Implementation Guide

By Dietmar Ebert, Hitachi Data Systems, and Hideki Nagasaki, Hitachi, Ltd.

January 15, 2015
Feedback

Hitachi Data Systems welcomes your feedback. Please share your thoughts by sending an email message to SolutionLab@hds.com. To assist the routing of this message, use the paper number in the subject and the title of this white paper in the text.
# Table of Contents

**Solution Components**

- Hardware Components.......................................................... 3
- Software Components........................................................ 6

**Solution Implementation**

- Obtain, Install, and Configure Hitachi Storage Adapter for SAP Landscape Virtualization Management........................ 8
- Configuring SAP Hosts.................................................................. 12
- System Provisioning....................................................................... 29
- SAP Landscape Virtualization Management Operations in Detail.......................................................... 35

**Additional Information**............................................................ 77
Hitachi Storage Adapter for SAP Landscape Virtualization Management 2.0

Implementation Guide

This describes the implementation of Hitachi Storage Adapter for SAP Landscape Virtualization Management with SAP Landscape Virtualization Management 2.0 within an IBM® AIX® or Hewlett-Packard UNIX (HP-UX) environment. Use it on any of these storage systems:

- Hitachi Virtual Storage Platform G1000
- Hitachi Unified Storage VM
- Hitachi Virtual Storage Platform

SAP Landscape Virtualization Management software is part of the virtualization and cloud management initiative from SAP. Use it to manage and provision existing SAP NetWeaver On-Premise systems in data centers and cloud infrastructures. The flexible and extensible architecture makes SAP Landscape Virtualization Management adaptable to meet your needs. Hitachi Data System uses this software to integrate with infrastructure technologies, such as storage based snapshots and full copies, to provide solutions focused on your needs.

Hitachi Storage Adapter for SAP Landscape Virtualization Management implements the interface for managing storage arrays. Integrate Hitachi storage solutions into SAP Landscape Virtualization Management to take advantage of the Hitachi benefits. It provides the following functions:

- Dynamically provision and de-provision LUNs on Hitachi storage
- Attach and detach LUNs from hosts that have been configured for access over Fibre Channel protocol

This paper is for you if you are a storage administrator or system administrator with a working knowledge of the following:

- Hitachi storage systems
- IBM AIX or HP-UX servers
- Fibre Channel protocol
- SAP software
Hitachi Storage Adapter also supports integrations with other platforms, such as Linux and Microsoft® Windows Server® operating systems. See the Hitachi Storage Adapter User Guide for details.

This guide does not replace existing documents from Hitachi Data Systems and SAP.

---

**Note** — These procedures were developed in a lab environment. Many things affect production environments beyond prediction or duplication in a lab environment. Follow recommended practice by conducting proof-of-concept testing for acceptable results before implementing this solution in your production environment. Test the implementation in a non-production, isolated test environment that otherwise matches your production environment.
Solution Components

These are the components needed to use Hitachi Storage Adapter for SAP Landscape Virtualization Management.

Hardware Components

Hitachi Storage Adapter for SAP Landscape Virtualization Management works with these storage systems:

- Hitachi Virtual Storage Platform G1000
- Hitachi Unified Storage VM
- Hitachi Virtual Storage Platform

Table 1 lists the server hardware and HBA that can be used for Hitachi Storage Adapter for SAP Landscape Virtualization Management. There are two server options for this environment:

- For IBM AIX, use a IBM Power Systems server.
- For HP-UX, use a Hewitt Packard Integrity server.

Table 1. Tested Deployment Hardware

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Quantity</th>
<th>Configuration</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>For IBM AIX option:</td>
<td>1</td>
<td>IBM Power 730 Express server</td>
<td>Server to virtualize the SAP source and target systems</td>
</tr>
<tr>
<td>IBM Power Systems™ server</td>
<td></td>
<td>1 × 4 Gb/sec LAN</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 GB RAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 × 8-core POWER7+™ processor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IBM PowerVM® hypervisor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 × 8 GB/sec 4-port Fibre Channel HBA</td>
<td></td>
</tr>
<tr>
<td>For HP-UX option:</td>
<td>1</td>
<td>Hewitt Packard Integrity rx2800 i2 server</td>
<td></td>
</tr>
<tr>
<td>Hewitt Packard Integrity server</td>
<td></td>
<td>Intel Itanium Processor 9320, 1.33 GHz, 4 cores</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 GB RAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 × 4 Gb/sec LAN</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 × 8 Gb/sec 2-port Fibre Channel HBA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP-UX vPar/Integrity virtual machine</td>
<td></td>
</tr>
</tbody>
</table>
Hitachi Virtual Storage Platform G1000

Hitachi Virtual Storage Platform G1000 provides an always-available, agile, and automated foundation that you need for a continuous infrastructure cloud. This delivers enterprise-ready software-defined storage, advanced global storage virtualization, and powerful storage.

Supporting always-on operations, Virtual Storage Platform G1000 includes self-service, non-disruptive migration and active-active storage clustering for zero recovery time objectives. Automate your operations with self-optimizing, policy-driven management.

Virtual Storage Platform G1000 supports Oracle RAC and VMware Metro Storage Cluster.

Hitachi Unified Storage VM

Hitachi Unified Storage VM is an entry-level enterprise storage platform. It combines storage virtualization services with unified block, file, and object data management. This versatile, scalable platform offers a storage virtualization system to provide central storage services to existing storage assets.

Unified management delivers end-to-end central storage management of all virtualized internal and external storage on Unified Storage VM. A unique, hardware-accelerated, object-based file system supports intelligent file tiering and migration, as well as virtual NAS functionality, without compromising performance or scalability.

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Quantity</th>
<th>Configuration</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi Compute Blade 2000 chassis</td>
<td>1</td>
<td>8-blade chassis</td>
<td>Server blade chassis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 management modules</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 cooling fan modules</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 × 1 Gb/sec LAN pass-through module per chassis</td>
<td></td>
</tr>
<tr>
<td>X57 A2 server blade from Hitachi</td>
<td>2</td>
<td>Microsoft Windows Server 2008 R2</td>
<td>1 server blade for SAP Landscape Virtualization Management 2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 × 10-core processors</td>
<td>1 server blade for storage controller software</td>
</tr>
<tr>
<td></td>
<td></td>
<td>128 GB RAM</td>
<td></td>
</tr>
<tr>
<td>Emulex HBA</td>
<td>2</td>
<td>8 GB/sec dual port Fibre Channel HBA</td>
<td>Host bus adapters for both X57 A2 server blades</td>
</tr>
</tbody>
</table>

Table 1. Tested Deployment Hardware (Continued)
The benefits of Unified Storage VM are the following:

- Enables the move to a new storage platform with less effort and cost when compared to the industry average
- Increases performance and lowers operating cost with automated data placement
- Supports scalable management for growing and complex storage environment while using fewer resources
- Achieves better power efficiency and with more storage capacity for more sustainable data centers
- Lowers operational risk and data loss exposure with data resilience solutions
- Consolidates management with end-to-end virtualization to prevent virtual server sprawl

**Hitachi Compute Blade 2000**

Hitachi Compute Blade 2000 is an enterprise-class blade server platform. It features the following:

- A balanced system architecture that eliminates bottlenecks in performance and throughput
- Configuration flexibility
- Sustainable power-saving capabilities
- Fast server failure recovery using a N+1 cold standby design that allows replacing failed servers within minutes
Software Components

Table 2 lists the software components used with Hitachi Storage Adapter for SAP Landscape Virtualization Management.

<table>
<thead>
<tr>
<th>Software</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP NetWeaver, Java Stack</td>
<td>7.3, SP07</td>
</tr>
<tr>
<td>SAP Landscape Virtualization Management</td>
<td>2.0, SP2 Patch 4</td>
</tr>
<tr>
<td>IBM option only: IBM AIX</td>
<td>7.1 and 6.1</td>
</tr>
<tr>
<td>HP-UX option only: HP-UX</td>
<td>11i v3 (Itanium only)</td>
</tr>
<tr>
<td>SAP ERP</td>
<td>6.0, SP11</td>
</tr>
<tr>
<td>Oracle</td>
<td>11g R2, Enterprise Edition</td>
</tr>
<tr>
<td>Hitachi Dynamic Link Manager Advanced</td>
<td>7.4.1</td>
</tr>
</tbody>
</table>

Hitachi Thin Image Snapshot

Hitachi Thin Image Snapshot creates rapid point-in-time copies. It stores only changed data blocks to maximize capacity utilization, and greatly improves write performance and minimizes impact on host service or application performance.

An essential component of data backup and protection solutions is the ability to quickly and easily copy data. Hitachi Thin Image snapshot provides logical, change-based, point-in-time data replication within Hitachi storage systems for immediate business use. Business usage can include data backup and rapid recovery operations, as well as decision support, information processing, and software testing and development.

Hitachi Copy-on-Write Snapshot

Hitachi Copy-on-Write Snapshot creates rapid point-in-time copies of any data volume within Hitachi storage systems without impacting application service or performance levels.

An essential component of data backup and protection solutions is the ability to copy data quickly. Hitachi Copy-on-Write Snapshot provides logical, change-based, point-in-time data replication within Hitachi storage systems. This use includes data backup and rapid recovery operations, as well as decision support, information processing, and software testing and development.
Hitachi ShadowImage Heterogeneous Replication

Hitachi ShadowImage Heterogeneous Replication is a storage-based solution that creates RAID-protected duplicate volumes within Hitachi storage. ShadowImage Heterogeneous Replication primary volumes (P-VOLs) contain the original data. Up to nine secondary volumes (S-VOLs) can be created as copies.

On Hitachi storage, ShadowImage Heterogeneous Replication is used to implement clones, which are full copies of the primary data. The clone is available to be used by secondary applications. The unique value of working with a clone is that any operation on the clone has no effect on the primary data.

Detailed information on using ShadowImage Heterogeneous Replication is in *Hitachi Command Control Interface User and Reference Guide* (MK-90RD7010).
Solution Implementation

Do the following procedures to implement Hitachi Storage Adapter for SAP Landscape Virtualization Management on your storage system.

The screen shots were taken in IBM AIX environment, unless otherwise noted.

Obtain, Install, and Configure Hitachi Storage Adapter for SAP Landscape Virtualization Management

This is how you obtain, install, and configure Hitachi Storage Adapter for SAP Landscape Virtualization Management on your system.

Obtain Hitachi Storage Adapter for SAP Landscape Virtualization Management

Obtain Hitachi Storage Adapter for SAP Landscape Virtualization Management from the Portal web page of Hitachi Data Systems at https://portal.HDS.com. You must register in advance before obtaining the software from this page.

To obtain the software, do the following:

1. Log on to the Portal.
2. Click the Support Portal tab.
4. From the Software list, click SAP Adapters and then click Search. The Portal searches for this software for you to download.
5. Click the Hitachi Storage Adapter for SAP LVM NetWeaver link.

Storage Adapter for SAP Landscape Virtualization Management is available as a CD image or a zip file. It contains the following components:

- Adapter License Terms in the eula folder
- Hitachi Storage Adapter for SAP NetWeaver® Landscape Virtualization Management User's Guide (MK-93SAP000-07) in the manual folder
- Software components in the **program** folder
  - Storage controller
  - Storage library for IBM AIX or HP-UX systems
  - Hitachi Storage Adapter for SAP Landscape Virtualization Management

There are separate folders for the software for use on (1) Hitachi Unified Storage 100 family and (2) Hitachi Virtual Storage Platform, Hitachi Unified Storage VM, and Hitachi Virtual Storage Platform G1000.

- **Hitachi Storage Adapter for SAP NetWeaver® Landscape Virtualization Management Release Notes** (RN-93SAP000-06 and later) in the `releasenote` folder

The download or distribution using CD of Storage Adapter for SAP Landscape Virtualization Management is subject to export control laws of the United States of America.

**Install and Configure the Hitachi Storage Adapter for SAP NetWeaver Components**

Follow the instructions in **Hitachi Storage Adapter for SAP NetWeaver® Landscape Virtualization Management User’s Guide** to do the following:

- Deploy Hitachi Storage Adapter for SAP Landscape Virtualization Management
- Install and configure the storage controller
- Install and configure the storage library for IBM AIX or HP-UX systems

**Enable Hitachi Storage Adapter for SAP Landscape Virtualization Management**

Perform the following steps to enable Hitachi Storage Adapter for SAP Landscape Virtualization Management.

These are the prerequisites to enable Storage Adapter for SAP Landscape Virtualization Management:

- The storage controller is up and running with all the storage arrays registered.
- Storage Adapter for SAP Landscape Virtualization Management is deployed successfully.
- The management server running SAP Landscape Virtualization Management has network connectivity to the storage controller.
To enable the configuration of Storage Adapter for SAP Landscape Virtualization Management, do the following.

1. Log on to SAP Landscape Virtualization Management.
2. Click **Infrastructure**.
3. Click the **Storage Managers** tab.
4. Click **Add**.
5. On **Storage Manager Types** (Figure 1), do the following:
   
   (1) On **Storage Manager Types**, select (highlight) the line with **Hitachi** for the vendor and **Hitachi Storage Adapter** for the product.

   (2) Click **Next**.

![Figure 1](image-url)
6. On **Storage Manager Properties** (Figure 2), do the following:

1. Type **Hitachi Storage Adapter** or other identifier in **Label**.
2. Type the **Controller URL** in **Value**.
   
   The format of the URL is the following:
   
   http://<hostname or IP address>:<port>
   
   **Note**: The IP address must be IPv4.
3. Leave the **Mandatory** check box selected.
4. To verify the configuration, click **Test Configuration**.
5. Click **Next**.

![Figure 2](image)

7. Save the configuration (Figure 3 on page 12).

1. On **Storage Systems**, click **Next**.
2. On **Summary**, click **Save**.
Before configuring the SAP hosts, you need to register the SAP systems and all the hosts you want to manage with SAP Landscape Virtualization Management. Although SAP Landscape Virtualization Management discovers existing SAP systems and hosts, you still need to configure the storage and network isolation settings manually.

Before starting, install the following on all SAP hosts:

- The SAP host agent
- The SAP adaptive extensions
- The storage library from Hitachi Data Systems

The SAP systems must be up and running so that the file system inventory of the storage library provides all the needed details for the configuration of the mount points.

The following sections describe specific settings:

- “Mount Points Configuration,” starting on page 13
- “Network Isolation,” starting on page 24

In the example shown below, the SAP system is a central system, having the central instance service and database service on a single host.
Mount Points Configuration

You must configure the mount points to do the following:

- “System Provisioning,” starting on page 29
- “Relocate a SAP System,” starting on page 37

Table 3 shows the details of a mount point configuration in SAP Landscape Virtualization Management.

Table 3. Mount Point Configuration Details

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Type</td>
<td>The storage type specifies how the file system is connected to the server. The possible types are the following:</td>
</tr>
<tr>
<td></td>
<td>- <strong>DFS</strong> (direct file system), running Fibre Channel or iSCSI protocol</td>
</tr>
<tr>
<td></td>
<td>- <strong>NFS</strong> (network file system), running the NFS protocol</td>
</tr>
<tr>
<td></td>
<td>- <strong>SR</strong> (storage resource), a legacy, file-based configuration</td>
</tr>
<tr>
<td></td>
<td>To enable Hitachi Storage Adapter for SAP Landscape Virtualization Management, you must use <strong>DFS</strong>.</td>
</tr>
<tr>
<td>Mount Point</td>
<td>The mount point specifies the directory to where the file system is being mounted.</td>
</tr>
<tr>
<td>Export Path</td>
<td>The export path characterizes the LUNs on the storage arrays. The storage array identification is its serial number in brackets, followed by a comma-separated list of LDEVs. If multiple storage arrays are in use, these are separated by a semi-colon, as follows:</td>
</tr>
<tr>
<td></td>
<td>[sn1]&lt;LDEV ID 1&gt;,…,&lt;LDEV ID n&gt;;&lt;sn2&gt;&lt;LDEV ID x&gt;,…,&lt;LDEV ID z&gt;</td>
</tr>
<tr>
<td></td>
<td>For example:</td>
</tr>
<tr>
<td></td>
<td>- Single LUN: [53101]00:2F:01</td>
</tr>
<tr>
<td></td>
<td>- Multiple LUNs: [53101]00:2F:03,00:2F:04,00:2F:05,00:2F:06,00:2F:07</td>
</tr>
<tr>
<td>Mount Options</td>
<td>The mount options contain detailed information on how to mount the file systems. If a volume manager is in use, which is the default on IBM AIX and HP-UX, the format is the following:</td>
</tr>
<tr>
<td></td>
<td>VG:&lt;volume group&gt;;LV:&lt;logical volume&gt;</td>
</tr>
<tr>
<td></td>
<td>For example:</td>
</tr>
<tr>
<td></td>
<td>- VG:MNMoragvg;LV:oracle</td>
</tr>
</tbody>
</table>
Table 3. Mount Point Configuration Details (Continued)

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS/SRID Type</td>
<td>This is the type of the file system, or the storage resource ID (SRID).</td>
</tr>
<tr>
<td></td>
<td>Select one of the file systems based on the operating system. These are the</td>
</tr>
<tr>
<td></td>
<td>supported system types.</td>
</tr>
<tr>
<td></td>
<td>▪ IBM AIX — jfs2</td>
</tr>
<tr>
<td></td>
<td>▪ HP-UX — JFS (vxfs)</td>
</tr>
<tr>
<td>Partner ID</td>
<td>The partner ID identifies which partner implementation to use. The partner ID for this integration is <strong>hit</strong>.</td>
</tr>
</tbody>
</table>

To enable the configuration of each mount point, do the following.

1. Log on to SAP Landscape Virtualization Management.

2. Click **Configuration** (Figure 4).

3. Click the **Systems** tab.

4. Click to expand the previously discovered SAP system to see the services (Figure 5 on page 14). In this example, MNM is the SAP system to be configured.
5. Mount each service in the SAP system, one at a time.

**Note:** Complete the automated configuration or the manual configuration for each service.

(1) Select the service. In this example, this is the service:

**System Database: MNM, Oracle, mannodemcs**

(2) On the **Instance Details** tab on the bottom half of the screen, click **Edit** (Figure 6 on page 16).
(3) To open Instance Properties, click **Next** (Figure 7).
(4) Select the **AC-Enabled** check box.

(5) Verify the settings under **Virtual Host Names and Networks**.

(6) Under Required Host Type, set the operating system in one of two ways:

- Manually select the check box of the operating system.
- Click **Retrieve From Host Agent**.

(7) To continue with the **Mount Points** screen, click **Next**.

For this system, continue with one of the following:

- “Automated Mount Points Configuration,” starting on page 17
- “Transfer Mount Configuration for System Provisioning,” starting on page 22

**Automated Mount Points Configuration**

If the file systems are attached to the server, you can use the storage library to discover the file systems and present the list of attached file systems. Figure 8 on page 18 shows a fully configured service with the proposed default values.
You have to configure all the services defined for this SAP system.

Repeat these steps for each service until you have configured all services.

To use the automated mount points configuration, do the following:

1. For **Timeout**, click **60 seconds**.
   
   On heavily loaded systems or systems having a large number of file systems attached, you might need to increase the timeout value.

2. For **Use HTTPS**, click **No**.

3. For **Host Agent Port**, use the default port, **1128**.
4. Click **Retrieve Mount List**.

   Clicking **Retrieve Mount List** returns all the attached file systems defined on the supported storage arrays. Remove file systems that are not relevant to this service. For example, remove the SAP instance directory `/usr/sap/<SID>` if you are configuring the database service.

5. To make sure that you have the correct ordering if you are using nested mount points, select all file systems and click **Sort**.

6. To keep your changes for this system, click **Save**.

*Manual Mount Points Configuration*

If the file systems are not attached to the server, or you want to configure the file systems manually, use this procedure.
To use the manual mount points configuration, do the following:

1. Click **Add** to create a new entry, using the values from Table 4.

Repeat this procedure for each related file system for this service.

This example shows you the configuration of the `/oracle` file system, defined on device `/dev/oracle` (logical volume `oracle`), part of Volume Group `MNMoravg` using `hdisk13`.

### Table 4. Columns and Their Values

<table>
<thead>
<tr>
<th>Column</th>
<th>Description and Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Type</td>
<td>DFS</td>
</tr>
<tr>
<td>Mount Point</td>
<td>/oracle</td>
</tr>
<tr>
<td>Export Path</td>
<td><strong>For IBM AIX:</strong></td>
</tr>
<tr>
<td></td>
<td>Use operating system commands (command line interface) to identify the serial number and LDEV ID. For example, type this at a command prompt</td>
</tr>
<tr>
<td></td>
<td>`# lscfg -vp -l hdisk13</td>
</tr>
<tr>
<td></td>
<td>This command returns something like the following, depending on the configuration of your system:</td>
</tr>
<tr>
<td></td>
<td><code>Serial Number............50 0CF6D</code></td>
</tr>
<tr>
<td></td>
<td><code>Device Specific.(Z1)........2F01 7B</code></td>
</tr>
<tr>
<td></td>
<td>To identify the serial number of the storage array and the LDEV ID, convert the information returned, as follows:</td>
</tr>
<tr>
<td></td>
<td>- <code>0CF6D</code> is the hexadecimal version of the (decimal) serial number 53101.</td>
</tr>
<tr>
<td></td>
<td>- <code>2F01</code> is the LDEV ID without presenting the leading zeroes. The LDEV ID which maps on the storage array is the following: <code>00:2F:01</code></td>
</tr>
<tr>
<td></td>
<td>- <code>7B</code> is the port configured in the host group.</td>
</tr>
<tr>
<td></td>
<td>Based on this example, the export path entry is the following: <code>[53101]00:2F:01</code></td>
</tr>
</tbody>
</table>
2. To keep your changes and continue with the next service, click **Save**.

<table>
<thead>
<tr>
<th>Column</th>
<th>Description and Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Path</td>
<td>For HP-UX: Use operating system commands (command line interface) to identify the serial number and LDEV ID. For example, type this at a command prompt</td>
</tr>
<tr>
<td></td>
<td><code># scsimgr inquiry -D /dev/rdisk/disk9 0x83</code></td>
</tr>
<tr>
<td></td>
<td>This command returns something like the following, depending on the configuration of your system:</td>
</tr>
<tr>
<td></td>
<td>Identifier: 48 49 54 41 43 48 49 20 &quot;HITACHI &quot;</td>
</tr>
<tr>
<td></td>
<td>35 30 32 30 30 34 42 &quot;5020004B&quot;</td>
</tr>
<tr>
<td></td>
<td>31 32 36 33                             '1263'</td>
</tr>
<tr>
<td></td>
<td>To identify the serial number of the storage array and the LDEV ID, convert the information returned, as follows:</td>
</tr>
<tr>
<td></td>
<td>- 5020004B represents the storage array model and the serial number.</td>
</tr>
<tr>
<td></td>
<td>- 50 is the fixed number.</td>
</tr>
<tr>
<td></td>
<td>- 2 represents storage model (in this case, HitachiUnified Storage VM).</td>
</tr>
<tr>
<td></td>
<td>- 0004B is the hexadecimal version of the (decimal) serial number 00075.</td>
</tr>
<tr>
<td></td>
<td>- 1263 is the LDEV ID without presenting the leading zeroes. The LDEV ID which maps on the storage array is the following: 00:12:63</td>
</tr>
<tr>
<td></td>
<td>Based on this example, the export path entry is the following: [200075]00:12:63</td>
</tr>
<tr>
<td>Mount Options</td>
<td>VG:MNMoragvg;LV:oracle</td>
</tr>
<tr>
<td>FS/SRID Type</td>
<td>For IBM AIX:</td>
</tr>
<tr>
<td></td>
<td>- jfs2</td>
</tr>
<tr>
<td></td>
<td>For HP-UX:</td>
</tr>
<tr>
<td></td>
<td>- vxfs</td>
</tr>
<tr>
<td>Partner ID</td>
<td>hit</td>
</tr>
</tbody>
</table>

Table 4. Columns and Their Values (Continued)
Transfer Mount Configuration for System Provisioning

Depending on the underlying database, the system provisioning operations require an additional file system to transfer the redo log files from the source system to target system. This file system is automatically mounted and un-mounted as part of the system provisioning process, on the source server and target server.

To configure an Oracle database, do the following.

1. Log on to SAP Landscape Virtualization Management.
2. Open the **Configuration** view.
3. Click the **Systems** tab.
4. Select the system running on the Oracle database (Figure 9).

---

**Figure 9**
5. If you have SAN-based file systems without a NFS server, such as Hitachi NAS Platform, do the following to edit the selected system.

   (1) On the Systems Detail tab, click Edit.

   (2) To open the Provisioning & RFC screen, click Next. Then, scroll down to the Transfer Mount Configuration for System Provisioning area.

   (3) For Usage Type, click Oracle Redo Logs for Online Clone.

   (4) Use “Automated Mount Points Configuration” on page 17 or “Manual Mount Points Configuration” on page 19 to configure the mount points.

   The configuration should look like Figure 10 when finished.

6. If you have an NFS server, such as Hitachi NAS Platform, do the following to configure the NFS server to store the redo log files.

   (1) For Storage Type, click NETFS.

   (2) For Export Path, enter the remote server and the file system. An example is the following: nfsserver:/transfer/MNM

   (3) For Mount Options, type the NFS mount options. An example is the following:

       rsize=32768, wsize=32768, rw, hard

       You cannot change FS/SRID Type and Partner ID.

7. To save the changes, scroll up and click Save.
Network Isolation

SAP Landscape Virtualization Management uses network isolation with operating system firewall rules to isolate the target system from its source system by blocking outgoing TCP connections.

The storage library on each host needs to communicate with Hitachi Storage Adapter for SAP Landscape Virtualization Management. Do either of the following to allow this outgoing connection:

- Allow this outgoing connection globally for all the systems and services.
- Allow this outgoing connection separately for each system and its services.

Alternatively, you can also specify the network isolation settings for each operation manually.

Identify Host Name and Port

To configure the settings, you need the IP address (or its host name) of Hitachi Storage Adapter for SAP Landscape Virtualization Management that was configured while installing the storage library. You find the IP address as $ControllerIP$ and the port as $ControllerPort$ in the configuration file HitachiStorageController.conf installed in /usr/sap/hostctrl/exe on the corresponding host.

Figure 11 shows the content of the HitachiStorageController.conf file.
**Global Network Isolation Settings**

The global network isolation settings are valid for all the systems and their services managed by this SAP Landscape Virtualization Management instance. You cannot change these settings in the per system configuration nor in the network isolation step of the operation itself.

To set the global network isolation settings, do the following:

1. Log on to SAP Landscape Virtualization Management.
2. Open the **Setup** view.
3. Click the **Settings** tab.
4. Verify that the **Expert Mode** on the right side is available.
5. Click the **Monitoring** tab and click **Edit**.
6. In the **Valid Host Names for Outgoing Connections** text box (Figure 12), type the IP address or the host name of Hitachi Storage Adapter for SAP Landscape Virtualization Management from Network Isolation. Separate multiple entries by a semicolon.

![Figure 12](image)

7. To keep the changes, click **Save**.

**System-Specific Network Isolation Settings**

In contrast to the global network isolation settings, system-specific settings are only valid for the specific system and its services. This allows you to increase security if you have more than one instance of Hitachi Storage Adapter for SAP Landscape Virtualization Management in use.

The system specific network isolation settings complete the global network isolation settings. You cannot overwrite them in the network isolation step of the operation.
To set the system-specific network isolation settings, do the following.

1. Log on to SAP Landscape Virtualization Management.
2. Open the **Configuration** view.
3. Select (highlight) the system you want to configure.
4. Click **Edit**, and then click **Next**. Proceed to **Network Isolation** (Figure 13).

![Figure 13](image)

5. To create a new outgoing connection, do the following (Figure 14 on page 28):

   You can specify **Host Name**, **Target Port**, or both.

   (1) Click **Add**.

   (2) Enter **Host Name**, **Target Port**, or both in the text box for the connection.

   (3) Click **Rule Type** from the list.
To save the changes, click **Apply**. Continue with configuring the system provisioning operation.
System Provisioning

From the storage perspective, SAP Landscape Virtualization Management system provisioning is the same for system clone, system copy, and system refresh operations. The differences are that each of the operations needs additional or slightly different configurations and have different workflows.

- **System Clone**
  
The simplest provisioning operation is system clone. This takes the minimum number of configuration settings. It has the least complex workflow.

- **System Copy**
  
The system copy operation extends the system clone operation by requesting the following additional configuration settings:
  - New SAP system ID
  - System number
  - SAP application user and groups
  - Database user and groups

  You also provide the external tools. You need this for renaming the SAP instance as well as the database.

  Most importantly, the source systems need to be prepared to run the Post Copy Automation task list. The workflow is extended to call and manage the external tools as well as to communicate with the target system to start and supervise the Post Copy Automation task list.

- **System Refresh**
  
  From a configuration point of view, the system refresh operation is more complex than the system clone, but is less complex than a system copy.

  Some of the parameters are known already:
  - The SAP system ID
  - SAP system number
  - The SAP application
  - Database users and groups

  The workflow extends upon the system copy workflow by Post Copy Automation by first exporting a defined set of customization data from the original target system to an export file.

  SAP Landscape Virtualization Management then triggers a complete database and system copy, which provides a new target system containing current business and application data.
After providing the new target system, Post Copy Automation then imports the customization data from the export file it created into the new target system.

Figure 15 illustrates the different workflows for each system provisioning operation.

**Figure 15**

The configuration steps, which are important for Hitachi Storage Adapter integration in all system-provisioning operations, are in the following:

- “Storage Provisioning,” starting on page 31
- “Isolation Configuration,” starting on page 33
Storage Provisioning

This covers the following:

- Database consistency, handled by SAP Landscape Virtualization Management
- Selection of the storage pools for the target LUNs

This screen allows you to have two views on the storage details. The one and only difference is that you will see additional information from the source system, like source storage pool and source LUN, if you enable **Show Source Data**.

The **Mount Data** tab has all the defined file systems for this volume. If a volume group is built across multiple LUNs, you see the same file system information for each LUN.

The **Storage Details** tab (Figure 16) has information about the storage system, the storage pool, and volume.

![Figure 16](image)

To configure the storage provisioning, do the following for each volume.

1. To specify a target storage pool, click the **Storage Pool** cell.
   
   A button () appears on the right side of the cell (Figure 17 on page 32).
2. Click the button on the cell.

A list of parity groups, dynamic provisioning pools, and Hitachi Copy-on-Write Snapshot Pools displays (Figure 18).

3. Consult your storage administrator to determine which pools meet your requirements and are available to run the SAP system.
4. Specify the pool for your application, as determined with your storage administrator one of these ways:

- Click the pool. Then, the Select Storage Pool dialog box closes, returning you to the Storage Volume window. The pool name is in the Storage Pool cell.

- Click the check box on the row and then click Go.

   Alternatively, you can type or paste the storage pool into the cell from an already selected pool.

The selection of a dynamic provisioning pool or a parity group causes a full copy using Hitachi ShadowImage In-System Replication software bundle. The Full Clone flag does not apply in this case.

If selecting a snapshot pool, either a snapshot (the Full Clone check box not selected) or a full clone (the Full Clone check box selected) will be created.

Isolation Configuration

As discussed in “Network Isolation,” starting on page 24, you need to allow network connectivity between the storage library and Hitachi Storage Adapter for SAP Landscape Virtualization Management.

---

**Note**—Only do this isolation configuration if you did not configure the network isolation with “Global Network Isolation Settings” on page 25 and “System-Specific Network Isolation Settings” on page 26.

---

To configure the network isolation for each operation, do the following.

1. Go to the Isolation step (Figure 19 on page 34).
2. To add a new outgoing connection, click **Add**.

You can add a connection by specifying a host name, port name, or a combination of both.

3. In the **Rule Type** column, click the cell to open the list, and then click **Host**, **Port**, or **Host & Port** (Figure 20 on page 35).
4. Type the **Target Host Name** and/or **Target Port**, based on what you clicked for **Rule Type**.

5. To save the changes, click **Apply**, and then continue with configuring the system provisioning operation.

SAP Landscape Virtualization Management Operations in Detail

This discusses the various Landscape Virtualization Management operations.

You must have the SAP systems installed and adaptive-computing enabled.

Hitachi storage resource integration implements the following basic storage workflows:

- Prepare storage resources, including operating system
  - Map LUNs to the host group associated with the server
  - Attach LUNs to the server
  - If volume groups are in use, import and activate the volume groups
  - Mount the file systems
Unprepare storage resources including operating system
- Unmount the file systems
- If volume groups are in use, deactivate and export the volume groups
- Detach the LUNs from the server
- Un-map the LUNs from the host group associated with the server

Provision and de-provision storage resources using in-system replication technologies
- Copy-on-Write Snapshot
- Shadow Image

Start a SAP System
If you start an SAP system (with operation Mass Start, including prepare if possible), which is not yet prepared, Hitachi Storage Adapter for SAP Landscape Virtualization Management prepares the infrastructure. This includes the following steps:
- The LUNs are mapped to the host group associated with the server
- The LUNs are attached to the server
- The volume groups, if in use, are imported and activated
- The file systems are mounted

Figure 21 illustrates the start of an SAP system.
Stop a SAP System

If you stop an SAP system (with operation *Mass Stop*, include unprepare if possible), SAP Landscape Virtualization Management first stops the SAP application. After that, Hitachi Storage Adapter for SAP Landscape Virtualization Management cleans up the infrastructure, which means the following:

- The file systems are unmounted
- The volume groups, if in use, are deactivated and exported by deleting the volume group configuration
- The LUNs are detached from the server
- The LUNs are un-mapped from the host group associated with the server

Figure 22 illustrates the stopping of an SAP system.

![Figure 22](image)

Relocate a SAP System

You can relocate SAP systems across your hosts. Reasons for that can be the following:

- Free a server for maintenance
- Run an SAP system on a more powerful or less powerful server

Relocating an SAP system (Figure 23 on page 38) involves Hitachi Storage Adapter for SAP Landscape Virtualization Management in unpreparing the source host, and preparing the target host. This is a Mass Stop (include unprepare if possible) on the source host, followed by a Mass Start (include prepare if possible) on the target host.
Create a System Clone of a SAP System

A system clone operation creates an exact copy of the source system at a specific point in time. After the clone operation finishes successfully, you are running two SAP systems with the same SID and system number. The operating system firewall isolates the target system, having a very limited number of allowed outgoing connections.

System clones are used mainly for quickly creating isolated testing, demo, or training systems.

Figure 24 on page 39 illustrates the clone process. The LUNs of the source system are replicated and the SAP system with the same SID is started on the target system.
As a prerequisite, make sure that the users and groups for the SAP application and database exist with the same user ID and group ID on the target server.
To create a clone of an SAP system, do the following.

1. Start the cloning process.
   (1) Open the **Provisioning** view.
   (2) On the **System and AS Provisioning** tab, select the source system you want to clone (Figure 25).

![Figure 25](image)

(3) To start the system clone process, click **Clone System**.
2. Edit the **Basic** screen.

   (1) On the **Basic** screen (Figure 26), do the following:
   
   - Click the target from **Pool**.
   - Type the **Short Name**.
   - Type a **Description** of the pool.

![Figure 26](image)

(2) To continue, click **Next**.
3. Edit the **Hosts** screen.

Specify the host for each service.

---

**Note** — You cannot spread a central system SAP installation across multiple hosts. For a central system, you must use the same host for all the services of the SAP system.

---

(1) On the **Hosts** screen (Figure 27), do the following:

- For **Host Type**, click **Use Existing Host**.

  If you have installed IBM Virtualization Manager and components, you may click **Provision New System** instead of **Use Existing Host**. Follow the IBM guidelines for virtualization.

---

![Figure 27](image-url)
For **Target Host**, click the cell and then click the button ( ) on the right side of the cell. Click the button to open the **Advanced Host Selection** dialog box (Figure 28). Click the host on the **Advanced Host Selection** dialog box. The dialog box closes.

Figure 28

(2) To continue, click **Next**.

4. Edit the **Host Names** screen.

   (1) On the Host Names screen (Figure 29 on page 44), provide a host name and network details for each host. This includes the IP address, network, instance, and host name usage.

   - If SAP Landscape Virtualization Management is allowed to modify DNS entries, to provide a host name and network details, select the **Auto IP Address** check box.
Figure 29

(2) To continue, click **Next**.

5. Edit the **Storage** screen.

   (1) On the **Storage** screen, select the storage pool for the target system. See “Isolation Configuration,” starting on page 33, for the configuration details.

   (2) To continue, click **Next**.

6. Edit the **Consistency** screen.

   (1) On the **Consistency** screen (Figure 30 on page 45), click the option for online or offline.
   
   - To read the description of each option, click the information (“i”) button.

   (2) To continue, click **Next**.
7. Verify information on the **Isolation** page.

   (1) Verify that you have an outgoing connection to Hitachi Storage Adapter for SAP Landscape Virtualization Management.
      - If this is not configured globally or on the SAP system level, as described in Network Isolation, then refer to Isolation Configuration for configuration details.

   (2) To proceed, click **Next**.

8. Verify the settings on the **Summary** page.

   (1) Review your settings (Figure 31 on page 46).
      - If you need to change settings on a previous screen, then you will lose your settings on each screen following the one where you made the change.
(2) To start the system clone operation, click **Start System Cloning**.

The system redirects you to the **Summary** area on the **Activities** tab of the **Monitoring** view (Figure 32 on page 47).
Create a System Copy of a SAP System

A system copy operation creates an independent SAP system with its own characteristic, which can be included as a regular system in the SAP transport landscape. The SID differs from the source system, and the system number can be changed. As a result, you have different users and groups on the target system.

A system copy operation is an extended system clone operation. During the configuration phase, there are modified and additional screens for retrieving system copy-related information.
A system copy is used frequently to create new quality assurance or test systems.

Figure 33 illustrates the system copy process. A difference to the operation described in “Create a System Clone of a SAP System,” starting on page 38, is that the SID changes from SAP to QAS in this example.

Figure 33

To create a copy of an SAP system, do the following.

1. Start the copy process.
   
   (1) Open the **Provisioning** view.

   (2) On the **System and AS Provisioning** tab, select the source system you want to copy (Figure 34 on page 49).
(3) To start the system copy process, click **Copy System**.

2. Edit the Basic screen.

   (1) On the **Basic** screen (Figure 35 on page 50), do the following:

   - Type a unique SID.
   - Click the target for **Pool**.
   - Type a password in **Master Password** and **Confirm Master Password**.
   - Type a **Description**.
Figure 35

(2) To continue, click Next.

3. Edit the Hosts screen.

Specify the host for each service.

(1) On the Host Selection of Target System screen (Figure 36 on page 51), do the following:

- Click Use Existing Host from the Host Type list.

If you have IBM Virtualization Manager and components in place, you can click Provision of New Host instead of Use Existing Host. In this case, follow the IBM guidelines for the virtualization part.
For **Target Host**, click the cell and then click the button ( ) on the right side of the cell. Click the button to open the **Advanced Host Selection** dialog box (Figure 37 on page 51). Click the host on the **Advanced Host Selection** dialog box. The dialog box closes.

(2) To continue, click **Next**.
4. Edit the **Host Names** screen.

   (1) On the Virtual Host Names and Networks screen (Figure 38), provide a host name and network details for each host. This includes the IP address, network, instance, and host name usage.

   - If SAP Landscape Virtualization Management is allowed to modify DNS entries, to provide a host name and network details, select the **Auto IP Address** check box.

![Figure 38](image)

Figure 38

(2) To continue, click **Next**.

5. Edit the **Instance Number** screen.

   (1) Verify the default settings (which are the same as on the source system), changing if necessary (Figure 39 on page 53).
6. Edit the **Storage** screen.

   (1) You can select the storage pool for the target system. Refer to “Storage Provisioning,” starting on page 31, for the configuration details.

   (2) To continue, click **Next**.

7. Edit the **Consistency** screen.

   ▪ To continue, click **Next**.

8. Edit the **Users** screen.

   (1) Accept or modify the values on the **Users** screen (Figure 40 on page 54).
(2) To confirm details, click **Show Details**.

(3) To continue, click **Next**.

9. Edit the **Rename** screen.

The **Release Configuration** screen should be pre-selected, with values for all options.

(1) If you have multiple release configurations, choose the correct one. For password, use the **Master Password** entered on the **Basic** screen for **Master Password** on the **Users** screen (Figure 41 on page 55).
Figure 41

(2) To make sure all the requirements are met, click **Execute Prerequisite Checker**.

(3) To continue, click **Next**.

10. Edit the **Isolation Screen**.

   (1) Verify that you have an outgoing connection to Hitachi Storage Controller.

   - If this is not configured globally or on the SAP system level, as described in Network Isolation, then refer to Isolation Configuration for configuration details.

   (2) To continue, click **Next**.

11. Edit the **ABAP PCA** screen.

   As a prerequisite, you must configure the RFC connectivity for this system. In this example, client 000 is configured to run the PCA task lists.

   By default, the task list `SAP_BASIS_COPY_INITIAL_CONFIG` is selected (Figure 42 on page 56).

   (1) Modify existing task lists or add new tasks lists based on your needs.
(2) To continue, click **Next**.

12. Review and edit the **Summary** screen.

(1) Review your settings (Figure 43 on page 56).

- If you need to change settings on a previous screen, then you will lose your settings on each screen following the one where you made the change.

(2) To start the system copy operation, click **Start System Copy**.

The system automatically directs you to the **Summary** area of the **Activities** tab in the **Monitoring** view (Figure 44 on page 57).
Figure 44

Refresh a SAP System

A system refresh operation is a follow-up activity of a system copy operation. Refreshing a system results in the following:

1. Post Copy Automation exports a defined set of customization data from the original target system to a file.

2. SAP Landscape Virtualization Management triggers a complete database or system copy, which provides a new target system containing current business and application data.

3. Post Copy Automation imports the customization data from the export file that was created in the previous step into the new target system.

As a result, you work with the most current data replicated from the source system without the need to re-customize the target.

System refreshes are done only on a previously copied system to update that system with the latest business data.
Figure 45 illustrates the system refresh process.
To refresh a SAP system, do the following.

1. Start the refresh process.
   
   (1) Open the **Provisioning** view.

   (2) In the **System and AS Provisioning** tab, select the source system you want to refresh (Figure 46). You can only refresh previously-copied SAP systems.

   ![Figure 46](image.jpg)

   (3) To start the system refresh process, click **Refresh System**.
2. Edit the **Basic** screen.

   (1) Do the following on the **Basic** screen (Figure 47):
   
   - Select the **Export already exists** check box if the export already exists.
   - Type the location where to save the export in **Export to directory**.
   - Type the master password in **Password** and **Confirm Password**.

![Figure 47](image)

(2) To continue, click **Next**.

3. Edit the **Hosts** screen.

   (1) On the **Host Selection of Target System** screen (Figure 48 on page 61), do the following:
   
   - Click **Use Existing Host** from the **Host Type** list.

   If you have IBM Virtualization Manager and components in place, you can click **Provision of New Host** instead of **Use Existing Host**. In this case, follow the IBM guidelines for the virtualization part.
For **Target Host**, click the cell and then click the button ( ) on the right side of the cell. Click the button to open the **Advanced Host Selection** dialog box (Figure 49 on page 61). Click the host on the **Advanced Host Selection** dialog box. The dialog box closes.

(2) To continue, click **Next**.
4. Edit the **Host Names** screen.

   (1) Review the settings on this screen (Figure 50).

![Figure 50](image)

(2) To continue, click **Next**.

5. Edit the **Storage** screen.

   (1) Select the storage pool for the target system. Refer to “Storage Provisioning,” starting on page 31, for the configuration details.
Figure 51

(2) To continue, click **Next** and then click **Next** again.

Do not edit the **Consistency** screen.

6. Edit the **Users** screen.

   All information on the **Users** screen is fixed, except **Password**. You entered the password on the **Basic** screen.

   (1) Accept or modify the passwords (Figure 52 on page 64).
7. Edit the Rename screen.

The release configuration should be pre-selected.

(1) If you have multiple release configurations, choose the appropriate one (Figure 53 on page 65).

Figure 52

(2) To confirm details, click Show Details.

(3) To continue, click Next.
(2) To verify all requirements are met, click **Execute Prerequisite Checker**.

(3) To continue, click **Next**.

8. Edit the **Isolation** screen.

   (1) Verify that you have an outgoing connection to Hitachi Storage Adapter for SAP Landscape Virtualization Management (Figure 54 on page 66).

   - If this is not configured globally or on the SAP system level, as described in “Network Isolation,” starting on page 24, then refer to “Isolation Configuration,” starting on page 33, for configuration details.
9. Edit the ABAP PCA screen.

Before starting, you must configure the RFC connectivity for this system. In this example, client 000 is configured to run PCA task lists.

(1) Accept or modify the task lists you need (Figure 55 on page 66).

- By default, the task list `SAP_BASIS_COPY_REFRESH` is selected.

10. To continue, click Next.
11. Edit the **Delete Storage Volume** screen.

   (1) Select the volume you want to delete. This volume contains old system data from before the refresh.

![Image of Delete Storage Volume screen]

**Figure 56**

12. Click **Next** to proceed to the **Summary** page (Figure 57 on page 68).

13. Edit the **Summary** screen.

   (1) Review your settings (Figure 57).

   - If you need to change the settings on a previous screen, you will lose your settings on all following screens.
(2) To start the system refresh operation, click **Start System Refresh**.

The system redirects you to the **Summary** area of the **Activities** tab on the **Monitoring** view (Figure 58 on page 69).
Figure 58

Stop a SAP System

You must stop a SAP system before destroying a SAP system.

To stop a SAP system, do the following.

1. Open the **Operations** view.

2. Select the SAP system you want to stop (Figure 59 on page 70).
3. On the **Mass Operations** tab, under **Operation**, click **Mass Stop** (including unprepared if possible) in the **Operation** list (Figure 60).
4. Click **Execute** (Figure 60).
   - To confirm the operation status, click **Monitoring** (Figure 61).

![SAP Landscape Virtualization Management](image)

**Figure 61**

**Destroy a SAP System**

Before you destroy the SAP system, verify that you have shut down the system and unprepared the system. Otherwise, the system destroy operation will not work.

The system destroy operation cleans up the following:

- The storage array by destroying the LUNs
- The DNS by removing the host name record
- SAP Landscape Virtualization Management by removing the configuration of the services

Figure 62 on page 72 illustrates the situation after a System Destroy operation of the SAP system on the right.
To destroy a SAP system, do the following.

1. Open the **Provisioning** view

2. Select the SAP system you want to destroy (Figure 63 on page 73).
3. To start the destroy system process, click **Destroy System**.

A list of storage arrays and LUNs display. By default, all the LUNs are selected for destroying.

4. Uncheck (clear) the check boxes for the LUNs you want to keep (Figure 64 on page 74).
5. To continue, click **Next**.

6. Decide whether to delete the DNS entry or entries (Figure 65 on page 75).
   - If you want to delete a DNS entry, keep the DNS entry selected.
   - If you want to keep a DNS entry, clear (uncheck) the DNS entry selection.
7. To continue, click **Next**.

8. Review your settings and then click **Start System Destroy** (Figure 66).

![Figure 65](image)

The system directs you to the **Summary** area of the **Activities** tab on the **Monitoring** view (Figure 67 on page 76).

![Figure 66](image)
Figure 67
Additional Information

These are the resources for this document, as well as additional sources of information.

Hitachi Data System Documentation
The following information is from Hitachi Data Systems:

- Hitachi Storage Adapter User Guide (provided with Hitachi Storage Adapter)
- Hitachi Virtual Storage Platform G1000
- Hitachi Virtual Storage Platform
- Hitachi Unified Storage VM
- Hitachi Dynamic Link Manager Advanced

SAP Documentation and SAP Notes
The following information about SAP Landscape Virtualization Management is from SAP:

- SAP Help Portal (SAP Landscape Virtualization Management 2.0, Enterprise Edition)
- SAP Note 1783702 - SAP Landscape Virtualization Management 2.0 (requires SAP log on credentials)
- SAP Note 1709155 - System Provisioning with Landscape Virtualization Management 2.0 (requires SAP log on credentials)
- SAP Landscape Virtualization Management - Information by Topic Areas
- SAP Landscape Virtualization Management at a Glance
- SAP Landscape Virtualization Management FAQ
- SAP Community Network - Virtualization and Cloud Infrastructure

IBM Documentation and SAP Notes
The following information is about IBM servers is from IBM and SAP:

- IBM Power Systems
- IBM AIX, Unix on Power Systems and System p
- Note 1728222 - Configuration of IBM Systems Director VMControl for SAP LVM (requires SAP log on credentials)
- Note 1728293 - Configuration of IBM Power HMC for SAP LVM (requires SAP log on credentials)
Hewitt Packard Documentation and SAP Notes
The following information is about Hewitt Packard servers is from Hewitt Packard and SAP:

- Hewitt Packard Integrity Servers
- HP-UX, Mission-Critical UNIX Operating System
For More Information

Hitachi Data Systems Global Services offers experienced storage consultants, proven methodologies and a comprehensive services portfolio to assist you in implementing Hitachi products and solutions in your environment. For more information, see the Hitachi Data Systems Global Services website.

Live and recorded product demonstrations are available for many Hitachi products. To schedule a live demonstration, contact a sales representative. To view a recorded demonstration, see the Hitachi Data Systems Corporate Resources website. Click the Product Demos tab for a list of available recorded demonstrations.

Hitachi Data Systems Academy provides best-in-class training on Hitachi products, technology, solutions and certifications. Hitachi Data Systems Academy delivers on-demand web-based training (WBT), classroom-based instructor-led training (ILT) and virtual instructor-led training (vILT) courses. For more information, see the Hitachi Data Systems Services Education website.

For more information about Hitachi products and services, contact your sales representative or channel partner or visit the Hitachi Data Systems website.