



Deploying SAP in Oracle and Linux Environments Using the Hitachi Universal Storage Platform[®] Family

Implementation Guide

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Summary

SAP's Enterprise Resource Planning (ERP) software integrates business process and information technology and people associated with the business that implement these systems. The mission-critical nature of SAP deployments requires an IT infrastructure that delivers high performance and is highly available. The infrastructure must be easy to deploy, manage and scale. Good planning prior to deploying SAP software is key to preventing performance issues, whether you're deploying business process management software for the first time or replacing a storage system that doesn't meet your needs.

This white paper introduces the architectural concepts that underpin SAP and explains how to use a Hitachi Universal Storage Platform[®] V or Hitachi Universal Storage Platform VM based solution to maximize the value of SAP deployments using Oracle and Linux. It also provides deployment guidelines for a successful implementation of SAP in Oracle and Linux environments using the Hitachi Universal Storage Platform family, and describes the hardware and software required to build the solution.

This white paper is written for businesses of all sizes that are deploying SAP on the Hitachi Universal Storage Platform family. It is targeted at anyone at those businesses who is charged with deploying SAP. At small companies, that might be a single individual who handles all data center functions, including applications, storage and network administration. At larger companies, these responsibilities are likely divided.

For best results use Acrobat Reader 8.0.



Contributors

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SAP is the leader in the field of business process management solutions. Organizations rely on SAP's software to automate mission-critical operations. Very often SAP applications must be available 24 hours a day, seven days a week, meaning a loss of application availability can have a divesting effect on businesses. That is just as true for a small business as it is for a global enterprise.

SAP's Enterprise Resource Planning (ERP) software integrates business processes and information technologies. Generally, SAP ERP implementations are enterprise-wide and integrate a variety of SAP business modules.

The mission-critical nature of SAP deployments requires an IT infrastructure that delivers high performance and is highly available. The infrastructure must be easy to deploy, manage and scale. The storage area network (SAN) typically is responsible for two out of every three customer calls related to SAP database performance issues. It is crucial that the SAN, which houses database files, not only is capable of handling current loads, but is also capable of scaling to meet future transaction loads.

Good planning prior to deploying SAP software is key to preventing performance issues, whether you're deploying business process management software for the first time or replacing a storage system that doesn't meet your needs.

All SAP solutions include an embedded database that runs on the selected operating system. The most widely implemented SAP database is Oracle running on a Linux or Unix operating system.

This white paper introduces the architectural concepts that underpin SAP and explains how to use a Hitachi Universal Storage Platform[®] V or Hitachi Universal Storage Platform VM based solution to maximize the value of SAP deployments using Oracle and Linux.

This white paper also provides deployment guidelines for a successful implementation of SAP in Oracle and Linux environments using the Hitachi Universal Storage Platform family. It describes the hardware and software required to build the solution and provides links to supporting documentation needed to build, test and validate the solution. Although this document does not provide step-by-step detailed instructions for each and every task required to deploy the solution, it does provide a consolidated resource where administrators can easily locate related materials needed to construct a functional solution.

This white paper is written for businesses of all sizes that are deploying SAP on the Hitachi Universal Storage Platform family. It is targeted at anyone at those businesses who is charged with deploying SAP. At small companies, that might be a single individual who handles all data center functions, including applications, storage and network administration. At larger companies, these responsibilities are likely divided. Although Hitachi Data Systems' testing used the Hitachi Universal Storage Platform VM, the Hitachi Universal Storage Platform V can also be used to deploy this solution.

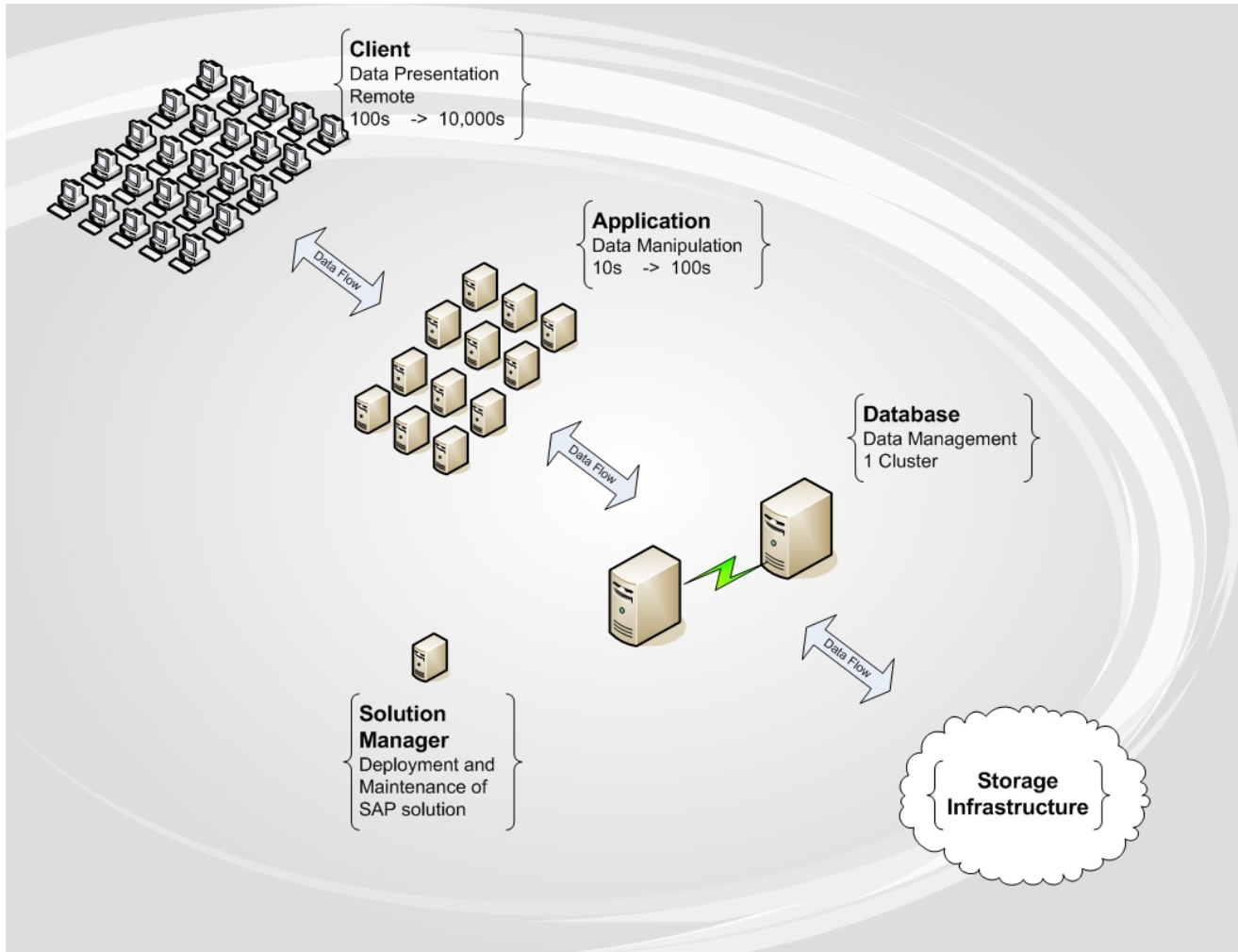
Storage administrators might not realize how important it is to have a high-level understanding of SAP architecture to ensure that storage systems meet service level agreements. This paper provides that understanding for storage administrators who are just beginning SAP deployments as well as those who might be attempting to remedy problems in existing deployments.

This white paper assumes either familiarity with SAN technologies and tools and Hitachi storage management software, including Hitachi Storage Navigator and Hitachi Dynamic Link Manager. It does not assume detailed knowledge of SAP's products or architecture.

Solution Overview

SAP's ability to scale almost without limit is based on the company's use of a three-tier approach to solution deployment that involves a client tier, an application tier and a database tier, as shown in Figure 1. This conceptual framework is the same for all SAP implementations, whether large or small.

Figure 1. SAP Three-Tier Architecture



In very small or test environments, all three tiers might be implemented on a single server. In production environments, the client tier is deployed into a user environment and can run on a variety of device types ranging from hand-held scanners that collect and transmit data to SAP or desktop PCs used by information professionals. In all cases, these devices are located physically close to the end user. This tier can scale virtually without limit with an assumption that all other tier will scale as well.

The application and database tiers are centralized in the data center and are the focus of the majority of IT attention. By design, the application tier can scale as the needs of an organization grow. The expansion is accomplished by simply adding servers. SAP software balances the processing load across the application servers, which delivers high performance and protects against service interruption in the case of hardware failure.

In production environments, database servers are clustered to eliminate a single point of failure. While any performance issues that are related to the application servers are easily remedied by additional servers, that is not the case with the database tier. Performance issues in the database tier can be difficult to remedy. Hitachi Data Systems effectively introduces a fourth tier – the storage tier to SAP implementations that is highly effective in addressing the data availability requirements of SAP deployments. In addition, proper focus on the architecture of the storage tier minimizes SAN-related performance issues that can develop as the SAP solution evolves and expands.

For demonstration purposes, this paper details the steps required to deploy the Solution Manager server as well as a single server that contains an instance from application and database tiers. The focus of the paper is the architecture of the storage infrastructure; the conceptual fourth tier of this solution, because any storage configuration and performance issues that arise originate in this area. You only use the Solution Manager server when you're deploying the SAP environment or making changes to it, so it will not require additional resources even if the SAP ERP server scales exponentially and hence it is not as mission critical.

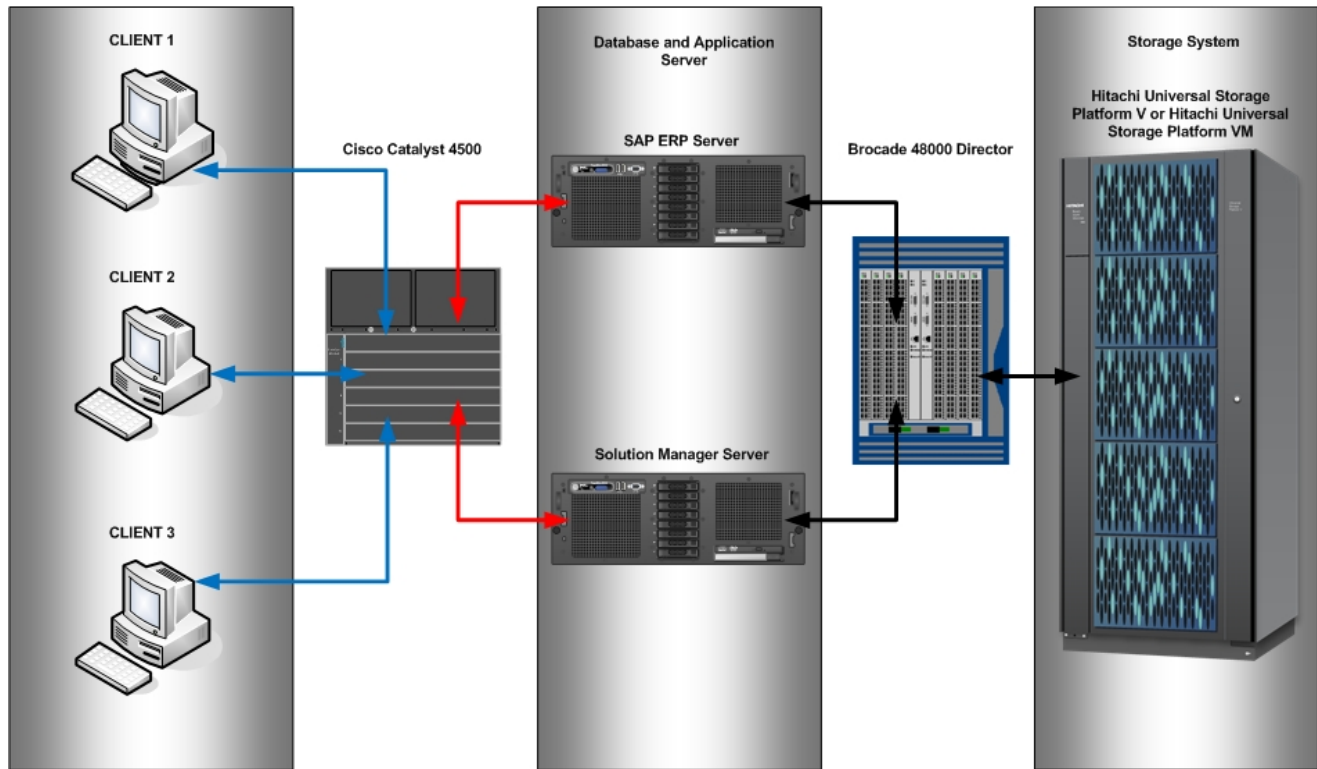
The solution described in this deployment guide includes the following components:

- Hardware:
 - Servers for deployment of SAP Solution Manager, SAP ERP and SAP GUI software
 - Storage system that stores application data
- Software:
 - **SAP business process software** — SAP Solution Manager, SAP ERP, SAP GUI and Oracle database that is provided by SAP
 - **Hitachi storage management software** — Hitachi Storage Navigator and Hitachi Dynamic Link Manager Advanced

Solution Architecture

This white paper describes a solution that includes an SAP client that accesses the SAP application infrastructure, which in turn stores data in and accesses data from a Hitachi Universal Storage Platform V or Hitachi Universal Storage Platform VM, as illustrated by Figure 2.

Figure 2. Solution Architecture



Tested Deployment

In the tested deployment, the client tier consists of Windows-based servers with SAP GUI installed. The clients connect to the SAP system in the SAP application tier via a Cisco Catalyst 4500 switch. The SAP Solution Manager was installed on a management server. The SAP application tier and database tier are installed on a single server. The SAP application is connected to a Hitachi Universal Platform VM storage system via a Brocade 48000 director.

The following sections describe the hardware and software used to deploy the solution described in this white paper.

Table 1 describes the hardware used in the tested deployment.

Table 1. Tested Deployment Hardware

<i>Hardware</i>	<i>Quantity</i>	<i>Configuration</i>	<i>Role</i>
Hitachi Universal Storage Platform VM storage system	1	Firmware version 60-05-10-00/00 4 Fibre Channel ports 1 pair of front-end directors 2 pair of back-end directors 28 x 300GB 15K RPM Fibre Channel drive 40 x 300GB 10K RPM Fibre Channel drive 64GB cache 14GB shared memory	N/A
Brocade 48000 SAN Fibre Channel switch	1	FOS 6.21 10 4Gb Fibre Channel ports used	N/A
Dell Power Edge R905 server	1	4 quad core AMD Opteron 1.9GHz processors 64GB memory 2 Emulex LPe11002-MH4 Fibre Channel host bus adapters (HBAs) 4Gb/s	SAP Solution Manager server
Dell Power Edge R905 server	1	4 quad core AMD Opteron 1.9GHz processors 64GB memory 2 Emulex LPe11002-MH4 Fibre Channel HBAs 4Gb/s	SAP ERP server
Dell PowerEdge 750	2	Intel Pentium 3.0GHz processor 1GB memory	SAP clients
Dell PowerEdge 750	1	Intel Pentium 3.0GHz processor 1GB memory	Management server with access to Hitachi Storage Navigator software.

Table 2 lists the software used in the tested deployment.

Table 2. Tested Deployment Software

<i>Software</i>	<i>Version</i>
SAP ERP	6.0 Special Release 3 (SR3)
SAP Solution Manager	7.0
SAP GUI	7.1
Oracle Database 10g Enterprise Edition	10.2.0.4
Hitachi Command Control Interface (CCI)	01-23
Hitachi Dynamic Link Manager	6.0.1.0.804
Hitachi Storage Navigator	Firmware version 60-05-10-00/00

The following sections provide information about each of the components of the tested deployment.

Hitachi Universal Storage Platform Features

The Hitachi Universal Storage Platform V and the Hitachi Universal Storage Platform VM are the most powerful and intelligent enterprise storage systems in the industry. The Universal Storage Platform V and the smaller footprint Universal Storage Platform VM are based on the Universal Star Network™ architecture. These storage systems deliver proven and innovative controller-based virtualization, logical partitioning and universal replicator for open system and mainframe.

With this architecture as its engine, the Hitachi Universal Storage Platform V redefined the storage industry. It represents the world's first implementation of a large scale, enterprise-class virtualization layer combined with thin provisioning software. It delivers unprecedented performance, up to 247PB of internal and external virtualized storage capacity and 512GB of directly addressable cache.

The Hitachi Universal Storage Platform VM blends enterprise-class functionality with a smaller footprint to meet the business needs of entry-level enterprises and fast growing mid-sized organizations, while supporting distributed or departmental applications in large enterprises. With the Hitachi Universal Storage Platform VM, smaller organizations can enjoy the same benefits as large enterprises in deploying and managing their storage infrastructure in a way never possible before. It supports up to 96PB of internal and external virtualized storage capacity and 128GB of directly addressable cache.

Although Hitachi Data Systems' testing used the Hitachi Universal Storage Platform VM, the Hitachi Universal Storage Platform V can also be used to deploy this solution.

Servers

Servers must meet specification requirements for the SAP Solution Manager and SAP ERP roles they are hosting. For more information about server requirements for SAP ERP, SAP Solution Manager and SAP clients, see the following SAP Notes, which are available to licensed customers from SAP's [Web site](#):

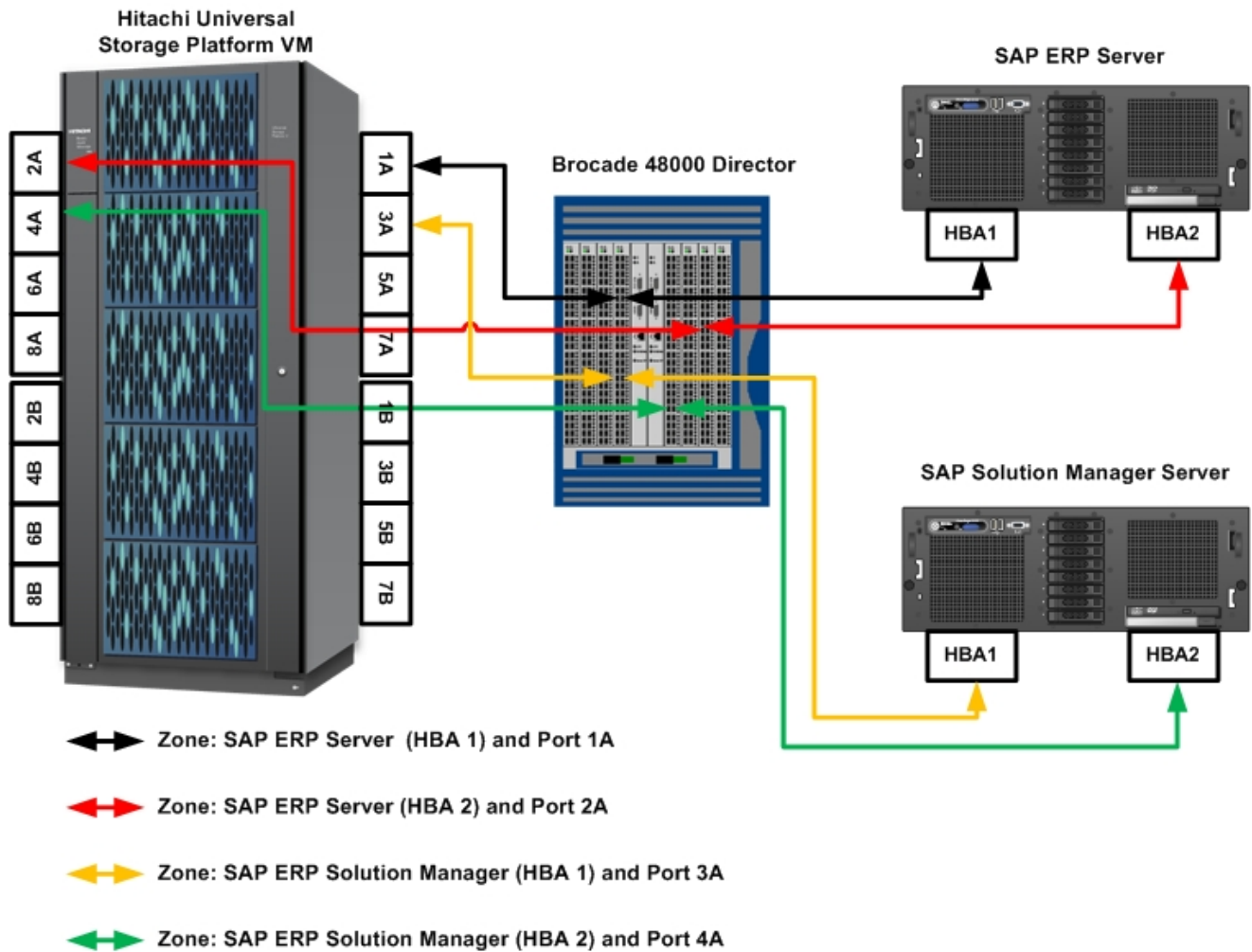
- SAP Note 1094599, *Installation NW7-SR3/Business Suite 2005 SR3 Unix/Oracle*
- SAP Note 26147, *SAP GUI Resources: Hardware and Software*
- SAP Note 901070, *Resource Requirements for SAPECC6*

Storage Area Network Components

Attach the SAP ERP server, and SAP Solution Manager Server to redundant HBAs via a SAN consisting of a Fibre Channel switch or a director. The Hitachi Universal Storage Platform VM, which was used in testing for this solution, has thirty two 4Gb Fibre Channel ports. In the tested deployment, the SAP ERP and SAP Solution Manager servers were connected via two HBAs each to a Brocade 48000 Director. The Brocade 48000 director, in turn, was connected to four different ports of the Hitachi Universal Storage Platform VM.

Figure 3 illustrates zones and the redundant paths that are managed by Hitachi Dynamic Link Manager Advanced software in the deployment tested for this solution.

Figure 3. Connections to the Hitachi Universal Storage Platform VM



SAP Software

SAP provides business software and enterprise applications that enable companies to execute their business and IT strategies more effectively by integrating structured and unstructured information, business processes and people involved. SAP offers a large portfolio of products and solutions to integrate cross enterprise processing using technologies such as Electronic Data Interchange (EDI), Collaborative Cross Applications. SAP is based on a NetWeaver Technology platform that allows an enterprise to choose from a wide variety of operating systems and database management systems. An SAP system can be flexibly deployed either in a single-stack (using ABAP) or dual-stack (using ABAP and Java) environment. Moreover, due to its three-tier architecture, SAP systems can scale vertically and horizontally.

SAP ERP

SAP ERP combines scalable and effective software for enterprise resource planning (ERP) with a flexible, open technology platform that can leverage and integrate SAP and non-SAP systems. This industry leading solution provides end-to-end software functionality for enterprise management and support by controlling and processing business related company processes. The tested deployment described in this white paper uses ERP version 6.0 Special Release 3 (SR3).

SAP Solution Manager

SAP Solution Manager is a service and support platform that provides the integrated content, tools and methodologies to implement, support and monitor operations of SAP implementations. Solution Manager is installed on a separate system. The tested deployment described in this white paper used SAP Solution Manager Version 7.0.

SAP GUI 7.1

SAP GUI is the client software that allows SAP users to access various functionalities in SAP applications and SAP Solution Manager. The tested deployment described in this white paper used SAP GUI version 7.1 on various clients.

Oracle Database 10.2.0.4

SAP systems can be used with a variety of databases available from different vendors. The execution of business transactions in SAP systems are processing units grouped to provide specific functions; these processing units execute changes to the database that are consistent. Oracle is the industry leader in providing state-of-the-art high performance database management system. Oracle has several technological features embedded in the database software that provide flexibility and manageability. Some of these features cover backup and recovery, cloning of database etc. The tested deployment described in this white paper uses the Oracle database version 10.2.0.4 that is available from SAP.

Hitachi Software

Hitachi software helps you maintain high levels of information availability and optimize application performance while improving IT staff productivity through the automation of management and maintenance tasks.

Hitachi Storage Navigator Software

Hitachi Storage Navigator software is the integrated interface for the Universal Storage Platform family firmware and software features. Use it to take advantage of all of the Universal Storage Platform's features. Storage Navigator software provides both a Web-accessible graphical management interface and a command-line interface to allow ease of storage management.

Storage Navigator software is used to map security levels for SAN ports and virtual ports and for inter-system path mapping. It is used for RAID-level configurations, for logical unit (LU) creation and expansion, and for online volume migrations. It also configures and manages Hitachi Replication products. It enables online microcode updates and other system maintenance functions and contains tools for SNMP integration with enterprise management systems.

Hitachi Dynamic Link Manager Advanced Software

Hitachi Dynamic Link Manager Advanced software bundles Hitachi Dynamic Link Manager I/O multipathing software and Hitachi Global Link Manager software. Hitachi Dynamic Link Manager software, which is installed on the SAP ERP and SAP Solution Manager servers, includes capabilities such as path failover and failback and automatic load balancing to provide higher data availability and accessibility.

Hitachi Dynamic Link Manager software includes the following load-balancing algorithms that are especially suited for Hitachi storage systems:

- Round robin
- Extended round robin
- Least I/Os
- Extended least I/Os
- Least blocks
- Extended least blocks

The choice of load-balancing algorithm depends on the specific environment and access patterns of the application. In most cases, the round robin algorithm provides the best overall performance. In some environments, such as an environment shared with other applications, one of the other algorithms might give the best overall performance.

The Hitachi Universal Storage Platform family supports active-active multipath connectivity. To obtain maximum availability, design and implement your host-storage connections so that at least two unique paths exist from the host to the storage system. Hitachi Data Systems recommends the use of dual SAN fabrics, multiple HBAs and host-based multipathing software when deploying SAP systems.

Because the SAP Solution Manager and SAP ERP servers have HBAs each, two I/O paths exist from host to the storage system. This means that each LU is identified twice by the operating system. Hitachi Dynamic Link Manager software manages the dual naming issue and provides high availability in case of I/O path failure. Install Hitachi Dynamic Link Manager Advanced software on both the SAP Solution Manager server and the SAP ERP server.

Deploying the Solution

A successful deployment of SAP software involves the following high-level steps:

1. Establish your requirements for the deployment.
2. Configure servers and operating environment.
3. Complete pre-installation tasks.
4. Configure storage and file systems.
5. Install and configure SAP Solution Manager software.
6. Install and configure SAP ERP software.
7. Install and configure SAP GUI software.
8. Verify the SAP system.

Your checklist might vary based on your environment. More details about each of these steps are included in the following sections.

The specific activities and detailed processes for each of the high-level tasks are located in documentation provided by Hitachi Data Systems and SAP. This documentation set is required to assist with deploying the solution. For more information, see the following resources:

- Hitachi Universal Storage Platform V Storage Navigator User's Guide
- Hitachi Dynamic Link Manager Users Guide for Linux
- [SAP Notes](#) and related guides

SAP Deployment Considerations

To deploy a basic SAP system that is also highly available and provides high performance, use high-powered servers and storage systems that provide availability, scalability and performance. As shown in Figure 3, accepted best practice is to deploy SAP Solution Manager and SAP ERP software on separate servers. Figure 3 shows multiple I/O paths providing high-availability from the hosts to storage via a Fibre Channel director.

Server and Operating Environment Configuration

When deploying SAP Solution Manager and SAP ERP software for this solution, Hitachi Data Systems used two high-powered Dell PowerEdge R905 servers with four Quad Core CPUs and 64GB memory. Each server had two Emulex LPe 11002 HBAs (4Gb/s transfer rate) and two 1GB network interface cards.

Two SAP client servers and one management server for access to Hitachi Storage Navigator were deployed using Dell PowerEdge 750 servers with 2 CPUs and 2GB memory.

Hitachi Data Systems installed Red Hat Enterprise Linux version 5.2 (x86 64 bit) on the SAP Solution Manager and SAP ERP servers. Microsoft Windows 2008 was installed on SAP clients and the management server to access Hitachi Storage Navigator.

Hitachi Data Systems suggests you to refer the following SAP notes in the order listed to gather all the requirements about supported operating system for SAP systems used for this solution. These SAP Notes are available to licensed customers from SAP's [Web site](#):

1. SAP Note 171356, *SAP Software on Linux: Essential*
2. SAP Note 1048303, *Red Hat Enterprise Linux 5.x: Installation and Upgrade*
3. SAP Note 1172419, *Linux: Supported Java Versions on the x86_64 Platform*

Pre-installation Tasks

You must complete several pre-installation tasks before installing either SAP Solution Manager or SAP ERP software or configuring your storage. For more information about pre-installation tasks, see the following SAP Notes in the order listed, which are available to licensed customers from SAP's [Web site](#):

1. SAP Note 855498, *Installation Pre-requisite Checker, SAP Guides*
2. SAP Note 1145779, *SAP Solution Manager 7 Installation*
3. SAP Note 1052298, *SAP NetWeaver 7.0(2004s) SR3 Installation on UNIX/Oracle*
4. SAP Note 830576, *Parameter Recommendations for Oracle 10g*
5. SAP Note 1289199, *Information about Oracle Parameters*
6. SAP Note 828268, *Oracle Database 10g: New Functions*
7. SAP Note 871735, *Current Patch Set for Oracle 10.2.0*

Storage Configuration

Proper planning helps ensure a robust solution. Proper planning requires that you identify your storage needs, carefully choose a RAID configuration and carefully plan storage networking. After these planning decisions are made, you can begin configuring your storage system.

Identify Storage Needs

The critical nature and performance requirements of SAP implementations demand that IT administrators carefully select SAN infrastructure elements. It's important to remember that not all elements of an SAP storage infrastructure demand the same level of performance. Also note that a mature implementation has a wide variety of requirements, ranging from high performance for data related to the production instance to cost-effective near-line storage for archiving. The performance and availability requirements of the production landscape are measured separately from any other part of the environment. The most demanding areas of concern are the data file that contains data from the Oracle Instance for ERP.

When deploying an SAP system, primary areas of concern are disk type, disk size and RAID configuration. Given the potential negative effect of a performance issue, Hitachi Data Systems recommends erring on the side of too much rather too little performance.

A common practice is to take advantage of the ability of high end SANs to divide disk resources among multiple hosts to attain the highest utilization possible. Hitachi Data Systems does not recommend this in the

case of SAP, because when the ERP systems share RAID groups of application data and application online log data with other applications, poor performance can result.

Not all elements of the SAP storage infrastructure demand the same level of performance. The most demanding areas are online redo log files. Hitachi Data Systems recommends placing online transaction log files on RAID-5 and placing data files on individual RAID-1+0 groups, and always on the fastest disk. A 2D+2D configuration used in deploying this solution provides high performance, can yield a larger number of IOPs and maintains meeting best practice response times

The production data file grows as the SAP project matures and expands. The conservative approach is to use fast disks and RAID-1+0 for data files. For smaller database configurations with a low number of transactions and concurrent users, you can also reduce costs by using RAID-5 for data files. The goal is to incorporate a configuration that meets the I/O requirements of the application within the budgetary constraints of the business.

The other areas of an SAP implementation, like SAP and Oracle binaries and staging area for re-organization, are not generally high focuses for performance. A variety of disk types and RAID configurations are available that can help lower our TCO and meet the I/O and availability requirements of SAP. These are out of scope of this white paper.

Hitachi Data Systems also recommends use of logical volume manager (LVM) to create volume groups and logical volumes. For this solution, the logical volumes, volume groups and file systems are carefully laid out based on the application needs. Both the SAP Solution Manager Server and the SAP ERP server use same volume group, logical volume and file system configuration.

For this solution SAP and Oracle binaries are placed in individual logical volumes, which in turn are part of a Volume. Each set of database online logs and archive logs are placed in their own volumes, which in turns are placed in their own volume.

Choose RAID Configuration

Hitachi Data Systems recommends using RAID-5 for online log file and software binaries and RAID-1+0 for data file. In addition, SAP Solution Manager and SAP ERP software need various file systems with varied requirements to be created.

Table 3 provides storage configuration details for SAP Solution Manager software. This table assumes RAID-5, RAID type 3D+1P and 300GB 10K FC disks for software binaries, online redo log files and archive log files. This table also assumes RAID-1+0, RAID type 2D+2D and 300GB 15K Fibre Channel disks for data files.

Table 3. Storage Configuration Details for SAP Solution Manager Software

<i>RAID Group Type</i>	<i>RAID Group</i>	<i>LDEV</i>	<i>Size (GB)</i>	<i>Host LUN</i>
RAID-5 (3D+1P)	1-1	00:01:12	100	0000
RAID-5 (3D+1P)	1-1	00:01:13	150	0001
RAID-5 (3D+1P)	1-5	00:01:04	805	0002
RAID-5 (3D+1P)	1-6	00:01:05	805	0003
RAID-5 (3D+1P)	1-7	00:01:06	805	0004
RAID-1+0 (2D+2D)	3-6	00:03:05	536	0005
RAID-1+0 (2D+2D)	3-7	00:03:06	536	0006
RAID-1+0 (2D+2D)	3-8	00:03:07	536	0007
RAID-1+0 (2D+2D)	3-9	00:03:08	536	0008
RAID-1+0 (2D+2D)	3-10	00:03:09	536	0009

Table 4 provides storage configuration details for SAP ERP software. This table assumes RAID-5, RAID type 3D+1P and 300GB 10K Fibre Channel disks for software binaries, online redo log files and archive log files. This table also assumes RAID-1+0, RAID type 2D+2D and 300GB 15K Fibre Channel disks for data files

Table 4. Storage Configuration Details for SAP ERP Software

<i>RAID Group Type</i>	<i>RAID Group</i>	<i>LDEV</i>	<i>Size (GB)</i>	<i>Host LUN</i>
RAID-5 (3D+1P)	1-1	00:01:10	100	0000
RAID-5 (3D+1P)	1-1	00:01:11	150	0001
RAID-5 (3D+1P)	1-2	00:01:01	805	0002
RAID-5 (3D+1P)	1-3	00:01:02	805	0003
RAID-5 (3D+1P)	1-4	00:01:03	805	0004
RAID-1+0 (2D+2D)	3-1	00:03:00	536	0005
RAID-1+0 (2D+2D)	3-2	00:03:01	536	0006
RAID-1+0 (2D+2D)	3-3	00:03:02	536	0007
RAID-1+0 (2D+2D)	3-4	00:03:03	536	0008
RAID-1+0 (2D+2D)	3-5	00:03:04	536	0009

Table 5 lists provides details of host LUN, disk group, logical volumes and file system mapping. Both the SAP Solution Manager server as well as SAP ERP server has the same host LUN, disk group, logical volumes and files system mapping details.

Table 5. Storage Configuration Details for SAP ERP Software

<i>Host LUN</i>	<i>Disk Group</i>	<i>Logical Volume</i>	<i>File System Mount Point</i>	<i>Usage</i>
0000	appbi n_vg	appbi n_sap_l v	/sapmnt, /usr/SAP/<SID>, and /usr/SAP/trans	File system for central repository for SAP Solution Manager, SAP binaries, and central location for moving data to another system when required
0001	appbi n_v	appbi n_ora_l v	/oracl e	File system for Oracle binaries for installation of Oracle, Oracle client, home directory for Oracle user, and to store data temporarily for online data re-organization respectively
0002	appl ogA_vg	appl ogA_l v	/oracl e/<SID>/ori gl ogA and /oracl e/<SID>/mi rr l ogB	File system for online redo logs and duplex logs of the database

<i>Host LUN</i>	<i>Disk Group</i>	<i>Logical Volume</i>	<i>File System Mount Point</i>	<i>Usage</i>
0003	appl ogB_vg	appl ogB_l v	/oracl e/<SID>/ori gl ogB and /oracl e/<SID>/mi rrl ogA	File system for online redo logs and duplex logs of the database
0004	apparch_vg	apparch_l v	/oracl e/<SID>/saparch	File system for archived logs
0005	appsapdata_vg	appdata_sapdata_l v	/oracl e/<SID>/sapdata1	File system for SAP Solution Manager data
0006	appsapdata_vg	appdata_sapdata_l v	/oracl e/<SID>/sapdata2	File system for SAP Solution Manager data
0007	appsapdata_vg	appdata_sapdata_l v	/oracl e/<SID>/sapdata3	File system for SAP Solution Manager data
0008	appsapdata_vg	appdata_sapdata_l v	/oracl e/<SID>/sapdata4	File system for SAP Solution Manager data
0009	apporadata_vg	appdata_oradata_l v	/oracl e/<SID>/oradata	File system for Oracle data dictionary, temporary, UNDO, and users tablespace data

Identify Storage Networking

When deploying an SAP system, the storage used by SAP Solution Manager server and SAP ERP server must be isolated from each other in a SAN. As shown in Figure 3, four separate Fibre Channel zones are created, one from each HBA of the SAP Solution Manager server and SAP ERP server. The Fibre Channel zones for the SAP Solution Manager and the SAP ERP server do not share the Fibre Channel port of the storage systems.

World wide names (WWNs) of the HBAs residing on a physical server can be assigned to a host group and then a logical device (LDEV) can be associated with each host group. This means that a group of LDEVs can be isolated to be used by only the assigned physical servers.

Configure Storage

To configure your Hitachi Universal Storage Platform family storage system, follow these steps:

1. Create a Fibre Channel zone as show in Figure 3.
2. Create host groups using Hitachi Storage Navigator software, as follows:
 - a. Choose **GO > LUN Manager**.
 - b. Right-click a port (for example Port CL1-A) and select **Add New Host Group** from the pop-up menu.

The **Add New Host Group** dialog box appears.
 - c. Enter a name for the host group in the **Group Name** field and select **Host Mode** from the drop-down menu.

For the Red Hat Linux operating system, the value of the host mode is 00.
 - d. Click **OK** to add the host group.
 - e. Click the **Apply** button in the main window and then click **OK** at the prompt to complete the host group creation.

- f. Right-click the host group that was just created and select **Add New WWN** from the pop-up menu.
A list of WWNs appears.
 - g. Select a WWN from the list.
 - h. Enter a name for the WWN in the **Name** field and click **OK**.
 - i. Click **Apply** in the Hitachi Storage Navigator window.
The **Do you want to Apply** prompt appears.
 - j. Click **OK**.
The **Requested operation is complete** prompt appears.
 - k. Click **OK**.
3. Follow these steps to create a virtual logical volume image/logical unit (VLL) LDEV from a RAID group using Hitachi Storage Navigator software:
 - a. Choose **GO > LUN Manager**.
 - b. Click the **VLL** tab
 - c. Identify and expand the box (for example Box1) folder and then expand a RAID group (for example 1-1).
 - d. Click the **Virtual LVI/LUN (VLL)** tab page in the left pane under the RAID group (for example 1-1), select the actual RAID group (for example 1-1(1)).
 - e. On the right pane, right-click **Free Space** from the list and select **Install CV** from the pop-up menu.
 - f. Enter the custom volume (CV) capacity in the **Capacity** field and the number of CVs that you want to create in the **No** field.
 - g. Click the **Set** button and then click the **Next** button to display the LDEV number setting panel.
 - h. Select the device from the left pane and the select the LDEV number from the **Select LDEV No.** matrix on the right pane
 - i. Select the **Next** button, select the **Next** button again and click the **OK** button on each window that appears.
 - j. Click the **Apply** button and answer **No** in the quick format dialog box.
Formatting begins on the devices.
After formatting completes, the LDEV created can be associated to a host group.
 4. Follow these steps to associate LDEVs to host groups of the individual ports of the host connections using Hitachi Storage Navigator software:
 - a. Choose **GO > LUN Manager**.
 - b. Expand a port (for example Port CL1-A) and click a host group.
 - c. Select the control unit (CU) supplying the LDEV from the **CU:** drop-down menu.

The list of LDEVs available for the CU is populated in the LDEV section of the **LU Path & Security** window.

- d. Select a LDEV (for example 00:00:01) to be associated to the host group in the LDEV section of the LU Path & Security window.
- e. Select a LU number (for example 0001) in the right pane of the LU Path section of the LU Path & Security window.

The **Add LU Path** button activates.

- f. Click the **Add LU Path** button.
- g. Click the **Apply** button.

A **Do you want to apply?** prompt displays.

- h. Click **OK**.
5. Follow these steps to install Hitachi Dynamic Link Manager Advanced software and configure your storage system:
- a. Execute the following command on the server on which you want to install Hitachi Dynamic Link Manager Advanced software:

```
. /i nstal l hdl m
```

When the installation is complete, Hitachi Dynamic Link Manager Advanced displays a message indicating that the software was successfully installed.

Hitachi Dynamic Link Manager Advanced software names your disk device using the following format:

```
sddl m<di sk-devi ce>
```

<di sk-devi ce> is a combination of letters from a to z identifying your disk device.

- b. On each server, using LVM, create a physical volume (PV) on each disk device, using the following syntax:

```
pvccreate /dev/sddl m<di sk-devi ce>
```

- c. On each server, using LVM, create volume groups, using the following syntax:

```
vgcreate -s 64 <vol ume group name> <physi cal vol ume name(s)>
```

Table 5 shows the volume groups needed for this solution.

- d. On each server, create logical volumes, using the following syntax:

```
lvcreate -l <si ze of logi cal vol ume> -n <vol ume vol ume name> <vol ume group name>
```

Table 5 shows the logical volumes and respective volume groups needed for this solution.

e. On each server, create a file system for each logical volume, using the following syntax:

```
mke2fs -t ext2 /dev/<volume group name>/<logical volume name>
```

f. Mount each file system, using the following syntax:

```
mount -t ext2 -o async /dev/<volume group name>/<logical volume name>  
/<mount point>
```

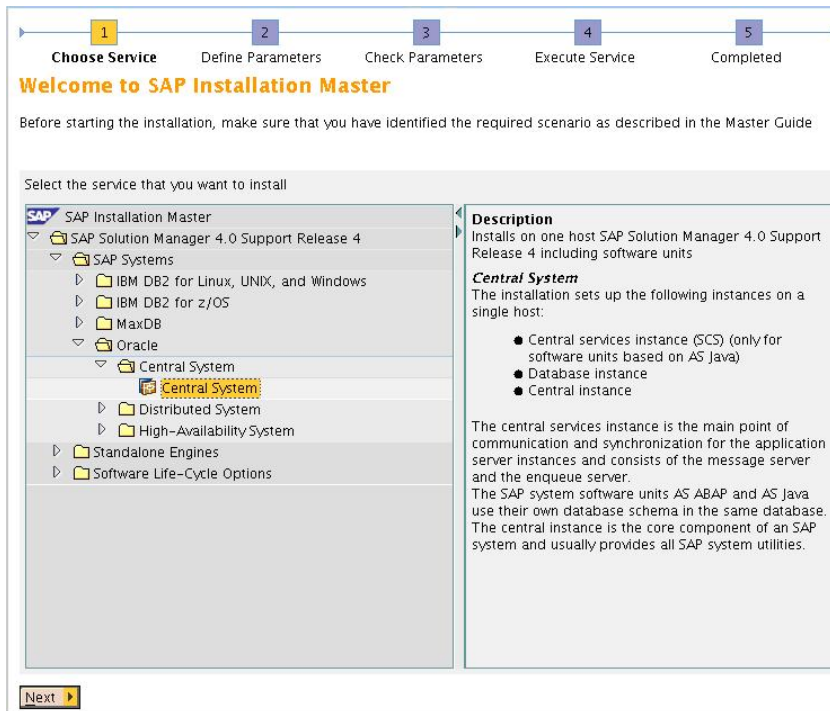
Table 5 shows the file systems and mount points needed for this solution.

SAP Solution Manager Installation and Configuration

Install SAP Solution Manager on a dedicated server. Follow these steps to install SAP Solution Manager:

1. Copy the SAP Solution Manager software from the installation media to a staging directory on the Solution Manager server.
2. Execute the `./sapinst` command from a subdirectory in the staging area.

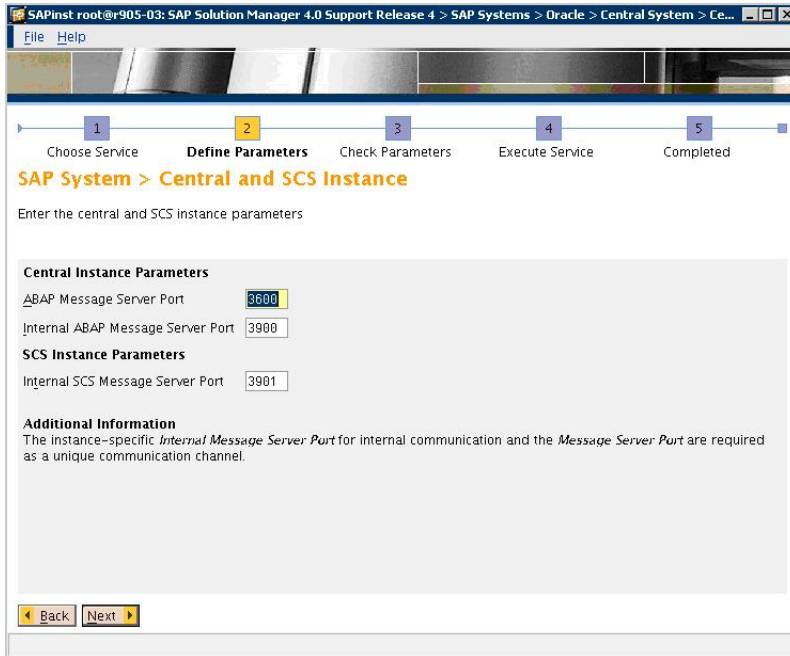
SAP Installation Master launches.



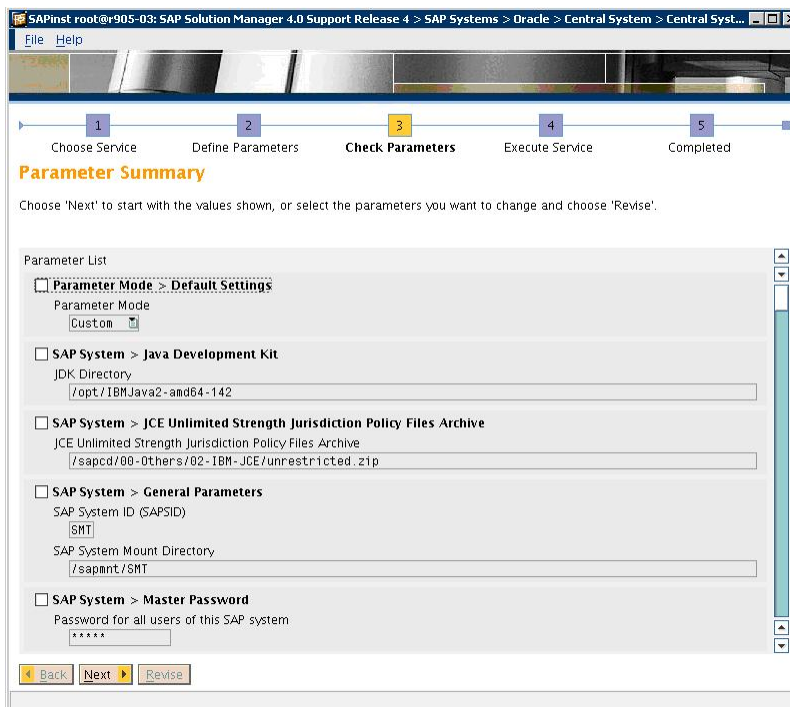
3. Choose the Central System service by navigating the service tree as follows:

SAP System Manager 4.0 Support Release 4 > SAP Systems > Oracle > Central System

4. Identify and provide the parameters as prompted by SAP Installation Master.



SAP Installation Master verifies all parameters that you provide and begins to execute the installation. If any parameters cannot be validated, values can be changed.



4. Provide any input required by SAP Installation Master during the execution phase.

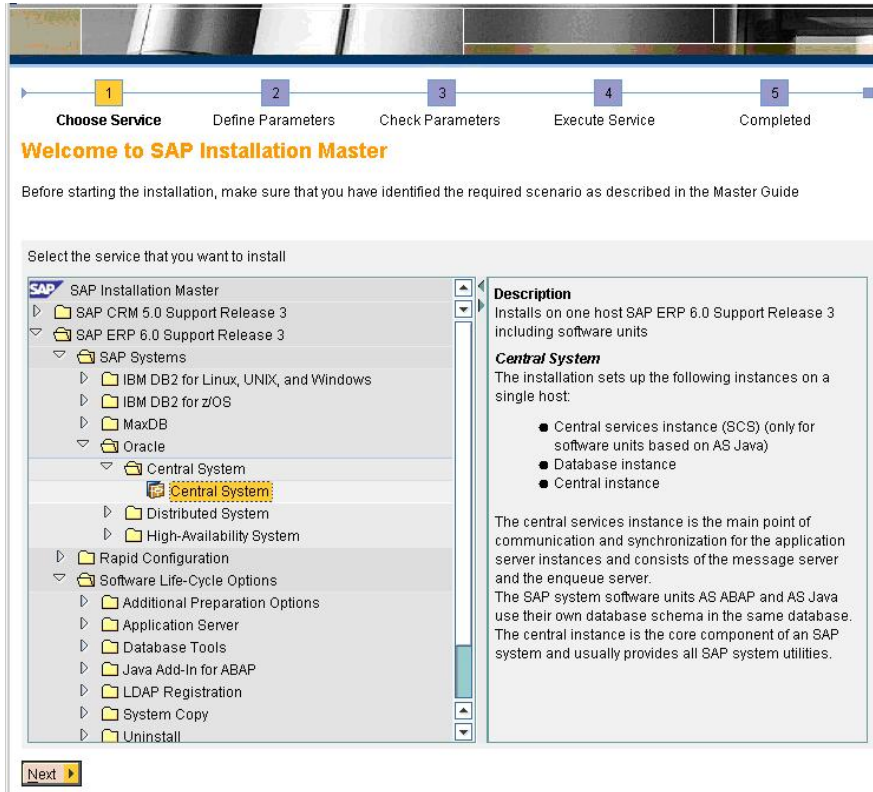
After all the steps are complete, SAP Installation Master displays a message indicating successful installation.

SAP ERP Installation and Configuration

Install SAP ERP on a dedicated server. Follow these steps to install and configure SAP ERP:

1. Copy the SAP Solution Manager software from the installation media to a staging directory on the Solution Manager server.
2. Execute the `./sapi nst` command from a subdirectory in the staging area.

SAP Installation Master launches.



3. Choose the Central System service by navigating the service tree as follows:

SAP ERP 6.0 Support Release 3 > SAP Systems > Oracle > Central System

- Identify and provide the parameters as prompted by SAP Installation Master.

1 Choose Service 2 **Define Parameters** 3 Check Parameters 4 Execute Service 5 Completed

Media Browser > Software Package Request

Enter the location of the required software packages

Media Name	Package Location	Copy Package To
Java Component: NW 7.0 SR3	/sapcd/16ERP-Java1/51033513	Browse...

Additional Information
SAPInst will detect the required software packages on the media and check the corresponding package identification files LABEL.ASC. If you want to copy the media to your local disk, enter the target location in the Copy Package To column.

Back Next

SAP Installation Master verifies all parameters that you provide and begins to execute the installation. If any parameters cannot be validated, values can be changed.

SAPInst root@r905-06: SAP ERP 6.0 Support Release 3 > SAP Systems > Oracle > Central System > Central System

File Help

1 Choose Service 2 Define Parameters 3 **Check Parameters** 4 Execute Service 5 Completed

Parameter Summary

Choose 'Next' to start with the values shown, or select the parameters you want to change and choose 'Revise'.

Parameter List

- Parameter Mode > Default Settings**
 - Parameter Mode: Custom
- SAP System > Software Units**

Install	Software Unit	Description	Depends On
<input checked="" type="checkbox"/>	ECC	ERP Central Component	AS ABAP
<input type="checkbox"/>	BD	ERP Biller Direct	AS Java
- Media Browser > Software Package Request**

Media Name	Package Location	Copy Package To
UC Kernel NW 7.0 SR3	/sapcd/02ERP-Kerne1	
Oracle Client	/sapcd/13ORA-CLIENT	
- SAP System > Java Development Kit**
 - JDK Directory: /opt/IBMJava2-amd64-142
- SAP System > JCE Unlimited Strength Jurisdiction Policy Files Archive**

Back Next Revise

5. Provide any input required by SAP Installation Master during the execution phase.

After all the steps are complete, SAP Installation Master displays a message indicating successful installation.

SAP GUI Installation and Configuration

SAP GUI software allows users and administrators to access SAP system from client machines. It also lets SAP system administrators manage SAP ERP and SAP Solutions Manager systems. SAP GUI software is installed on SAP clients. For the tested deployment used in this solution, the client machines are Microsoft Windows-based servers.

Follow these steps to install and configure SAP GUI software:

1. Double-click the SetupAI1.exe file to launch the SAP Front End Installer.

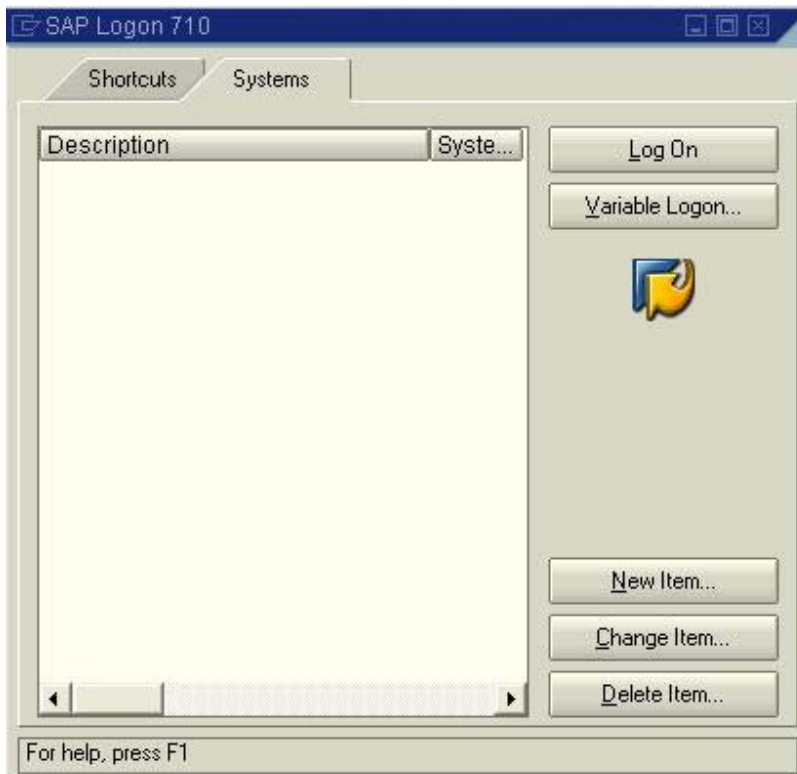
The installation wizard screen appears.



2. Follow the wizard's prompts to complete the installation.

When the all the steps are complete, a message indicating successful installation appears.

3. Double-click the SAP Log On icon to launch the SAP GUI interface.

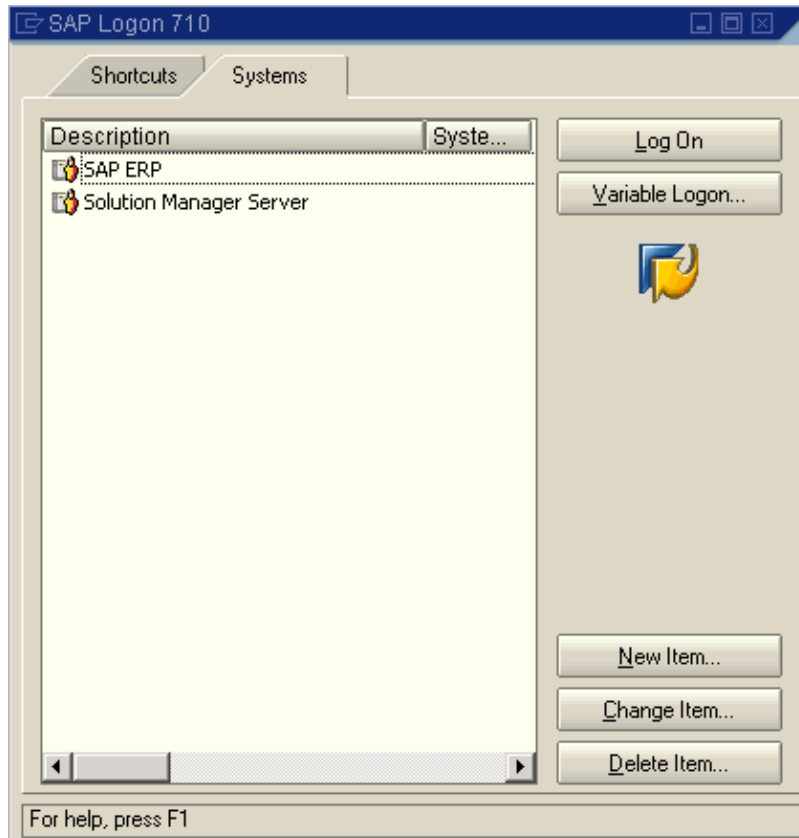


For example, click the **New Item** button to add systems to Solution Manager, or click the **Change Item** button to reconfigure an existing system.

SAP System Verification

It is important to verify that the newly installed and configured hardware and software are operating properly before making your deployment live. The verification process involves logging in to each server and executing a few transactions. Follow these steps:

1. Log in to SAP Solution Manager software using SAP GUI software.



2. Execute a transaction.

In this example, transaction SM50 is being executed in SAP Solution Manager.

Process Overview

No.	Type	PID	Status	Reason	Start	Err	Se.	CPU	Time	Report	Cl.	User Names	Action
0	DIA	7965	Running		Yes					SAPLTHFB	001	FED	
1	DIA	7966	Waiting		Yes								
2	DIA	7967	Waiting		Yes								
3	DIA	7968	Waiting		Yes								
4	DIA	7969	Waiting		Yes								
5	DIA	7970	Waiting		Yes								
6	DIA	7971	Waiting		Yes								
7	DIA	7973	Waiting		Yes								
8	DIA	7975	Waiting		Yes								
9	DIA	7976	Waiting		Yes								
10	UPD	7981	Waiting		Yes								
11	ENQ	7983	Waiting		Yes								
12	BGD	7985	Waiting		Yes								
13	BGD	7988	Waiting		Yes								
14	BGD	7989	Waiting		Yes								
15	SPO	7992	Waiting		Yes								
16	UP2	7996	Waiting		Yes								

SMT (1) 001 r905-03 INS

3. Log out of SAP Solution Manager and log in to SAP ERP using SAP GUI.
4. Verify the functionality of SAP ERP software.
5. Verify the functionality of SAP ERP software.

In this example, the DB13 transaction is being used by SAP ERP.

Jobs: DBA Planning Calendar

System: TST

Category: DBA Actions

Calendar ID:

August 2009

Week	Monday	Tuesday	Wednesday	Thursday	Friday
2009*36	August, 31	September, 01	September, 02	September, 03	September, 04
	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta
2009*37	September, 07	September, 08	September, 09	September, 10	September, 11
	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta
2009*38	September, 14	September, 15	September, 16	September, 17	September, 18
	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta
2009*39	September, 21	September, 22	September, 23	September, 24	September, 25
	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta	08:00:00 CheckDB 09:00:00 UpdateSta 17:00:00 CheckDB 18:00:00 UpdateSta

TST (1) 001 r905-06 INS

Conclusion

The white paper documents how to deploy, configure, validate and manage SAP systems in Oracle and Linux environments using the Hitachi Universal Storage Platform family. This solution allows companies deploying business applications using SAP to achieve superior performance, higher availability and high scalability, thus achieving higher return on investment and reducing total cost of ownership.

For more information about Hitachi products and solutions, see the [Hitachi Data Systems Web site](#), your sales representative or a channel partner.



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