system-specific security stores. Most IT organizations are pursuing an enterprise-wide federated Identity Management (IdM) strategy.

Host Integration Server 2009 offers Enterprise Single Sign-On (EntSSO), a set of technologies and tools for defining, storing and retrieving mappings between Microsoft Windows Active Directory® and foreign credentials. ESSO V4.0 in HIS 2009 offers intuitive user interface tools for administrations and end users to define and maintain affiliate applications, account mappings, and runtime services HIS 2009 features support EntSSO as a popular means of authenticating application and user access to remote systems.

ESSO provides a set of security services to store and pass encrypted user credentials across local and network boundaries. The credentials are always stored encrypted in the credential data store. All access to the credential data store via the SSO services requires the appropriate authority that is defined in the SSO system. End users do not have to remember multiple set of credentials. Middleware applications can connect to the backend applications as the specific user that initiated the original request.

Enterprise Single Sign-On supports popular mainframe and midrange security systems, as well as any foreign credentials that are application-specific.

- o IBM RACF (Resource Access Control Facility) for z/OS

- o Computer Associates eTrust CA-ACF2 Security for z/OS

- o Computer Associates eTrust CA-Top Secret Security for z/OS

- o IBM i5/OS V5R4 and i6/OS V6R1

It administrators define one or more ESSO "affiliate applications", which are logical names to a group of mapping. Each affiliate application has multiple user mappings, for example, users in Active Directory are mapped to their corresponding RACF credentials. Enterprise developers and administrators refer to these ESSO affiliate applications, when defining connections using HIS 2009 technologies, making it easy to configure and use single sign-on.

ESSO servers utilize a local or remote encrypted SQL Server 2008 database as storage for the ESSO data (affiliate applications, groups, users, mappings). In a distributed environment, with multiple ESSO databases and runtime services for fault tolerance, the ESSO data is replicated to keep systems up-to-date. IT administrators can configure multiple levels of auditing, to track access to the mapping database, as well as to provide an extra layer of accounting information on end user and application access to the backend host system and applications.
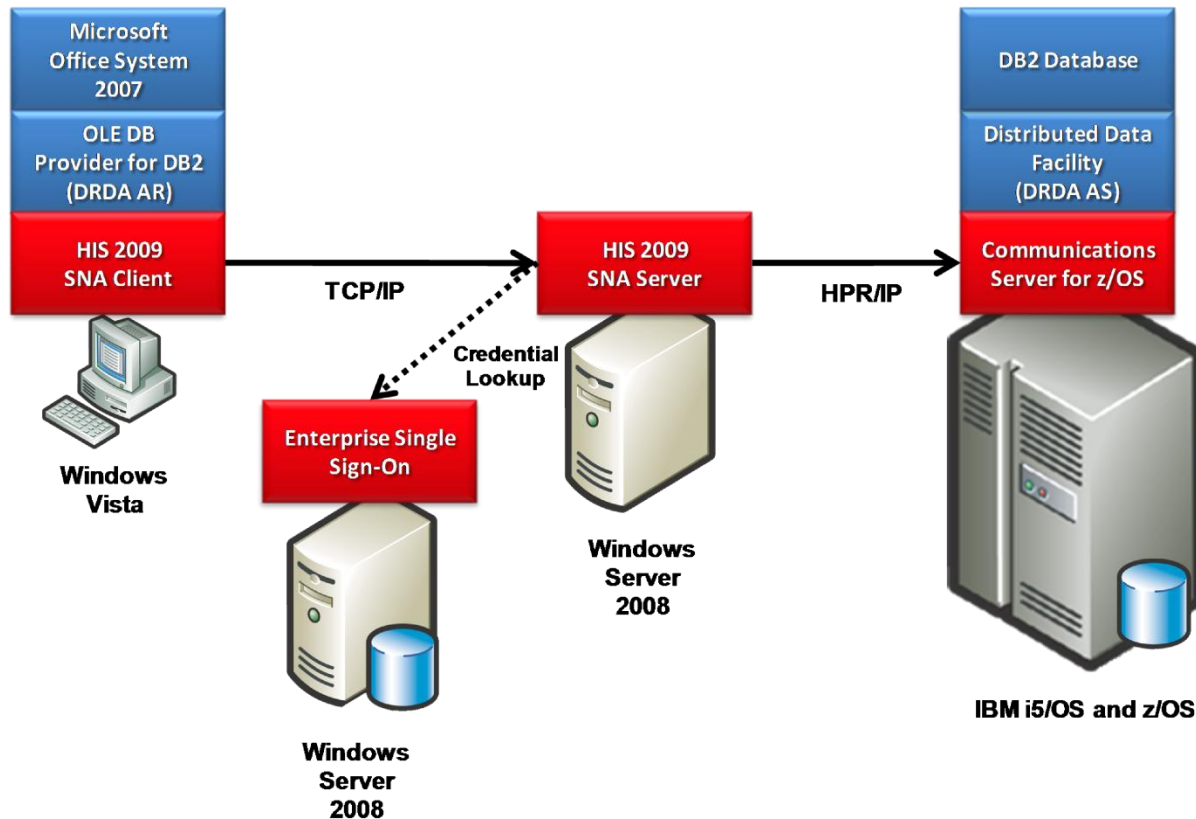
Figure 21: HIS 2009 SNA Server securely lookups credentials using ESSO.

There are two key challenges to utilizing any SSO solution: (a) how to efficiently create the mappings; and (b) how to keep the mappings in sync. ESSO provides infrastructure technology to solve both problems in the form of password synchronization. Using Identity Lifecycle Manager 2007 and the Host Access Management Agents V3.0, enterprise IT administrators can export RACF, Top Secret, ACF2, or AS/400 security credentials from the host and into ILM. Next, using the ESSO password synchronization adapter for Identify Lifecycle Manager 2007, the host credentials can be moved efficiently into the ESSO database. When users or administrators change the credentials in the foreign system, the IT administrator can pull these changes back into ESSO through ILM, or develop their own custom bi-directional password synchronization adapter using the ESSO SDK.

Improving Network Infrastructure

IBM host systems are designed for interoperability based on IBM Systems Network Architecture (SNA), which consists of proprietary IBM device types, session types, communications models and application programming interfaces. Host Integration Server 2009 provides enterprise IT organizations with network services, technologies and tools for efficiently integrating SNA with Microsoft infrastructure software.

Enterprises with distributed operations (manufacturing, government) or branch operations (banking, brokerage, insurance, retail, services) need to connect remote desktop, devices and servers with centralized IBM host mainframe System z and midrange System i data centers. For many years, Microsoft Host Integration Server and its predecessor products, Microsoft SNA Server and Microsoft Communications Server, have offered cost-effective SNA clients and SNA gateways for connecting these branch operations with the IBM host data center.

- SNA connectivity, 3270 terminal emulation, host print service and SNA programming interfaces to mainframe System z computers running IBM z/OS, z/VSE, z/TPF, and z/VM operating systems.

- SNA connectivity, 5250 terminal emulation, host print service and SNA programming interfaces to midrange System i computers running IBM i5/OS operating systems.

The most popular method of connecting networks with dissimilar protocols has always been to insert a gateway device that can convert from one protocol to another. Host Integration Server 2009 incorporates the traditional SNA "gateway" services, allowing distributed or branch-based desktops and servers access to remote host systems, without requiring any SNA protocols on the distributed desktop computer, branch-based server or wide-area networks. HIS 2009 does not require any non-IBM or non-native software to be installed on the IBM host system to support access by applications emulating popular SNA device types and logical unit types.

HIS 2009 network integration services connect Windows server software to existing IBM mainframe and midrange host systems, enabling IT professionals to consolidate network infrastructure and reduce operating costs.

- SNA Services operate as a gateway function, supporting common logical unit types (LU0, LU1, LU2, LU3, and LU6.2), connecting to host systems across an SNA Advanced Peer to Peer Network (APPN), as a Low Entry Network (LEN) node using traditional Data Link Control (DLC) connectivity, or as Branch Network node using modern High Performance Routing over Internet Protocol (HPR/IP).

- Administrators can deploy SNA applications on Windows Vista using the HIS client that connects to the HIS server via TCP/IP, supporting required SNA device types.

- Host Print Service provides server-based 3270 (LU1 and LU3) and 5250 (LU6.2) printer emulation, allowing host programs to send output to printers supported by Windows Server 2008, enabling control and sharing of resources.

- Resynchronization Services support standard Synchronization Level 2 (Sync Level 2), also known as the Two-Phase Commit (2PC) protocol, for distributed transactions over SNA DLC, HPR/IP and TCP/IP.

- TN3270 Service, with Secure Sockets Layer (SSL) and Transport-Layer Security (TLS), allows deployment of simple TCP/IP-based terminal (TN3270, TN3270E) and printer emulation programs (TN3287), while offloading the host system from supporting non-native TCP/IP-to-SNA protocol conversion.

- TN5250 Service, enabled IT administrators to off-load IBM midrange System I computers from managing connections by non-native TN5250 emulators, reducing host server operating costs.

- Enterprise developers can utilize the extensive HIS 2009 Software Development Kit (SDK) to build applications that emulator popular IBM logical unit types (LU0, LU1, LU2, LU3, LU6.2).

Simplified Configuration

Enterprise IT administrators can flexibly configure HIS 2009 to accommodate changes in network infrastructure and client usage, avoiding the need to impact to the host system. Adding new servers to a group (called an SNA subdomain), new connections to a server (for increased load, fault tolerance, or load balancing), new users to a pool of resources or server, or removing access based on security concerns, are simple IT tasks accomplished using intuitive Microsoft Management Console snap-in graphical tools, command line programs, or Windows Management Interface tools.

Client Computers

Host Integration Server 2009 reduces complexity, increases stability and saves memory by allowing enterprise IT administrators to utilize a single protocol on the client desktop or device. Prior to adoption of SNA gateway servers, enterprises would connect desktops and devices directly to the IBM host system using proprietary protocols, such as Data Link Control over 802.2 Token Ring or Ethernet local area networks (LANs). PC administrators would need to configure each desktop and device for the host network and logical unit addresses, as well as unique SNA addresses for the desktop and device. Whenever the host or network addresses were changed, to accommodate system upgrades and expansions, then PC and LAN administrators would need to propagate these to all branch desktops and distributed devices.

With SNA gateway servers, such as HIS 2009, network administrators need only maintain a single Internet Protocol network in the branch and centralized locations. Host Integration Server 2009 allows the administrator to create user and group profiles on the server that contain access rights to all Host Integration Server 2009 computers in the subdomain. Host Integration Server 2009 compatible emulators can be configured to connect to a local Host Integration Server 2009 with no configuration other than the choice of LAN protocol. In addition, Host Integration Server 2009 provides users of Windows with simplified logon to resources by automatically validating the user ID and password (using the Enterprise Single Sign-On

solution). Host Integration Server 2009 provides easier administration than direct connect solutions, by requiring a simple client-side configuration to a server group, which then automatically deploys a current configuration to the branch desktop or distributed device, based on configured security (group, user, workstation).

Resource Pooling

Host Integration Server 2009 implements a feature called LU pooling. Dependent 3270 LU2 and LU0 sessions and independent APPC LU6.2 session pairs can be grouped together into a pool of common resources. LU pooling allows fewer host resources to be shared by multiple users. When new users are added to an organization, these users can be granted access to pooled resources at the gateway, thereby minimizing host changes. Pools allow groups of intermittent users to use resources efficiently.

Using SNA Manager, the administrator can easily assign LU pools to users or groups. This eliminates the time that would be required to assign LUs individually. With Windows UI drag and drop capability, constructing pools and assigning users to them can be done with a few mouse clicks. An LU pool can span multiple host connections on a single server, or even multiple HIS 2009 computers for enterprise-level scalability. Resource pooling is a core technology that enables advanced capabilities, such as fault tolerance and load balancing.

Downstream Physical Units

Host Integration Server 2009 can support SNA downstream physical units, such as point-of-sale devices. To the downstream system, there appears to be a direct connection to the host. HIS 2009 accomplishes this by passing detailed LU information back and forth between downstream systems and the host. HIS 2009 performs PU concentration rather than PU pass-through. This reduces the network configuration and administration workload as well as the memory consumption at the host.

DSPU clients can share the Host Integration Server 2009 host connections. Also, DSPU clients can be supported along with regular clients, allowing for easy coexistence of various types of clients. Further, the DSPU configuration reduces host configuration requirements by concentrating PUs on the SNA gateway computer and passing the LUs to attached DSPUs. LUs from one or more PUs defined on the gateway can be shared with one or more downstream devices. This allows for more economical use of configured resources and alleviates the need to configure each downstream device in host VTAM.

Flexible Deployment

Flexibility is an essential goal of most desktop-to-host and client/server solutions. Given the high degree of change in the business world and computing industry, it is important that network managers design new information systems capable of accepting updated software, advanced hardware and new industry standards as needed. Host Integration Server 2009 supports the required SNA host types, including IBM mainframe and midrange systems, PU types, and LU types as shown in the table below.

Multiple Concurrent Connections

Host Integration Server can support up to 250 concurrent host, peer or DSPU connections. This allows Host Integration Server 2009 to provide flexible access to hierarchical mainframe programs through traditional 3270 terminal emulation and 3287 printer emulation, as well as more modern mainframe advanced peer-to-peer programming for communications programs. Also, this allows Host Integration Server 2009 to offer optional TCP/IP-to-SNA communications to newer midrange AS/400 computer, as well as older SNA-only Advanced 36 System Support Program running in emulation mode on AS/400 computers.

SNA Clients

Microsoft has worked to build strong relationships with independent vendors that develop SNA client emulation applications. These vendors offer products that are compatible with Host Integration Server 2009. Optionally, Microsoft Host Integration Server 2009 includes SNA clients for use with mainframe and midrange AS/400 computers. The Host Integration Server 2009 3720 Client and 5250 Client offer essential functionality for administrators and end users when accessing mainframe or midrange screen logic interface programs.

Client	Features
3270 Client	Emulation of IBM 3178 terminal models 2-5
	IND$FILE file transfer to and from TSO, VM/CMS, CICS
	Multiple sessions
	Copy and paste via the clipboard
	Print screen
	Supports collection of IBM NetView RTM data
	Multiple international host and PC code pages
	Online help
5250 Client	Emulation of IBM 5250 terminals
	Multiple sessions
	Copy and paste via the clipboard
	Print screen
	Graphical toolbar
	Multiple international host and PC code pages
	Online help

Table 2: HIS 2009 SNA 3270 and 5250 Clients.

Network Protocols

Typically, Host Integration Server 2009 is connected to the mainframe or midrange system via Token Ring, Ethernet and FDDI adapters that are installed on computers running Windows Server 2003 and Windows 2008 Server, using either 802.2 Data Link Control (DLC on 32-bit x86 only) or Internet Protocol-Data Link Control (IP-DLC). Also, Host Integration Server 2009 offers support for Synchronous Data Link Control (SDLC) or X.25 connections over dial-up or leased lines, as well as bus-and-tag or fiber channel connections — through the open SNA Device Interface Specification (SNADIS), supported by a number of independent hardware vendors (IHVs).

SNA Gateway Deployment Models

Host Integration Server 2009 supports traditional branch-based and centralized deployment models.

Branch-Based Deployment

Branch-based deployment is the traditional way to deploy SNA gateways. SNA gateways are placed in branches and communicate with the host using native SNA protocols, either directly via SDLC leased lines or X.25 network, or via 802.2/DLC, which is tunneled from the branch LAN to the central site LAN by routers, as well as routable SNA over IP (using the new IP-DLC Link Service).

Not all organizations are ready to move to a single interconnected WAN using IP-DLC, Data Link Switching (DLSw), Frame Relay or Asynchronous Transfer Mode (ATM). For example, many organizations have invested in leased SDLC lines or X.25 connections between remote and central sites.
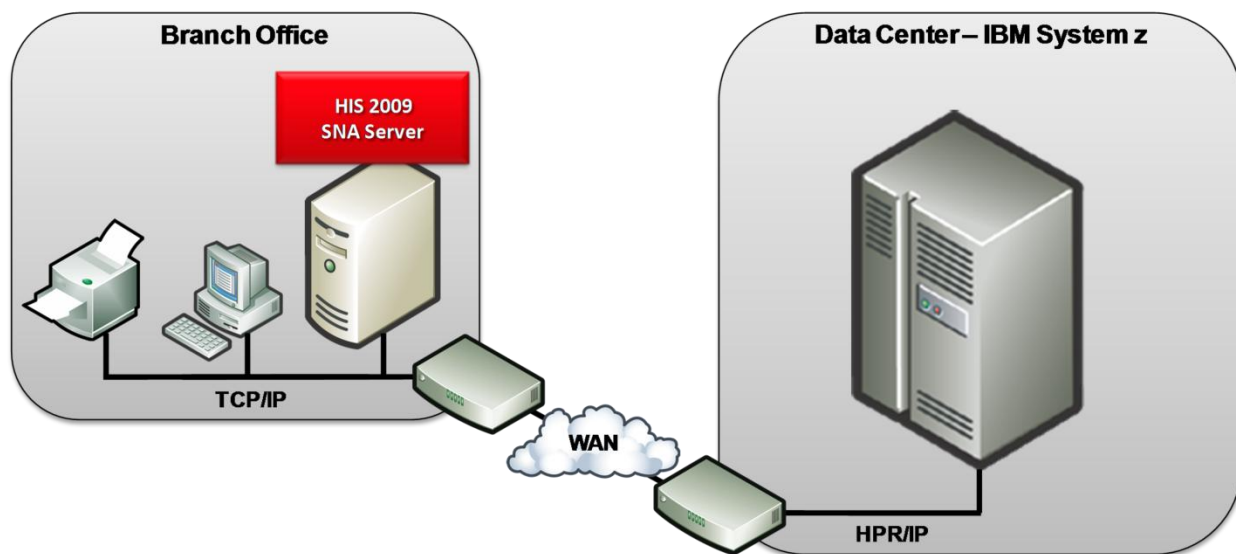

Figure 22: HIS 2009 branch-based deployment is the most common model.

Host Integration Server 2009 supports SDLC and X.25 connections making use of existing SNA infrastructure where appropriate. Given the added complexity and cost, some organizations

decide to rely on their existing SDLC and X.25 connections for SNA transactions and reserve their WAN for other protocols supporting non-SNA communications. The advantages of a branch-based deployment include reduction in WAN traffic, availability of multifunction servers in branch offices, and local session management.

More recently, this deployment model relies on the industry-standard SNA over IP, in the form of the HIS 2009 IP-DLC Link Service, which connects branch-based servers to the mainframe via routable IP, while supporting all the existing SNA PU types, LU types and SNA programs.

Centralized Deployment

Centralized deployment has emerged recently as an attractive way to isolate the SNA traffic to the data center. SNA gateways are placed at the data center and connected to the host using native SNA protocols or the new IP-DLC Link Service, offering high-speed gigabyte Ethernet connectivity. The centralized SNA gateways provide split-stack or TN3270E service for local and remote desktops that connect to the gateways using popular LAN protocols.

In a centralized configuration, LU pooling reduces the amount of host connections required and makes better use of host administration time, which would otherwise be spent reconfiguring host PUs and line definitions as required to meet constantly changing needs. In addition, centrally located Host Integration Server 2009 computers are easier to secure and manage by the central IS group. This reduces the need for SNA expertise at the remote site.
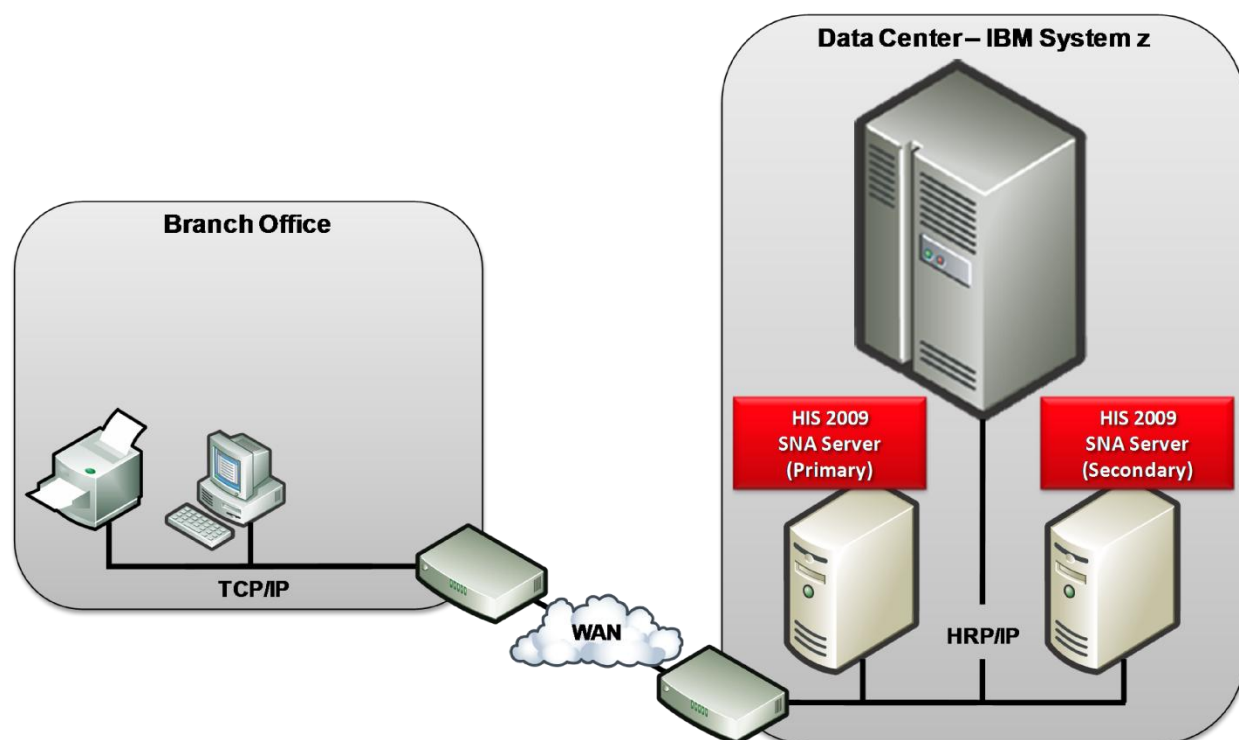

Figure 23: HIS 2009 centralized deployment works well with high-speed WANs.

Overwhelmingly, organizations are looking at TCP/IP as their single WAN protocol. Host Integration Server 2009 supports this protocol on most client platforms. In Host Integration Server 2009, Microsoft offers support for the industry-standard for SNA over IP when connecting to IBM mainframe computers. This standard is called high-performance routing over IP (HPR/IP) or "Enterprise Extender." With the new IP-DLC Link Service, centrally deployed Host Integration Server 2009 computers can connect to mainframe z9 and z10 mainframes across Token Ring or high-speed gigabyte Ethernet using the built-in Enterprise Extender support in OS/390 and z/OS.

IP-DLC Link Service

Many enterprises consist of distributed branch offices that must connect remote desktop and server computers to centralized IBM mainframe data centers through a wide area network based on TCP/IP. Some enterprises employ expensive Data Link Switching capable (DLSw) routers that encapsulate the IBM proprietary SNA protocols in TCP/IP.

A better approach is to use the industry standard for integrating SNA devices, network and mainframes with modern routed internets, based on commodity routers that do not have to support expensive DLSw functions. IBM calls this solution Enterprise Extender; the industry knows it as SNA over IP, High Performance Routing/IP (HPR/IP) or Cisco SNA-SW.

Host Integration Server 2009 includes an IP-DLC Link Service to enable HIS 2009 to participate in an IBM Enterprise Extender environment. Customers can deploy HIS 2009 in a branch office, in a central location, or even within the data center, directly connected to the mainframe across efficient gigabyte Ethernet.

IP-DLC provides SNA connectivity for applications using dependent and independent sessions. From an application perspective, such as a 3270 emulator or APPC program, there is no change in functionality. Using IP-DLC, each SNA packet is transmitted across the IP network as a UDP datagram. The SNA network traffic from branch-deployed or centrally deployed Host Integration Server computers can be routed across the IP network directly to an IBM mainframe system running z/OS and through the mainframe's built-in network adapter.

- Routing (across network segments, through the Internet);

- Performance (higher throughput on mainframe side with HPR versus DLC or TCP);

- Fault tolerance (re-routing, through pre-determined routes or automatically); and

- Class of service (based on configurable workloads).

The Host Integration Server 2009 IP-DLC Link Service allows enterprise IT organizations to realize broad cost savings. IT can retire expensive channel-attached 374x FEPs, move toward a single physical media (gigabyte Ethernet) within the mainframe datacenter, replace expensive and complex DLSw routers, simplify the network infrastructure, while supporting the same level of SNA-compatible applications and services.

TN3270 Services

Some organizations run the TCP/IP protocol on the host system, and then allow all users running a TN3270 or TN5250 emulator to connect directly to the host computer. In this scenario, the host must process the TCP/IP frames received from the client, translating the TCP/IP into the host's native SNA protocol. Running TCP/IP on a host system may simplify the network but it results in a significant performance penalty. Due to the substantial performance costs to the host of this approach, vendors have produced a number of methods to offload some or all of the TCP/IP-to-SNA protocol conversion required to support TCP/IP client programs. One of the most popular TCP/IP off-load methods is the SNA gateway.

Host Integration Server 2009 offers complete offload of TCP/IP-to-SNA protocol conversion for TN3270 and TN5250 clients, as well as a suite of other server-based services that obviate the need to run TCP/IP on the host computer. The two core services are the TN3270 Service and TN5250 Service.

- TN3270 support. TN3720, which is specified in Request for Comment (RFC) 1576, provides basic LU2 terminal emulation. This basic support allows access to the majority of legacy mainframe applications. However, the TN3270 standard lacks graphics support, access to the SSCP-LU session, full host AID key functionality, and LU1 or LU3 printer emulation. Even without these 3270 session capabilities, organizations and vendors have embraced TN3270.

- TN3270E support. This standard overcomes most of the shortcomings of TN3270, including LU1 and LU3 printing.

- TN3287 support. TN3287 is an interim de facto standard (published in RFC 1646) born out of the need to add printing capabilities to the original TN3270 protocol. The TN3287 protocol adds LU1 and LU3 printer emulation. Organizations that have standardized on TN3287, and invested time and resources configuring clients to use this standard, can seamlessly use the Host Integration Server 2009 TN3287 service.

- Authentication and Encryption. Support for Secure Sockets Layer (SSL) and Transport Layer Security (TLS) allow the network administrator using the TN3270 Service to increase the overall security of the enterprise network when accessing mainframe terminal and printer resources, including authentication of access to mainframe sessions and encryption of data between client emulator and TN3270 server. Although the Microsoft 3270 Client (emulator) does not support SSL or TLS, there are third-party software vendors that offer TN3270 emulators which support this functionality.

Host Print Service

Host Print Service provides server-based 3270 and 5250 printer emulation, allowing mainframe and AS/400 applications to print to any LAN printer supported by Windows 2008 Server. Organizations no longer need to install, configure and maintain print emulation sessions on every user's desktop. Host Print Service enables centralized control and greater sharing of limited print LU resources.

Mainframe Printing

Host Print Service supports mainframe systems via LU1 and LU3 data streams, with pass-through support for Intelligent Printer Data Stream (IPDS). IPDS pass-through support allows users to send mainframe print jobs unchanged to LAN printers without changing the host applications.

AS/400 Printing

The majority of organizations with AS/400 computers and LAN-connected PCs still print to AS/400 system printers. This is because of the difficulty in configuring and unreliability of most current client printer emulation software products. The Host Integration Server 2009 Host Print Service provides an alternative to costly AS/400 system printers, while avoiding the administrative burdens of direct-connect printer emulation solutions.

Administration

Using SNA Manager, the network administrator can manage all Host Print Service computers located anywhere on the network. Host Print Service allows for most page layout properties to be preset at the Host Integration Server 2009, such as those controlling margins, font typeface and font size. These properties are configured on a per-printer session basis allowing for the highest degree of flexibility.

Host Print Service supports print-to-file with auto-incrementing file names. The Host Integration Server 2009 administrator can configure the file naming scheme to be employed for each printer LU. Using Printer Definition Files (PDF), the network administrator has a wide degree of control over the printed output. This option provides another means to tailor the print jobs to meet the needs of PC users and better utilize LAN-based printers. Organizations can avoid the administration and software license costs of installing printer emulation session on each user's desktop by using Host Print Service.

Network Service Architecture

Host Integration Server 2009 has been designed with a modular architecture, consisting of server and client components.

Server Components

The server components of Host Integration Server 2009 run as services on Windows 2008 Server, providing network protocol conversion and communications functions. This portion of the Host Integration Server 2009 product contains the core SNA protocol stack and consists of three key components: SnaServer, SnaBase and SNADMOD.

The SnaBase service starts up before other HIS 2009 services and provides resource location functions for Host Integration Server computers and clients. SnaBase maintains a list of available servers, links, LUs and invokable Transaction Programs (TPs).

The SnaServer component is a Windows service that functions as the core protocol conversion engine of Host Integration Server 2009, providing SNA PU type 2 and 2.1 node emulation. In

addition, this component enables administration of the network services by communicating optional levels of status changes with other servers, clients and host computers. This allows the administration components to report the status of Links, Connections and Logical Units. The SnaServer service relies on the SnaBase and SNADMOD components. The SNADMOD component provides client-to-server and server-to-server communications.

Client Components

The client components of Host Integration Server 2009 run on Windows XP Professional and Windows Vista computers, enabling users to access and integrate Windows desktop productivity applications with vital host resources. The client software includes a number of components, including these:

- The SnaBase runs as either a service or application providing resource location functions for the client. SnaBase maintains a list of available servers, links, LUs and invokable TPs.

- The SNADMOD component provides client-to-server communications.

- The SNA APIs enable enterprise developers and independent software vendors to deploy Windows applications, including 3270 emulators and custom programs (e.g., teller or broker applications).

Scalability

One of the common misperceptions about SNA gateways is that they are a bottleneck and reduce overall desktop-to-host performance. An efficient SNA gateway achieves greater levels of performance by scaling to meet peak demand, thus eliminating any potential bottleneck. There are two methods of scaling: horizontal and vertical. Horizontal scaling is achieved when you deploy multiple SNA gateways working as a group to share and balance the load to meet demand. Vertical scaling is achieved when you deploy a single SNA gateway that can operate on increasingly more powerful hardware platforms depending on the need.

Feature	Capacity
Host Sessions per SNA Service	15,000
Users per Server	8,000
PUs per Server	250
Concurrent Host Connections per Server	250
Server per Group (subdomain)	15

Table 3: HIS 2009 offers scalable network servers for enterprise deployments.

Besides scalability, an efficient SNA gateway provides greater performance by taking advantage of the architecture of the underlying operating system. Host Integration Server 2009 can leverage the potentially greater processing power of computers on which Windows runs than any host computer to which it connects. By offloading communications processing from the host

it frees up the more expensive CPU cycles on the host system. Of course, actual performance can only be accurately assessed by deploying Host Integration Server 2009 in your networking environment.

Horizontal Scalability

Horizontal scaling is achieved by intelligently deploying two or more SNA gateways in a group. Each server in the group is part of the larger team. The goal of the team is to efficiently provide high-performance connectivity to desktop-based and server-based applications. To achieve high levels of performance, the gateways should evenly distribute the session load across all servers. This automatic load balancing avoids the potential of one server becoming overloaded and slowing down or creating a bottleneck. In addition, the group of servers should be configured so that one member server backs up one or more other servers to provide a high degree of fault tolerance. The concepts of load balancing and fault tolerance operate together to achieve higher performance as well as greater availability and reliability.

- Up to 15 Host Integration Server 2009 computers can interoperate simultaneously in a Host Integration Server 2009 subdomain. An indefinite number of Host Integration Server 2009 subdomains can be deployed in any one Windows domain.

- Up to 15 Host Integration Server 2009 computers can interoperate together for purposes of load balancing. Through horizontal scaling of Host Integration Server 2009, organizations can balance a larger session load, which results in higher performance.

- Up to 15 Host Integration Server 2009 computers can interoperate together for purposes of fault tolerance. With Host Integration Server 2009, there is no need to configure dedicated backup servers. All Host Integration Server 2009 computers can be configured to operate in dual mode as both production and backup servers.

Vertical Scalability

Vertical scaling is accomplished by deploying a single SNA gateway that can scale up to handle increasing loads over time and peak loads when demanded. Vertical scaling can also be used with horizontal scaling.

- Elements of vertical scaling include the SNA gateway software, underlying operating system and hardware platform.

- Each Host Integration Server 2009 supports up to 8,000 users and a total of up to 15,000 sessions.

- Each Host Integration Server 2009 can support concurrently up to 250 host or downstream connections. In addition, these concurrent connections can be configured using up to the maximum SNA RU size and LAN protocol packet size.

These maximum specifications are achievable because Host Integration Server 2009 uses the Windows operating system, which provides the optimum platform for vertical scaling. Core capabilities of Windows include virtual memory and portability of hardware platforms. This means there is no need for strict adherence of RAM usage formulas because Host Integration Server 2009 is designed to utilize virtual memory provided by the operating system.
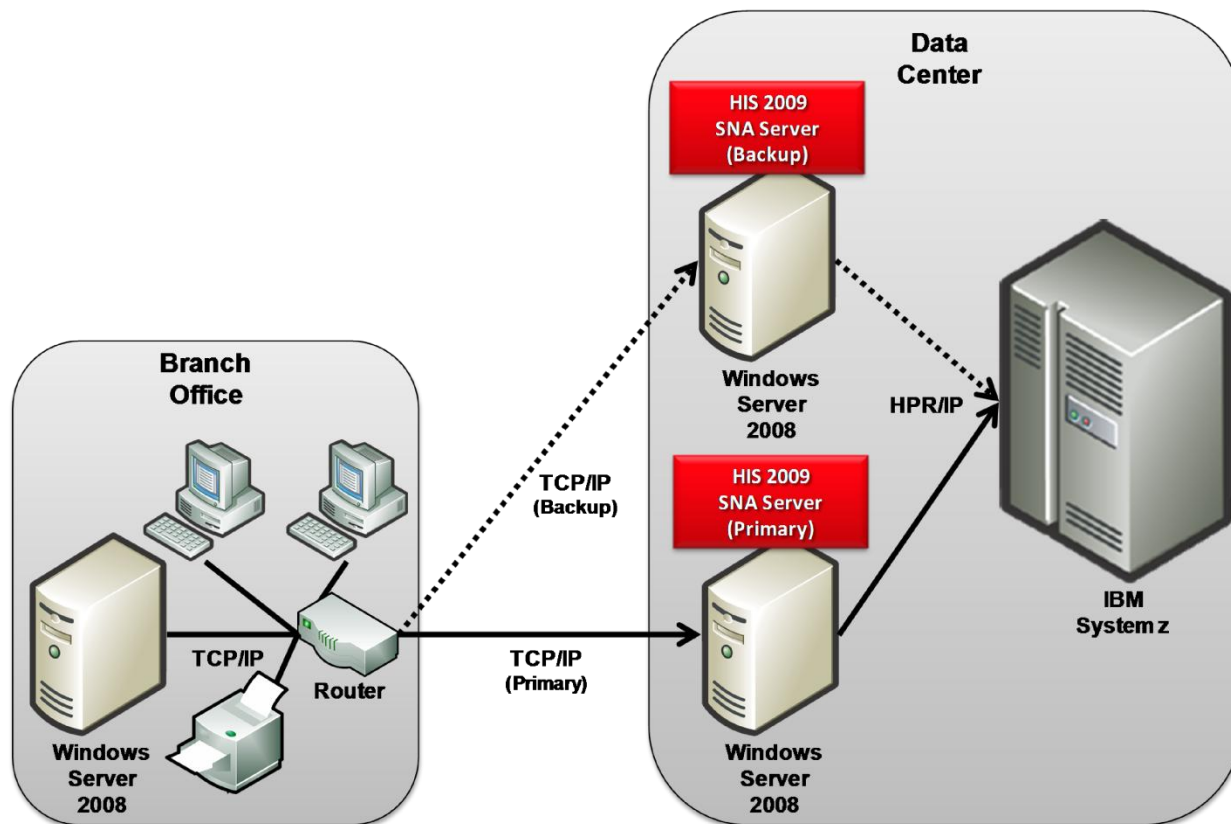

Figure 24: HIS 2009 hot backup provides enterprise-ready fault tolerance.

On-demand host connections provide the means to support increased user load, or to activate backup connections automatically, by allocating additional host resources when the need arises. This avoids having to maintain ongoing connections to host systems when no traffic requires the open connection. This is especially important in AS/400 environments where the host continually polls peer connections.

Hot Backup

Hot backup, or fault tolerance, ensures that if one SNA gateway computer should fail, then users can connect via another server automatically. In any organization, an individual gateway can be viewed as a single point of failure. For mission-critical use, Microsoft recommends a minimum of two Host Integration Server 2009 computers to provide fault tolerance. Up to 15 Host Integration Server 2009 computers can be grouped together to provide hot backup and load balancing, allowing sessions to be automatically rerouted to a backup gateway should the primary gateway or host link fail. The hot backup and load balancing features work both for mainframe and AS/400 connections and both for dependent and independent LUs.

Load Balancing

The Host Integration Server 2009 administrator creates pools of resources by collecting LUs from two or more connections, and possibly two or more servers. Using LU pooling, sessions can be distributed to desktops evenly across multiple host connections and multiple servers to balance the load. Load balancing ensures greater reliability by reducing the possibility that any single SNA gateway will be saturated and provides degraded response times. With load balancing and hot backup, the greater the redundancy planned into a deployment, the greater the reliability. The greater the reliability the greater the availability, and more of the organization's business is transacted in a timely manner.
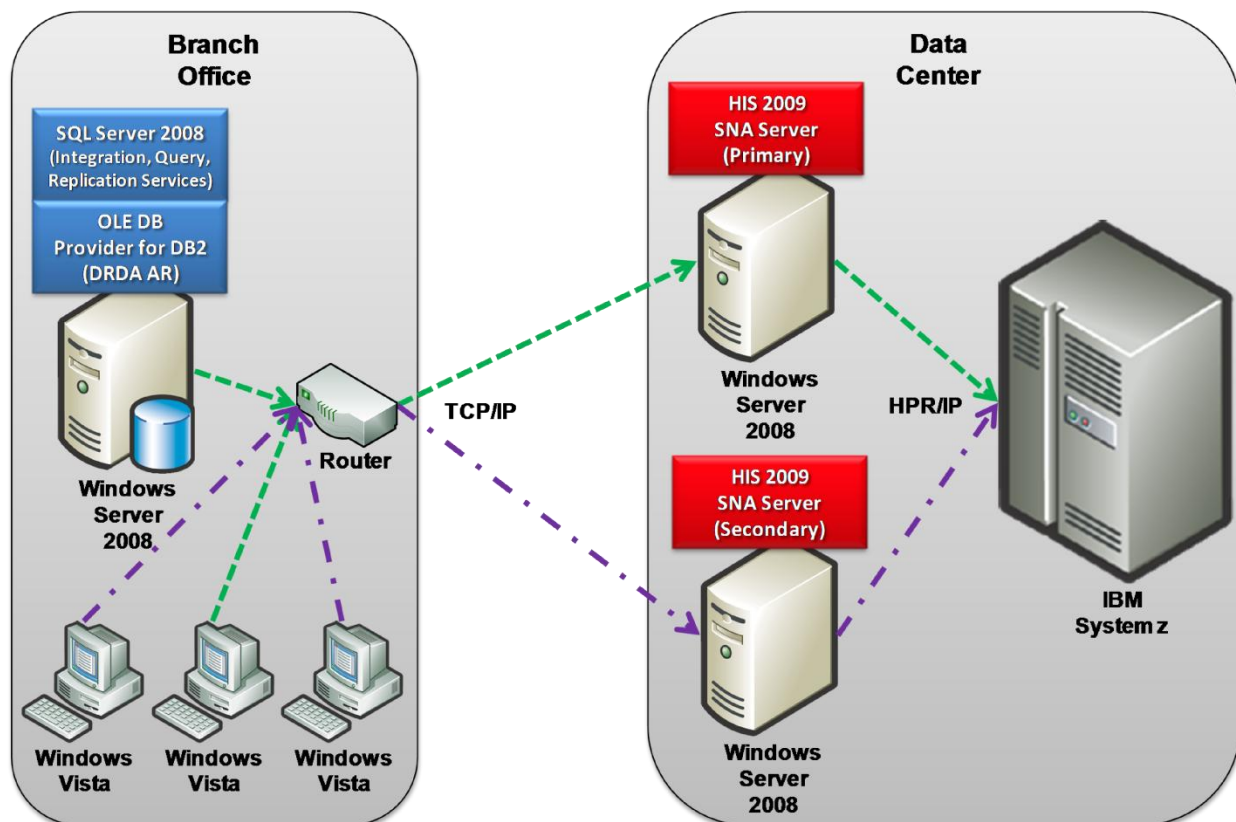
Figure 25: HIS 2009 load balancing ensures responsiveness to end users and applications.

Server Administration

There are several administrative interfaces available to be used to manage Host Integration Server 2009 resources:

- Microsoft Management Console (MMC)

- Scripting tools

- Windows Management Instrumentation (WMI)-based administration

- Mainframe tools

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SNA Manager

MMC is the standard Microsoft tool for assembling individual systems management utilities into customized toolsets that can be used to delegate administrative tasks and responsibilities to individual administrators.

Host Integration Server 2009 provides an SNA Manager MMC snap-in to manage multiple single servers or groups of servers (subdomains). This tool provides flexibility in viewing and managing subdomains, Host Integration Server 2009 computers, host connections, LUs, sessions, users and groups. SNA Manager integrates the administration of SNA Services, TN3270 Server, TN5250 Server and Host Print Service into a single interface.
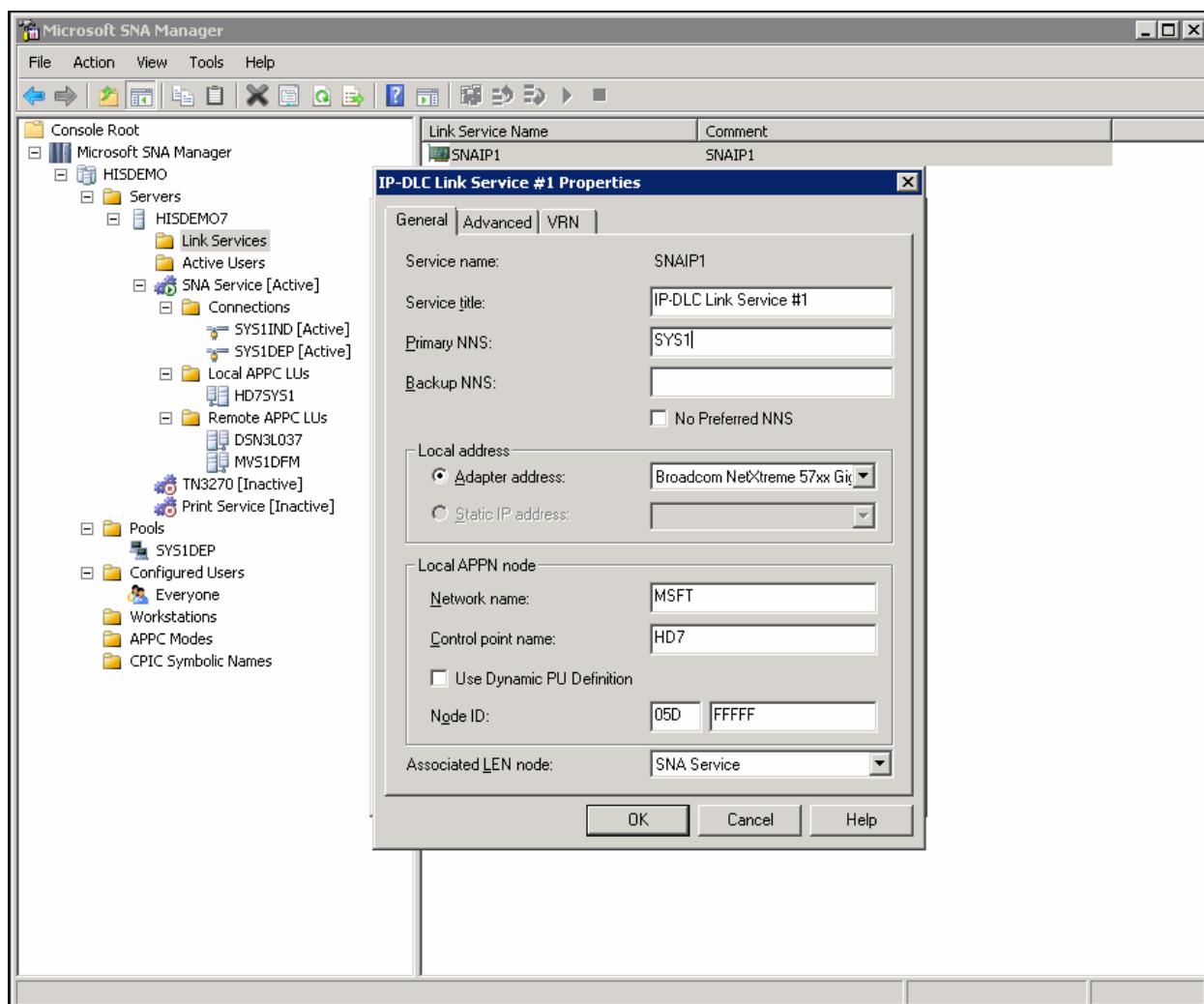
Figure 26: SNA Manager MMC-based Administration Tool.

Host Integration Server 2009 allows dynamic configuration of connections and resources with no impact on other services running on the Windows computer. Host links are Windows services and can be added without restarting Windows. Other elements of the configuration can

be added on the fly without requiring you to restart the core SNA services, including assigning 3270 LUs to users or groups.

SNA manager offers easy-to-use wizards for completing popular configurations, such as 3720 emulation, AS/400 connections and host security. Simple dialog boxes walk the administrator through the steps necessary to configure these popular features. The dialog boxes help the user to map parameters from the VTAM gen or AS/400 configuration to settings within Host Integration Server 2009. Regardless of whether the administrator has a LAN background or has experience working with host systems, Host Integration Server 2009 is designed to make it easy to configure the PC-to-host connectivity. Automatic configuring of several host parameters also saves time and reduces configuration errors.

In addition to the graphical tools provided by SNA Manager, Host Integration Server 2009 provides two command-line utilities, LinkCfg and SNACFG. You can use these command-line interfaces to easily modify a basic offline configuration file without starting the graphical interface, or to store configuration commands in a command file, so that they can be carried out easily in the future. You can also use the SNACFG command-line interface to print out a text version of your configuration.

As an alternative to the GUI-based MMC, Host Integration Server 2009 also comes with command-line utilities that can be used to create, modify and manage Host Integration Server 2009 SNA gateway resources.

Host Integration Server 2009 also supports administration using Microsoft WMI technology. WMI is an automation interface that supports several programming models, including Visual C++®, Visual C#®, Visual Basic®, Visual Basic .NET, ASP and ASP.NET. Using WMI, administrators can build their own tools to monitor, configure and administer all SNA objects.

In addition to integrating with Windows 2008 Server management tools, Host Integration Server 2009 also integrates with popular mainframe-based network management tools such as IBM NetView. Windows Server 2008Event Log Alerts can be forwarded up to a mainframe NetView system using the NVAlert component. A NetView operator can also run Host Integration Server 2009 commands using the NVRunCmd command provided by Host Integration Server 2009. In addition, the NetView Response Time Monitor (RTM) can be used to capture information on client response time and forward the data back to NetView.

Supportability

An SNA gateway allows efficient network administration by simplifying configuration, management, and monitoring of desktops, gateways and host connections. Administration of desktops, gateways and host links should be possible locally, from the gateway, and remotely, from any LAN workstation or the host. An effective SNA gateway should also offer administration capabilities that are integrated with the underlying operating system.

Diagnostics

The Microsoft Host Integration Server 2009 Diagnostics tool has been improved to allow the administrator to test and troubleshoot SNA connections and resources from a central location.
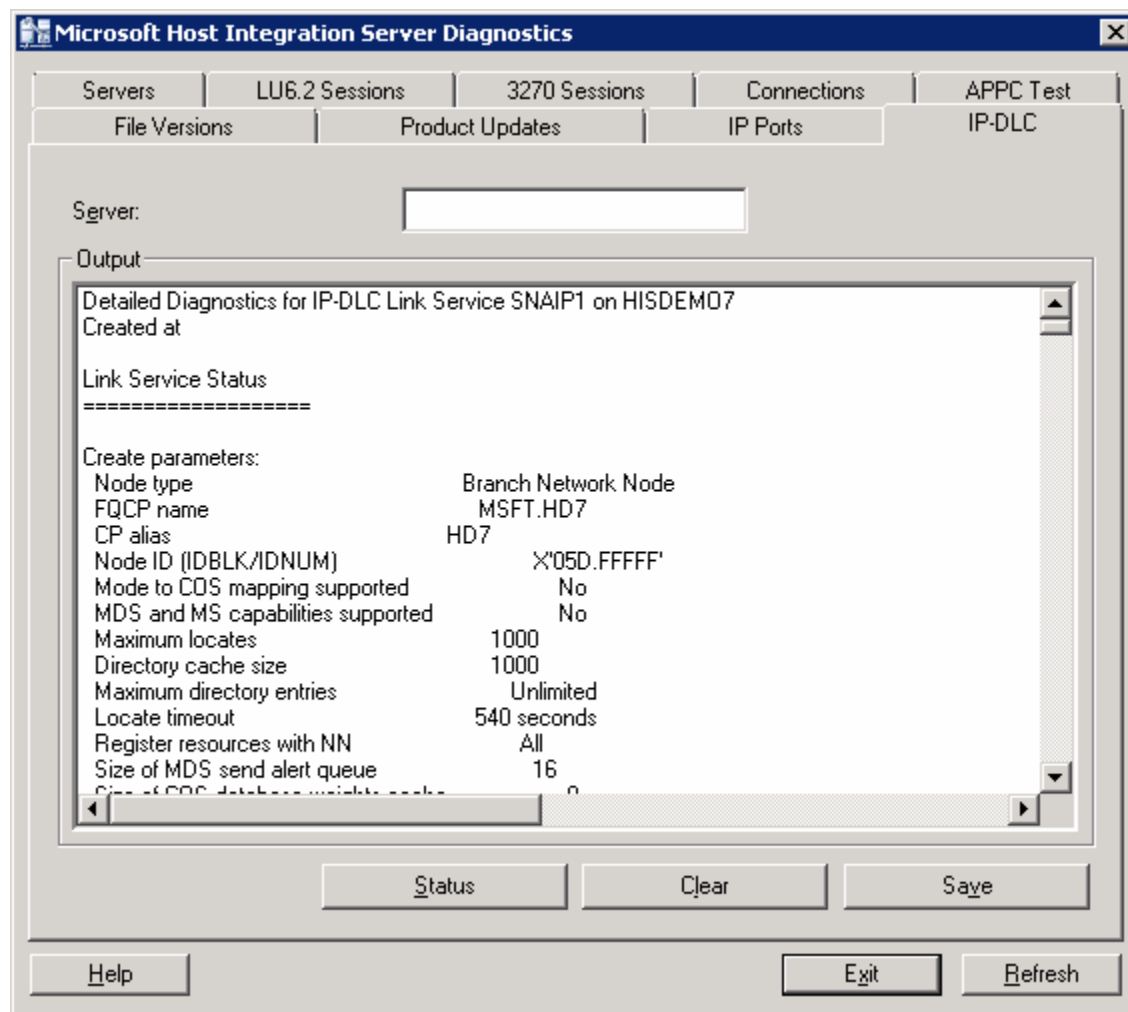

Figure 27: SNA Manager and Diagnostics Tool.

SNA Traces

For extensive troubleshooting capability, Host Integration Server 2009 provides a single Windows-based graphical program for all server tracing needs. The Host Integration Server 2009 trace utility is accessible from the Host Integration Server 2009 computer, or it can be run remotely over all supported LAN protocols.

SNA Trace allows the administrator to quickly collect information about the sequence of events leading up to a problem, and the exact state of the system when the error occurred. It allows you to track the activities of APIs including calls made to an API, communication links, and activity within Host Integration Server 2009. Information collected with SNA Trace can be essential for assisting a Microsoft Product Support Services engineer to solve complex problems. SNA Trace stores a history of the activity you select in trace files. With Host

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Integration Server 2009 there is no need to stop the server to obtain detailed tracing information with SNA Trace. This allows for uninterrupted use of Host Integration Server 2009 while troubleshooting problems.

In Host Integration Server 2009, the SNA Trace utility has been improved to support Windows events. Optionally, SNA Trace will monitor the Windows Event Log for a specific event ID, at which time SNA Trace stop tracing. This greatly increases the likelihood that you will capture but not overwrite valuable trace data.
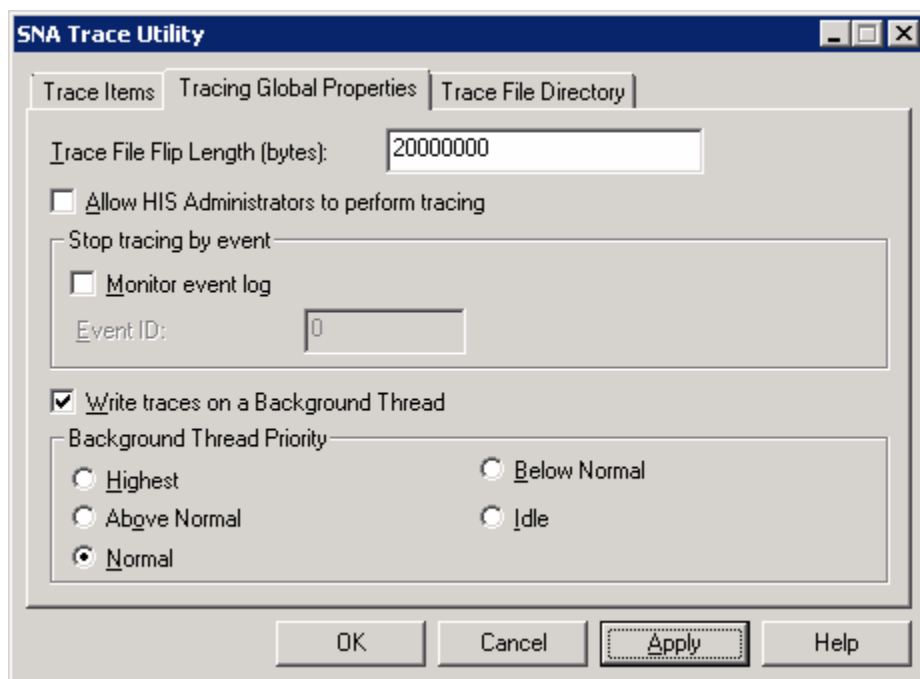
Figure 28: SNA Trace Utility.

This trace information can help LAN administrators improve performance and solve configuration problems. For example, it allows administrators to get the equivalent of a data scope trace of activity on a link that fails to start. Trace reading is possible using the provided SNA Trace Viewer application.

Server Error and Audit Logging

With SNA Manager, you can control the server to which events are logged, set the level of detail to be recorded, and specify which system will receive all pop-up error messages. You can use information from Windows Server 2008 event logs as you test a configuration or diagnose problems. For example, Event Viewer can help you find out about device drivers that did not initialize and reasons for host connection failures, or details of negative responses and sense codes. Event logs are viewed with the Windows Event Viewer.

Windows Utilities

Host Integration Server 2009 takes advantage of utilities that are provided with Windows Server 2008, such as the Windows Command Line facility, User Manager, Event Viewer, Task Manager, Performance Monitor and Control Panel.

Windows Utility	Description and Benefits
Command Line	The administrator can use simple and familiar Windows command line operations. Host Integration Server 2009 services can be started and stopped using Windows NET commands. NetView operators can control remote Host Integration Server 2009 computers from a host NetView console using the NetView NVRunCmd facility.
User Manager	All user and group accounts are managed with the User Manager. The accounts established through the User Manager are also used by Host Integration Server 2009. You need to create an account only once for use by Windows Server 2008 or Host Integration Server 2009.
	SNA Manager exposes the common Users and Groups dialog box through which you can specify the users and groups defined in a Windows domain.
Task Manager	Task Manager gives you a simple, quick view of how each application, application component or system process is using CPU and memory resources, as well as a summary of overall CPU and memory usage.
	Task Manager allows you to quickly terminate applications and processes that are not responding, thereby improving system performance. Resource usage for specific components and application processes can be viewed in charts and reports.
Event Viewer	All Host Integration Server 2009 events can be sent directly to the central applications log file maintained by the Windows Server 2008 Event Viewer. Multiple Host Integration Server 2009 computers can send their data to a central Windows Server 2008 computer for single-point collection and monitoring.
	Host Integration Server 2009 and any Windows events can be forwarded to IBM NetView for viewing by the remote IBM NetView console operator. Using the NetView RunCmd facility, the NetView operator can then act on the Host Integration Server 2009 and Windows events.
Performance Monitor	Host Integration Server 2009 exports server and workstation status information, including NetView RTM data, to Performance Monitor to tune performance or help diagnose difficulties.
	Performance Monitor can display a broad range of information, such as server status, CPU usage, host connection status and session status. The information can be presented in chart format with live updates, saved to a log for later analysis or report, and saved as alerts and used for spawning

	any Windows Server 2008 command line or program when a critical event occurs, such as a lost connection.
	Host Integration Server 2009 allows the administrator to specify the times at which the gateway should send RTM data to host NetView and also define the triggers that will cause RTM to register that the host has responded. Host Integration Server 2009 forwards NetView RTM data from clients to host NetView.
	Workstation RTM data can be sent to the Windows Server 2008 Performance Monitor for viewing, logging, generating alerts, etc. Administrators can view any workstation's response time for any client emulator that supports local RTM. The 3270 Client that comes with Host Integration Server 2009 supports collection of RTM data.
Control Panel	Components of Host Integration Server 2009 can be configured and monitored using the Services and Network Control Panel applets. This is in addition to the configuration and monitoring capabilities provided by SNA Manager.
	The services applet controls Windows services. All Host Integration Server 2009 host links and core components are Windows services. Therefore, using the services applet, Host Integration Server 2009 link services and other components can be started, stopped, paused and continued. For example, you can stop the NVRunCmd service if you don't want a NetView operator to run commands on the Host Integration Server 2009 computer.
	The Network applet displays the bindings for SNA link adapters. From here, the SNA administrator can unbind or rebind some SNA protocols such as DLC. This capability is in addition to SNA Manager's capability to start, stop and reset host links, or Host Integration Server 2009 install, configure and reconfigure host link adapters.

Table 4: HIS 2009 enables IT professionals with easy administration options.

Packaging and Licensing

Organizations are using Microsoft BizTalk Server to integrate and orchestrate composite solutions that span multiple systems and applications. Microsoft host integration technologies and tools are packaged with and licensed as supplemental software to Microsoft BizTalk Server 2009.

HIS 2009 Packaging

Microsoft host integration technologies and tools are available in two product packages, one that is labeled HIS and one that is labeled as a BizTalk product.

Microsoft Host Integration Server 2009

This package contains a single setup program that installs the HIS 2009 technologies and tools described in this white paper.

Microsoft BizTalk Adapters for Host Systems 2.0

This package contains the same HIS 2009 software, labeled as a BizTalk product, plus four (4) additional features: BizTalk Adapter for Host Applications; BizTalk Adapter for WebSphere MQ; BizTalk Adapter for DB2; and BizTalk Adapter for Host Files.

HIS 2009 Licensing

Microsoft host integration technologies and tools are available as supplemental licensed software to Microsoft BizTalk Server 2009.

Microsoft Host Integration Server 2009

The Microsoft Host Integration Server 2009 package is licensed as supplemental software to Microsoft BizTalk Server 2009 Branch edition, which is available through Microsoft Volume Licensing. Look for more information about Microsoft BizTalk Server 2009 licensing on the Microsoft Volume Licensing Web site (http://www.microsoft.com/licensing).

Microsoft BizTalk Adapters for Host Systems 2.0

The Microsoft BizTalk Adapters for Host Systems 2.0 package is licensed as supplemental software to Microsoft BizTalk Server 2009 Developer edition, Standard edition, and Enterprise edition. BTS 2009 Developer is licensed through the Microsoft Developer Network (MSDN®) and Microsoft Volume Licensing. Look for more information about Microsoft BizTalk Server 2009 Developer edition on the Microsoft Developer Network Web site (http://msdn.microsoft.com/en-us/default.aspx). Look for more information about Microsoft BizTalk Server 2009 licensing on the Microsoft Volume Licensing Web site (http://www.microsoft.com/licensing).

BizTalk Adapters

Microsoft BizTalk Adapters for Host Systems 2.0 connect to existing programs and data on IBM mainframe and midrange servers, allowing an enterprise IT department to extend those investments to new business intelligence, service-oriented architecture and business process solutions built on Microsoft server applications.

BizTalk Adapter for DB2

The Microsoft BizTalk Adapter for DB2 connects BizTalk Server 2009 to vital data stored in IBM mainframe DB2 for z/OS, IBM midrange DB2/400, and IBM DB2 Universal Database (running on AIX, Linux, Solaris, and Windows operating systems). The adapter is based on the Microsoft ADO.NET Data Provider for DB2 and supports a broad range of functions, including static and dynamic send ports, receive ports, and distributed transactions across SNA and TCP/IP network connections. Using SQL commands defined within port configuration wizards, IT professionals can easily create solutions that efficiently integrate DB2 databases without writing code.

BizTalk Adapter for Host Files

The Microsoft BizTalk Adapter for Host Files connects BizTalk Server 2009 to vital data stored in IBM mainframe System z VSAM datasets and IBM midrange System i AS/400 physical files. The adapter is based on the Microsoft ADO.NET Data Provider for Host Files, offering built-in data conversions from host data types to XSD data types, including a broad set of EBCDIC and UNICODE string conversions. The adapter offers an intuitive Visual Studio 2008 designer, including host COBOL and RPG source code import wizards, with which to define metadata maps of the host records. The port configuration wizards allow IT professionals to define static and dynamic send ports, solicit response receive ports, based on a set of SQL commands.

BizTalk Adapter for Host Applications

The Microsoft BizTalk Adapter for Host Applications is based on technology in Transaction Integrator allowing enterprises to connect BizTalk Server 2009 solutions to existing IBM mainframe System z (CICS and IMS) or midrange System i (AS/400) server programs. The adapter offers an intuitive Visual Studio 2008 designer, including host COBOL and RPG source code import wizards, with which to generate XSD schemas for use in BizTalk Server 2009 projects. Using the BizTalk Adapter for Host Applications, IT professionals can efficiently extend host programs with new solutions based on BizTalk Server 2009.

BizTalk Adapter for WebSphere (client-based)

The Microsoft BizTalk Adapter for WebSphere MQ uses the IBM WebSphere MQ Base Client (non-transactional) or WebSphere MQ Extended Transactional Client (transactional) APIs to communicate with remote WebSphere MQ Queue Managers, without needing to deploy and manage WebSphere MQ Server for Windows, to efficiently exchange messages with line-of-business applications across the enterprise.

Look for more information about Microsoft BizTalk Server 2009 and the Microsoft BizTalk Adapters for Host Systems 2.0 on the Microsoft BizTalk Server 2009 Web site (http://www.microsoft.com/biztalk).

Installation, Configuration and Deployment

The Host Integration Server 2009 product is designed to make it extremely easy to install, configure, manage and use both the server and client components. This benefit may significantly reduce training and support costs.

The Microsoft Host Integration Server 2009 package contains a single setup program that installs the HIS 2009 technologies and tools described in this white paper, for deployment on a client desktop, device, or server computer. After installation, the features can be configured using the Configuration Tool.

Product Installation

The computer on which you install HIS 2009 must have the following minimum hardware:

- 6-gigabyte (GB) hard disk space (including prerequisites and installation media)

- VGA (800x600) or higher resolution with 256 colors

- Developer Design Tools require VGA (1024x768) or higher resolution with 256 colors

HIS 2009 requires one of the following operating systems (32-bit x86 or 64-bit x64).

- Windows XP SP2 Professional SP2

- Windows Server 2003 SP2

- Windows Server 2003 R2 SP2

- Microsoft Windows Vista SP1

- Windows Server 2008

- Virtualization with Hyper-V

Additionally, HIS 2009 requires the following other software products, which are considered product installation prerequisites.

- .NET Framework 3.5 SP1

- Core XML Services (MSXML) 6.0 SP1

HIS 2009 Setup will install redistributable software product prerequisites automatically from the Web or from a pre-downloaded CAB file. Automatically installing from the Web or downloading the CAB file requires Internet access. You can download the CAB file at: http://go.microsoft.com/fwlink/?LinkID=133541.
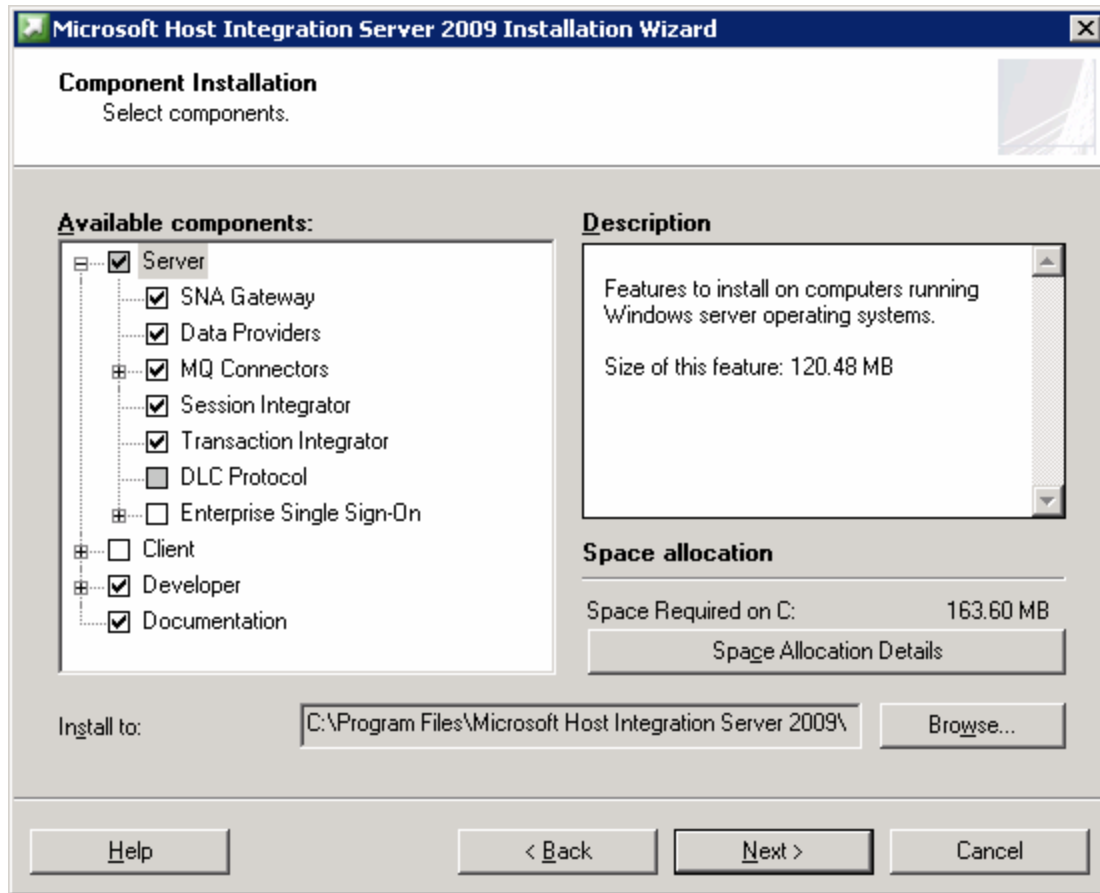
Figure 29: Server components listed in the HIS 2009 Installation Wizard.

In HIS 2009, the installation process is first, followed by the configuration process. The Host Integration Server 2009 installation process is based on the Microsoft Windows Installer (MSI) technology, through a familiar Windows graphical setup program that walks the user through the necessary steps to install the product, as well as a command line unattended installation program for remotely installing the product using Microsoft Systems Center Configuration Manager 2007.

The BAHS 2.0 setup will install one set of four additional BizTalk adapter features, when compared to the HIS 2009 setup. When installing BAHS 2.0 on a computer with BizTalk Server 2009 installed, the BAHS 2.0 setup will enable the Server components selection group named "BizTalk Adapters".
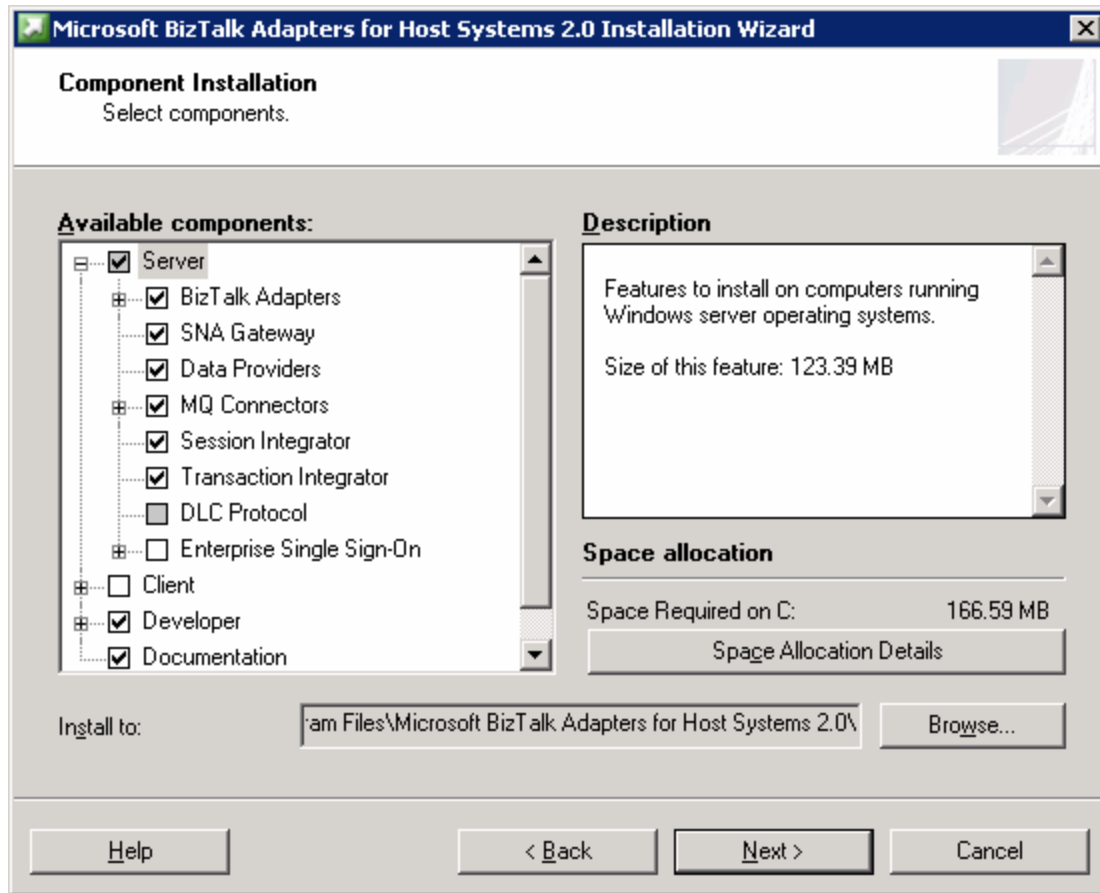
Figure 30: Server components listed in the BAHS 2.0 Installation Wizard.

The HIS 2009 setup process will identify supported earlier versions of the Microsoft host integration technologies and tools. HIS 2009 setup will automatically upgrade existing installations of HIS 2000, HIS 2004, HIS 2006 and BizTalk Adapters for Host Systems (1.0).

IT professionals can install the HIS client software on end user desktops, using this software to connect to remote IBM mainframe System z and midrange System i computers through an intermediary (upstream) HIS server operating as an SNA gateway. The connection between client and server computer is via TCP/IP. The connection between server and host computer is via SNA DLC or SNA HPR/IP.

Enterprise developers will utilize the Software Development Kit (SDK). Also, developers may use the Design Tools components (with program, message, and data integration technologies), which require one of the following to be pre-installed.

- Visual Studio 2005 SP1 (with C++ and C#)

- Visual Studio 2008 (with C++ and C#)

IT professionals may install the MSMQ-MQSeries Bridge, which requires Microsoft Message Queuing (MSMQ) with routing support this feature of Windows Server 2003 or Windows Server 2008 to be pre-installed.
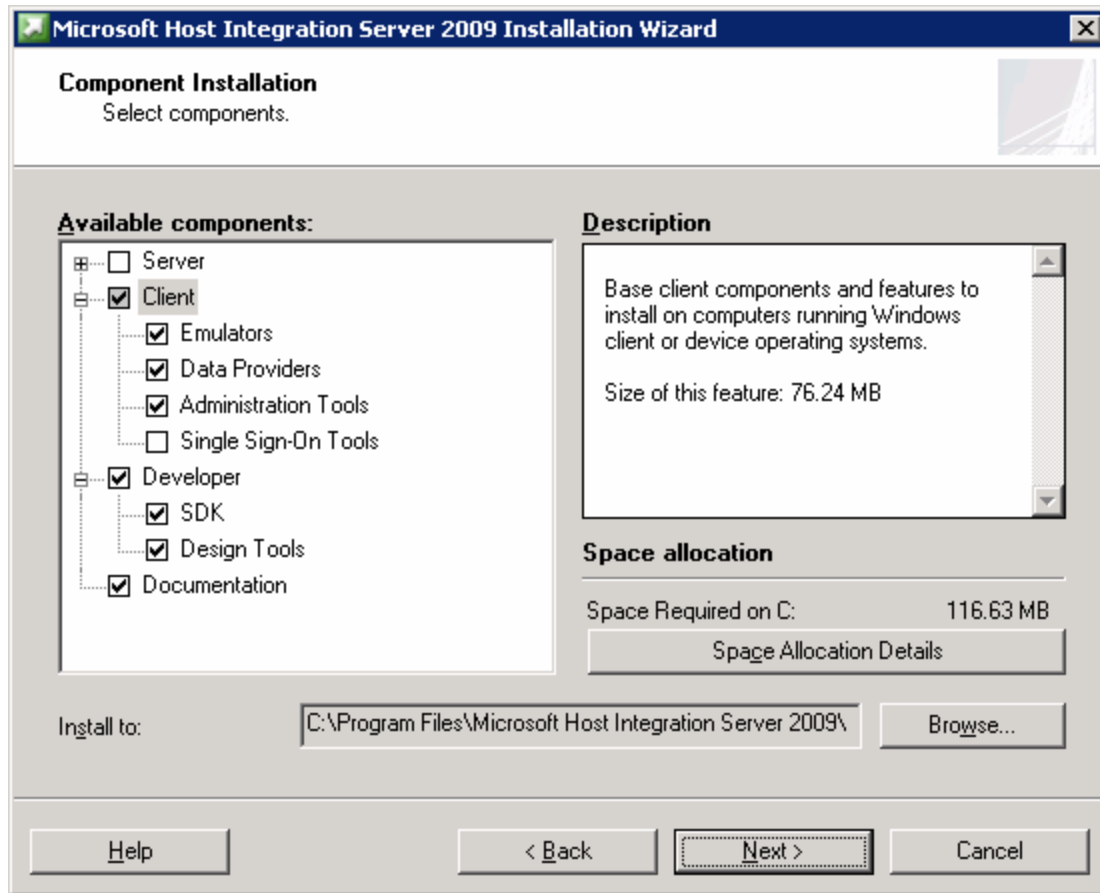
Figure 31: Client and Developer components listed in the HIS 2009 Installation Wizard.

Configuration

IT professionals and enterprise developers can configure HIS 2009 features as a post-installation activity, using the HIS 2009 Configuration Tool.

Feature Prerequisite Software

In order to configure some features, one must have pre-installed the following feature pre-requisite software

A number of features require a local or remote SQL Server 2005 with SP2 or SQL Server 2008 database, for storing metadata, configuration, or runtime data.

- DB2 Distributed Transactions over TCP/IP network connections

- Transaction Integrator

- Enterprise Single Sign-On

The HIS 2009 technologies for integrating with IBM WebSphere MQ require the software to be installed. The MSMQ-MQSeries Bridge requires one of the following IBM products.

- IBM WebSphere MQ Client 6.0 with Fix Pack 6.0.1.1

- IBM WebSphere MQ Client 7.0 with Fix Pack 7.0.0.1

- IBM WebSphere MQ Extended Transactional Client 6.0 with Fix Pack 6.0.1.1

- IBM WebSphere MQ Extended Transactional Client 7.0 with Fix Pack 7.0.0.1

The WCF Channel for WebSphere MQ can utilize one of the above-listed MQ client products or IBM WebSphere MQ Server 7.0 with Fix Pack 7.0.0.1.

Feature Configuration

To configure the HIS 2009 server and client installations, the IT professional must specify both a set of common settings and feature-specific settings. The common settings include the Security Groups, consisting of HIS Runtime Users and HIS Administrators.

The Network Integration specific settings define whether the installation is an HIS client, HIS server, or HIS SNA gateway server. The HIS client will connect through an upstream or intermediary SNA gateway server. The HIS server will connect either as a client to an SNA gateway server, or directly via TCP/IP where supported (e.g., Transaction Integrator, Messaging Integration features, Session Integrator, Data Providers).

- Subdomain name. Up to 15 HIS SNA gateway servers can work within a group, called and SNA subdomain, for purposes of load balancing and fault tolerance.

- Role. Within an SNA subdomain, one HIS SNA gateway is configured as the primary server, securely storing a copy of the group-wide configuration file with listing of servers, services, connections, and resources. The remaining 14 HIS SNA gateway servers are configured as the secondary role, with the ability to auto-promote to primary in case of failure scenarios.

- Services. HIS 2009 servers can support a number of additional SNA off-load services, including host printing, TN3270 and TN5250 gateway, and LU6.2 Resynchronization Services.

- Client Protocol. Typically, HIS client-to-server and server-to-server communications are across a TCP/IP network. However, for backwards compatibility with earlier versions of HIS, there remains optional support for Named Pipes.

- Active Directory. HIS clients and servers can locate sponsor servers, from which they can obtain list of SNA subdomain resources (e.g. connections and defined logical units), through Active Directory, by specifying a directory name and organizational unit.

To secure the HIS servers, services, configuration and resources, HIS 2009 supports a set of group accounts. IT administrators can securely deploy HIS clients and servers by utilizing the

Secure Configuration Wizard and Secure Deployment Guide, which provides guidance on how to restrict access to resources based on user and group access control lists.

The Data Integration specific settings are two. The first setting is related to the optional DB2 distributed transaction resynchronization service for TCP/IP networks. This feature relies on a local or remote SQL Server 2005 with SP2 or SQL Server 2008 database in which to store at runtime mappings between IBM DB2 and Microsoft transaction identifiers, allowing the distributed systems to exchange transaction logs in the case of a network failure. The second setting controls the behavior of the host file distributed data management network client program, whether it will operate as a service (application server installations) or a program (client installations).

The Transaction Integrator specific setting is singular, related to configuring the required TI HIP database for storing HIP application information in a local or remote SQL Server 2005 with SP2 or SQL Server 2008.

The Session Integrator specific setting determines under which account the runtime service will operate.

Secure Deployment

As mentioned previously, IT professionals can utilize unattended installation, optionally with products such as Microsoft Systems Center Configuration Manager 2007, to deploy HIS client and server instances to remote computers. Microsoft Trustworthy Computing is a long-term, collaborative effort to create and deliver secure, private and reliable computing experiences based on sound business practices. Look for more information about Microsoft Trustworthy Computing on the Microsoft Trustworthy Computing Web site (http://www.microsoft.com/mscorp/twc/default.mspx). To support this effort, HIS 2009 offers a number of technologies, tools, and best practices for secure deployment.

Host Integration Server 2009 is designed to be "secure by default" when installed. The Configuration Wizard assists the administrator to expose and unlock portions of the product appropriate for their domain. The online documentation offers a new Secure Deployment Guide that discusses security and deployment best practices, including Enterprise Single Sign-On. The product documentation offers prescriptive guidance for improving security of your systems and key steps to enable access to less-privileged users and groups.

Host Networking Configuration

Preventing unauthorized access to host resources is essential to enhancing the security of mission-critical applications and data stored on IBM mainframes and AS/400 computers. SNA gateways can offer an extra layer of flexible security compared to direct-connected workstations. Direct connection allows each desktop user to access the host by simply knowing the applicable host parameters. An effective SNA gateway will take advantage of the underlying operating system to provide this extra security.

Host Integration Server 2009 running on Windows Server 2008 provides additional security to help prevent unauthorized host access through a number of mechanisms, including requiring

security login for client-server connections by HIS-aware software products (e.g. 3270 and 5250 emulators) and hiding the host resource configuration in the case of TN3270 clients. In addition, Host Integration Server 2009 and Windows Server 2008 provide options for monitoring other security issues, such as access to the SNA subdomain configuration file.
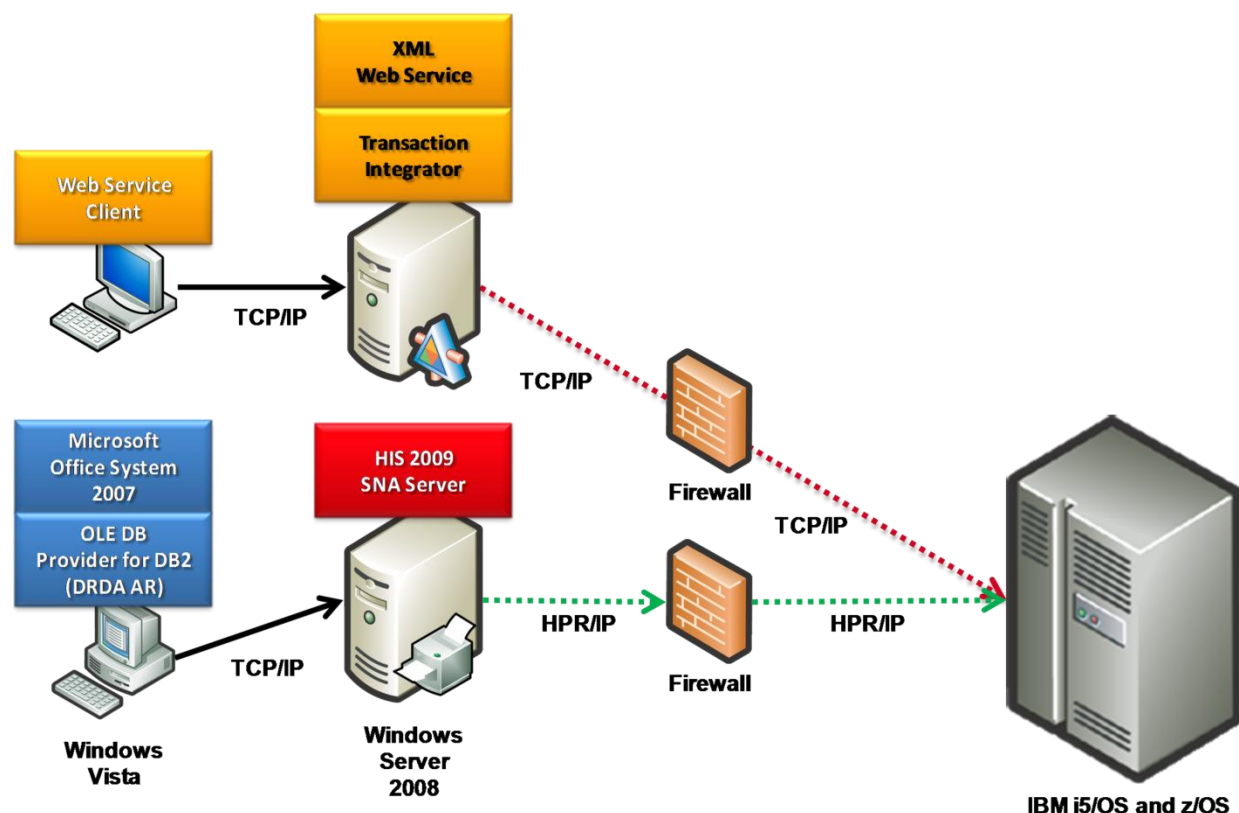

Figure 32: HIS 2009 administration and runtimes support Secure Product Configuration.

Windows Domain Security

HIS 2009 SNA gateway services can run on either Windows Server 2003 or Windows Server 2008, with optional support for Microsoft Systems Center Configuration Manager 2007, Microsoft Systems Center Operations Manager 2007, and Identity Lifecycle Manager 2007. This focus on Microsoft infrastructure software allows the HIS product team to better integrate HIS 2009 with Windows domain security.

An Extra Level of Security

IT administrators can configure HIS 2009 resources, including dedicated and pooled logical units, for access by users and groups identified in the specific Windows Server domain security database within which the HIS 2009 servers are deployed. Within the SNA Manager, a Microsoft Management Console snap-in, IT administrators have direct integration with the Users and Groups common dialogs familiar in Windows Server. Using the SNA Manager, an IT administrator can easily specify which users, groups, and workstations defined in the Windows Server domain will be granted access to SNA pools and session resources.

On the client side, security features are seamless for Windows clients running popular LAN protocols: TCP/IP and Named Pipes. The user's login to Windows provides the user identifier and password needed to validate the user for host access via HIS 2009 SNA gateway services. Also, this security integration provides users with a simplified login to both the operating system and HIS 2009 protected host networking resources.

Administrative Permissions

Using the SNA Manager, IT administrators can set varying levels of secured access to the HIS 2009 configuration file, including read-only and no access. IT professionals can safely deploy HIS servers in branch offices, by providing only partial but not full control to remote administrators.

Windows File System

With the Windows File System (NTFS), system administrators can lock down sensitive HIS 2009 configuration files with a C2-level security standard, the same level of security required by most U.S. government agencies. By placing the HIS 2009 installation on an NTFS drive, the system administrator can take advantage of C2-level security to better protect the host resource definitions listed in the HIS 2009 configuration file.

Full Audit Tracking

Depending on best practices within an organization, IT professionals can configure a range of logging options, based on HIS 2009 support for the Windows Event Log. IT administrators can take advantage of full audit tracking of access to and changes to the HIS 2009 configuration files through the Windows Event Log.

Data Encryption

Most client-to-host communications are unsecured today. For instance, 3270 and 5250 logon identifiers and passwords are sent in clear text between the client and the host. However, with Host Integration Server 2009, organizations in the banking, insurance and other security-conscious industries can help safeguard their host communications. All terminal emulation and other applications written to the HIS 2009 SDK APIs automatically benefit from the HIS 2009 data encryption features. HIS clients can connect to HIS SNA gateway servers using optional client-to-server data encryption. Also, HIS non-gateway application servers can connect to HIS SNA gateway servers using an optional server-to-server data encryption. IT administrators can set data encryption on or off from the SNA Manager. The encryption algorithm is RC4 stream cipher developed by RSA Data Security Inc. with a key length up to 128 bits. Encryption and decryption are performed in software on both client and server. Although the CPU cost of encryption on the client is negligible, it is generally not negligible on a server supporting many 100s of clients. IT administrators can manage the allocation of CPU resources, by selectively enabling this feature on a user-by-user basis. Host access rights tied to the Windows user database and encryption make using Host Integration Server 2009 a highly secure method to access host systems from PC networks. These features can be used to augment existing security systems, adding the extra level of security required as more SNA networks are opened up to allow intranet and even Internet access.

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Software Development Kit

All Host Integration Server 2009 documentation is available online, making it easier to find the information you need. In addition, online documentation includes SDK sample files for key component technologies. The HIS 2009 online documentation has been republished in the form of common help topics that can be viewed within the Microsoft Documentation Explorer, which is common to Visual Studio 2005, BizTalk Server 2006 and other products. The HIS 2009 Developer's Guide installs with the core product documentation to help developers use features of the SDK, and includes improved samples.

Application Programming Interfaces

The Host Integration Server 2009 SDK, including online documentation and source code samples, provides the means to build complete APPC, CPI-C, CSV and Logical Unit for Applications (LUA) solutions, as well as add-on products to Host Integration Server 2009 core functionality. Most of these APIs were discussed in the paragraph above. LUA is a customizable API that allows one to develop either at a low level in the SNA protocol stack, at the Request User Interface (RUI), or a higher level, at the Session Level Interface. These APIs are used every day by large institutional organizations building on their legacy of banking and insurance applications, many of which had previous to Host Integration Server 2009 relied on specialized control unit devices, such as the IBM 4147 financial series controller.

LU 0 is a device type used mainly in the financial industry to support teller terminals and automatic teller machines. LU types 1 and 3 are used to support printer emulation programs on client and server PCs, including the Host Integration Server 2009 Host Print Service. LU type 2 provides terminal emulation support for client programs from multiple vendors as well as the HIS 3270 Client. LU 6.2 supports Application Program-to-Program Communications (APPC), Common Program for Communications (CPI-C) and Common Service Verbs (CSV).

SNA client emulation vendors support host connectivity via Host Integration Server 2009 by adapting their products to support the Host Integration Server 2009 Function Management Interface (FMI) — sometimes referred to as the Emulator Interface Specification (EIS). The FMI or 3270 EIS API is encapsulated in a piece of Host Integration Server 2009 "client" code that Microsoft licenses to ISVs royalty-free. The emulator talks to this Host Integration Server 2009 client module, which in turn communicates with Host Integration Server 2009 via a client/server connection. When you use a full-featured 3270 emulator (or Microsoft's 3270 Client) with Host Integration Server 2009, you are connecting to the server via the FMI. FMI supports LU types 1-3. When you use a full-featured 5250 emulator (or Microsoft's 5250 Client) with Host Integration Server 2009, you are connecting to the server via APPC.

Through broad API support on the popular PC platforms and comprehensive network protocol support, Host Integration Server 2009 effectively integrates PC and host systems. Network managers can employ Host Integration Server 2009 to provide enterprise wide connectivity for disparate systems, with the knowledge that it will work with all required standards and environments.

Top New Features

HIS 2009 offers significant value to enterprise IT professionals and enterprise developers, compared to previous releases. The following are the top new features in HIS 2009.

- Connect host programs to Microsoft server applications across IBM WebSphere MQ infrastructure, using new Message Integrator enterprise developer design tools and data conversion built on new Windows Communications Foundation (WCF) Channel for WebSphere MQ.

- Define entities and relationships in Microsoft server applications that are based on remote IBM DB2 database objects, using the Entity Data Model (EDM) and Entity Provider for DB2.

- Ensure system recovery by using new Volume Shadow Copy Service (VSS) to manage the backup and restore of deployed servers.

- Publish host transaction programs as standard Web services, using enhanced TI developer design and deployment tools for Windows Communications Foundation (WCF).

- Transfer data faster from host data sources, in IBM DB2 databases and host file systems, using enhanced ADO.NET Data Providers with improved data conversion.

- Build Transaction Integrator projects faster with new COBOL/400 import wizard to automatically convert midrange program source code into .NET components.

- Process binary data extracted from record files, efficiently converting mainframe machine types to .NET Common Language Specification data types, using new off-line data reader.

- Deploy Transaction Integrator applications more flexibly using dynamic remote environments, while improving performance and security using managed .NET components.

- Virtualization using Windows Server 2008 Hyper-V™ reduces costs through lower hardware, energy, and management overhead.

- Application integration, messaging integration, and data integration connectivity within an Internet Protocol version 6 (IPv6) network, allowing Enterprise IT administrators with choice to support IPv4-only, dual stack, or IPv6-only environments.

Conclusion

Microsoft Host Integration Server 2009 offers technologies and tools that allow enterprise developers, knowledge workers, and administrators to deliver new solutions, while preserving the integrity and performance of vital line-of-business IBM host systems.

Whether publishing a services layer using the .NET Framework and Internet Information Services 6.0, orchestrating business process with BizTalk Server 2009, analyzing and reporting data with SQL Server 2008, securely consolidating network infrastructure with Windows Server 2008, or enabling knowledge worker collaboration through Office SharePoint Server 2007, HIS 2009 gives enterprise IT the ability to realize greater value through their existing investments in IBM systems.

Look for information on Microsoft Host Integration Server 2009 on the Microsoft BizTalk Server 2009 Web site (http://www.microsoft.com/biztalk/en/us/host-integration.aspx). Participate in the Microsoft Host Integration Server community.

- Microsoft Connect (https://connect.microsoft.com/site/sitehome.aspx?SiteID=66).

- Microsoft Newsgroups (http://www.microsoft.com/communities/newsgroups/en-us/default.aspx?dg=microsoft.public.hiserver.general).

- Microsoft TechNet (http://technet.microsoft.com/en-us/his/default.aspx).

- Microsoft Developer Network (http://msdn.microsoft.com/en-us/library/aa286574.aspx).