Hitachi Storage Adapter for SAP Landscape Virtualization Management 2.0

Best Practices Guide

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

January 16, 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 Overview........................................................................................................3

Key Solution Components..........................................................................................7
   Hardware Components..........................................................................................7
   Software Components.........................................................................................9

Solution Design.........................................................................................................11
   Hitachi Compute Blade 500 Configuration.........................................................13
   Hitachi Virtual Storage Platform G1000 Configuration......................................15
   Storage Area Network Architecture..................................................................21
   Network Architecture.........................................................................................26
   Management Architecture....................................................................................31

Engineering Validation..............................................................................................40
Hitachi Storage Adapter for SAP Landscape Virtualization Management 2.0

Best Practices Guide

This describes best practices when using Hitachi Storage Adapter for SAP Landscape Virtualization Management with SAP Landscape Virtualization Management 2.0 within an IBM® AIX® or Hewitt 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 best practices 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 with 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><strong>For IBM AIX option:</strong></td>
<td>1</td>
<td>- IBM Power 730 Express server</td>
<td>Server to virtualize the SAP</td>
</tr>
<tr>
<td>IBM Power Systems™ server</td>
<td></td>
<td>- 1 × 4 Gb/sec LAN</td>
<td>source and target systems</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><strong>For HP-UX option:</strong></td>
<td>1</td>
<td>- Hewitt Packard Integrity rx2800 i2 server</td>
<td></td>
</tr>
<tr>
<td>Hewitt Packard Integrity</td>
<td></td>
<td>- Intel Itanium Processor 9320, 1.33 GHz, 4 cores</td>
<td></td>
</tr>
<tr>
<td>server</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, 2 management modules, 8 cooling fan modules, 1 × 1 Gb/sec LAN pass-through module per chassis</td>
<td>Server blade chassis</td>
</tr>
<tr>
<td>X57 A2 server blade from Hitachi</td>
<td>2</td>
<td>Microsoft Windows Server 2008 R2, 2 × 10-core processors, 128 GB RAM</td>
<td>1 server blade for SAP Landscape Virtualization Management 2.0, 1 server blade for storage controller software</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><strong>IBM option only:</strong> IBM AIX</td>
<td>7.1 and 6.1</td>
</tr>
<tr>
<td><strong>HP-UX option only:</strong> 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 Architecture

Figure 1 provides an overview of SAP Landscape Virtualization Management, showing all the interfaces that help to do the following:

- Cut costs due to standardizing and automating technical operations
- Save hardware resources and power by using computing resources effectively in virtualized environments
- Respond dynamically to changing business needs
- Maintain high service levels with lower budgets

![Diagram of SAP Landscape Virtualization Management](image)

**Figure 1**

Hitachi Storage Adapter for SAP Landscape Virtualization Management on your storage system supports the Storage Connect interface to manage the underlying Hitachi storage. Use this interface in the following scenarios:

- Relocation of SAP and database instances
- System clone
- System copy
- System refresh

This solution consists of the following components:

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

This is the interface between SAP Landscape Virtualization Management and storage controller. Deploy it on the SAP Landscape Virtualization Management system or systems.
■ **Storage Controller**

The storage controller controls all storage related tasks, such as the following on the storage system:

- Provision
- De-provision
- Replicate
- Map and un-map LUNs

Install storage controller on a server running Microsoft Windows Server with network connectivity to the following:

- SAP-managed hosts
- The SAP Landscape Virtualization Management server

Storage controller requires at least one Fibre Channel or local area network connection to the storage array. This provides access to the storage system command device.

The storage controller abstracts the underlying storage system, providing a unique interface to Hitachi Storage Adapter for SAP Landscape Virtualization Management and storage library.
### Storage Library

The platform-dependent storage library from Hitachi integrates into the SAP host agent. It connects and disconnects the requested LUNs from hosts managed by SAP Landscape Virtualization Management.

The storage library supports mounting and unmounting file systems sitting either directly on LUNs or on logical volumes.

The storage library provides an inventory of file systems, attached LUNs and operating system properties that are required by SAP Landscape Virtualization Management. Install the storage library on every managed host within the SAP Landscape managed by SAP Landscape Virtualization Management where Hitachi storage operations are required.

Figure 2 shows the high level integration of the Hitachi Storage Adapter and SAP Landscape Virtualization Management and call structure between the components.
A possible integration scenario is shown in Figure 3. This SAP system landscape consists of a development, quality assurance, and production system. Additionally there are two spare hosts available as a target for system copy or as a relocation target for system maintenance purposes. SAP Landscape Virtualization Management has network connectivity to all of the hosts as well as to the storage controller.
Best Practices

These are best practices for using Hitachi Storage Adapter for SAP Landscape Virtualization Management within an IBM AIX or HP-UX environment.

Host Group Security

To protect mission-critical data in your storage system from unauthorized access, apply security policies to logical volumes. LUN manager lets you enable LUN security on ports to safeguard LUs from illegal access.

If LUN security is enabled, host groups affect which host can access which LUs. Hosts can only access LUs associated with the host group to which the hosts belong. The hosts cannot access LUs associated with the other host groups. For example, hosts in the "aix" host group cannot access LUs associated with the "windows" host group.

Atomic Storage Provisioning

The LUNs are provisioned in an atomic way. If a creation of one of the requested LUNs fails, or one of the local replication tasks finishes unsuccessfully, all the activities done so far on the storage system will be rolled back. In such a case, there are no additional clean-up activities necessary.

IBM AIX Logical Volume Manager Support

Hitachi Storage Adapter for SAP Landscape Virtualization Management supports the IBM AIX Logical Volume Manager with the following restrictions:

- The only supported file system is jfs2.
- The log device must be defined on a logical volume of type jfs2log.
  - Inline log devices are not supported.
- The volume group must only contain file systems configured for the SAP services. A file system that is not configured, but mounted, blocks SAP Landscape Virtualization Management operations. For example, the unprepare task will not de-configure the volume groups, remove, and un-map the devices.

In the supported scenario, a volume group can contain multiple logical volumes and/or multiple physical volumes. One of these logical volumes has to be of type jfs2log and used as outline log device. Each logical volume contains one file system, which is used in the mount point configuration of the SAP service. Multiple volume groups can be used to present a storage layout to the SAP system.
Figure 4 shows a possible storage layout for an SAP ERP 6.0 installation running on an Oracle database.

The volume group can either be created in one of the following ways:

- On one single LUN on a parity group or dynamic provisioning pool
- Across multiple LUNs on a parity group or dynamic provisioning pool
- Across multiple LUNs defined in multiple parity groups or dynamic provisioning pools
Hitachi Storage Adapter for SAP Landscape Virtualization Management supports the HP-UX Logical Volume Manager with the following restrictions:

- Minimum requirement version is Logical Volume Manager 2.
- The only supported file system is JFS (VxFS).
- VxFS requires a single log per file system. The log is written on the same logical volume as the file system.
- The volume group must only contain file systems configured for the SAP services. A file system that is not configured, but mounted, blocks Landscape Virtualization Management operations. For example, the unprepare task will not de-configure the volume groups, remove, and un-map the devices.

In the supported scenario, a volume group can contain multiple logical volumes and/or multiple physical volumes. Each logical volume contains one file system, which is used in the mount point configuration of the SAP service. Multiple volume groups can be used to present a storage layout to the SAP system.
Limitations of Hitachi Storage Adapter for SAP Landscape Virtualization Management

Hitachi Storage Adapter for SAP Landscape Virtualization Management has the following limitations:

- All the components for the SAP system (SAP application software, database software, and all database related files) must reside on supported Hitachi Storage.
- The Hitachi Storage Adapter v2.2 supports Hitachi Unified Storage VM, Hitachi Virtual Storage Platform and Hitachi Virtual Storage Platform G1000 for the following platforms:
  - IBM AIX
  - HP-UX
  - Linux
- Hitachi Storage Adapter supports only Fibre Channel-attached storage.
- Hitachi Dynamic Link Manager must be installed on all hosts managed by SAP Landscape Virtualization Management where storage operations are required.
- Network connectivity is required between all components.
- Limitations for an IBM AIX environment:
  - AIX virtual SCSI disks are not supported.
  - Only NPIV virtualized HBAs are qualified and supported.
- Limitations for HP-UX environment:
  - Raw device mapped LUNs are supported.
  - Physical servers, HP-UX virtual partitions (vPar), and Hewlett Packard Integrity Virtual Machines (Integrity VM) are supported.
  - HP-UX native multi-pathing is supported.
  - Emulex and Q-logic HBA are supported.

Refer to the Hitachi Storage Adapter User Guide for details.
Roles and Responsibilities

These are the roles and responsibilities for managing this environment.

Storage Administrator
The storage administrator is responsible for operating and maintaining the storage arrays. The storage administrator creates the parity groups, provisions pools for dynamic provisioning, Hitachi Copy-on-Write Snapshot, or Hitachi Thin Image Snapshot.

The storage administrator also manages the users and their privileges needed to connect the storage controller to the storage array.

SAP System Administrator
The SAP system administrator operates and manages the SAP systems. Some operations include activities on the storage arrays which are simple operations, like mapping or un-mapping the LUNs in case of a Start/Stop/Relocate operation. It also includes complex tasks like provisioning and de-provisioning LUNs with managing the replication.

Storage Controller
The storage controller can run on a physical or a virtualized server. The only prerequisite is that the server-guest needs a Fibre Channel connection to the Hitachi storage that serves the disks of the managed SAP systems.

On virtualized environments, LUNs can be connected using one of the following:

- Raw device mappings in case of VMware guests
- Pass-through disks on Microsoft Hyper-V® 2.0 guests
- NPIV virtualized HBAs on Microsoft Hyper-V 3.0 guests

The storage controller serves hundreds of requests in parallel. Nevertheless, multiple requests to the same Hitachi storage system are processed sequentially.

Multiple storage controllers can be used and defined in SAP Landscape Virtualization Management.

If multiple storage controllers are managing the same Hitachi storage system, you do not have the choice to select which storage controller should be used to run the operation. Instead, SAP Landscape Virtualization Management automatically selects one.
Table 3 gives recommendations regarding the hardware requirements of the storage controller. The hardware requirements mainly depend on the number of storage array entities (for example, LUNs, WWNNs, ports, Hitachi ShadowImage Heterogeneous Replication pairs, Hitachi Copy-on-Write Snapshot pairs) defined across the Hitachi storage system. Each entity allocates about 1 KB of main memory. The storage controller application is memory bound, not CPU bound.

### Table 3. Hardware Recommendations for Storage Controller

<table>
<thead>
<tr>
<th>Number of Entities Across the Managed Hitachi Storage Systems</th>
<th>Hardware Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 50,000</td>
<td>One virtualized guest:</td>
</tr>
<tr>
<td></td>
<td>▪ 2 vCPUs</td>
</tr>
<tr>
<td></td>
<td>▪ 4 GB main memory</td>
</tr>
<tr>
<td>Up to 250,000</td>
<td>One virtualized guest:</td>
</tr>
<tr>
<td></td>
<td>▪ 2 vCPUs</td>
</tr>
<tr>
<td></td>
<td>▪ 6 GB main memory</td>
</tr>
<tr>
<td>Up to 500,000</td>
<td>One virtualized guest:</td>
</tr>
<tr>
<td></td>
<td>▪ 4 vCPUs</td>
</tr>
<tr>
<td></td>
<td>▪ 8 GB main memory</td>
</tr>
</tbody>
</table>

You also can run the storage controller application on a physical server with an up-to-date CPU. The main memory requirements are the same as described in Table 3.
Storage and File System Layout

The storage and file system layout depends on the SAP system, the operating system, and the underlying database. These are some ideas and recommendations regarding the number of LUNs, LUN sizes, and logical volume manager.

- For performance reasons, a good practice is defining LUNs with a maximum size of 1 TB.
- To define a Volume Group, either use a single LUN or multiple LUNs. If needed, an already defined Volume Group can be extended by additional LUNs. In this case, you need to reconfigure the corresponding SAP services to add the additional LUNs in the mount point sections.
- The more LUNs are used for setting up the SAP system, the longer run times you will get in various steps of an SAP Landscape Virtualization Management operation:
  - Prepare Clone Volumes
  - Finalize Clone Volumes
  - Prepare
  - Unprepare
  - Delete Volumes
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 regarding 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 — Enterprise Edition (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)
Hewett 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.