VMware vSphere 6.0 Virtual Volume Environment Deployment in Hitachi Virtual Storage Platforms

Implementation Guide

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VMware vSphere 6.0 Virtual Volume Environment Deployment in Hitachi Virtual Storage Platforms

Implementation Guide

This guide provides the steps to deploy VMware vSphere Virtual Volume (VVol) with Hitachi Virtual Storage Platform (VSP) Gx00, VSP G1000 and VSP Fx00. The VVol implementation is comprised of Hitachi Storage Provider for VMware vCenter, Hitachi Command Suite (HCS), and Hitachi VSPs. This paper focuses on providing the procedural overview for quick start installation and configuration of VVols on VSPs using VMware APIs for Storage Awareness for Hitachi Storage Provider for VMware vCenter (Storage Provider for VMware vCenter) and HCS as an index for each component document. For details on each procedure, refer to these product guides:

- Hitachi Storage Provider for VMware vCenter Deployment Guide
- Hitachi Command Suite User Guide
- Hitachi Command Suite Installation and Configuration Guide
- Hitachi Command Suite Administrator Guide
- Hitachi Virtual Storage Platform G1000 Provisioning Guide for Open Systems
- Provisioning Guide
  - Hitachi Virtual Storage Platform G200, G400, G600, G800
  - Hitachi Virtual Storage Platform F400, F600, F800
- Hitachi Thin Image User Guide
  - Hitachi Virtual Storage Platform G200, G400, G600, G800
  - Hitachi Virtual Storage Platform F400, F600, F800
  - Hitachi Virtual Storage Platform G1000

This paper is intended to be used by IT administrators charged with the storage deployment, or administration of VMware vSphere infrastructures on Hitachi Virtual Storage Platform. It assumes familiarity with storage area network (SAN)-based storage systems, VMware vSphere, Hitachi data replication technologies, and common IT storage practices.

The screen shots represented in this document were acquired using VSP G600.
VMware vSphere Virtual Volume (VVol) Overview

VMware vSphere Virtual Volume is based on a new integration and management framework between vSphere and the storage system introduced by vSphere6.0. The incompatibility between vSphere and the array virtual machine management today is the difference between the primary units for both sides, such as virtual disks (VMDK files) for the virtual machines and LUNs for the array. This can require sacrificing SLAs for virtual machines. For example, virtual machines that reside on the same data store (LUN) are forced to use the same RPO leveraging storage replication in spite of different RPOs required for each virtual machine.

With Virtual Volumes, the virtual disk becomes the primary unit of data management at the storage system level. It becomes possible to execute storage operations with granularity and to provision native storage-systems-based data services to individual virtual machines (VMs).

Figure 1
Regarding the management framework, VMware is introducing a new policy-driven framework called Storage Policy Based Management (SPBM) that interacts with the array. The SPBM framework allows both advertising of storage capabilities and capture of storage service-level requirements (capacity, performance, availability, and so forth) in the form of logical templates (VM storage policies). SPBM automates VM placement by identifying an available VVol datastore that matches the specified policy requirements. When coupled with VVol, SPBM can dynamically instantiate the necessary data services when required. Policy-driven management allows for automated provisioning of VMs and quicker adjustment to business changes.

Figure 2
With VVols and Hitachi VVol implementation, VM operations such as VM power on/off, VMware snapshot, VM clone, and Migration are integrated with arrays via vCenter and Hitachi out-of-band operation that includes Storage Provider for VMware vCenter, Hitachi Command Suite, and Hitachi VSPs. For example, VM clone and VMware snapshot are offloaded to arrays via vCenter and leverage Hitachi ShadowImage and Hitachi Thin Image (HTI) out-of-band respectively. This allows physical resources to be used effectively in the virtual infrastructure within the data center.

Figure 3
System Configuration

Storage Provider for VMware vCenter and VVols with HCS are distributed as a single Open Virtualization Format (OVA) file and are deployed on VMware vSphere as a single packaged virtual machine (VM) from version 3.3. Hitachi VVol implementation has an option to create and manage the storage objects by using either Hitachi Command Suite (HCS) or Storage Navigator depending on your environment. These enhancements provide the user with faster deployment, ease of use and operation flexibility. This document describes using HCS for creation and management of storage objects. Regarding other options such as multiple components with multiple vCenter instances and combinations, please refer to HCS documentation.

Figure 4 shows the system configuration for VVol Environment Deployment in Hitachi Virtual Storage Platform G1000.
Figure 5 shows the system configuration for VVol Environment Deployment in Hitachi VSP G200, VSP G400, VSP G600, VSP G800, and Hitachi Virtual Storage Platform VSP F400, VSP F600, and VSP F800.

Table 1 shows the role of each system configuration element for VVol delivery.

Table 1. System Configuration Element Roles

<table>
<thead>
<tr>
<th>#</th>
<th>Item</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VMware vSphere Web Client</td>
<td>The Virtual Machine (VM) administrator uses this console to manage the virtual environment.</td>
</tr>
<tr>
<td>2</td>
<td>VMware vCenter Server</td>
<td>Application to execute the integrated management of the VMware vSphere environment. In addition, it executes the operation of VVol for VM via VASA.</td>
</tr>
<tr>
<td>3</td>
<td>Storage Provider Web UI</td>
<td>The Storage administrator uses this console to manage the Storage Provider for VMware vCenter.</td>
</tr>
<tr>
<td>4</td>
<td>Storage Provider for VMware vCenter</td>
<td>It indicates Hitachi Storage Provider for VMware vCenter. Retrieves the Hitachi storage system information requested by the VASA API from VMware vCenter Server and ESXi hosts and relays it to them. Hitachi storage information is retrieved by VVols with HCS.</td>
</tr>
<tr>
<td>5</td>
<td>HCS Web Client</td>
<td>The Storage administrator uses this console to manage the Storage environment</td>
</tr>
</tbody>
</table>
Configuration of Storage Provider for VMware vCenter and VVols with HCS comprises the out-of-band interaction with vCenter that is the key design element for considering the number of VMs and the number of concurrent job executions in the VVol environment.

Consider the following when deploying Storage Provider for VMware vCenter and VVols with HCS:

- Deploy Storage Provider for VMware vCenter and VVols with HCS in a management cluster as a VM
- Deploy Storage Provider for VMware vCenter and VVols with HCS on the host using high-performance CPU and memory
- Deploy Storage Provider for VMware vCenter and VVols with HCS on non-VVol datastores (VMFS/NFS) using high speed devices such as SSDs or external storage

The system configuration described in Table 2 is based on the result of tests using the VMware VVol certification kit. Management servers in which Storage Provider for VMware vCenter and VVols with HCS VM resides are verified as follows for each VM operation:

- Power ON with 200 VMs simultaneously
- Power OFF, creation, or deletion of VMware snapshot and creation or deletion of VM clone operations could be executed simultaneously with 32 VMs respectively

<table>
<thead>
<tr>
<th>#</th>
<th>Item</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>HCS</td>
<td>In the VVol environment, HCS carries out storage settings at the time of the construction or disposal of the VVol environment.</td>
</tr>
<tr>
<td>7</td>
<td>VVols with HCS</td>
<td>Managing Storage Container.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Managing Storage Policy Based Management (SPBM).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Managing VVol metadata.</td>
</tr>
<tr>
<td>8</td>
<td>VSP G1000</td>
<td>Managing and providing PE (ALU).</td>
</tr>
<tr>
<td></td>
<td>VSP G200, VSP G400, VSP G600, VSP G800</td>
<td>Managing and providing SLU (VVol).</td>
</tr>
<tr>
<td></td>
<td>VSP F400, VSP F600, VSP F800</td>
<td>Storing SLU (VVol) metadata.</td>
</tr>
<tr>
<td>9</td>
<td>SVP</td>
<td>The SVP is a management server that attaches to VSP Gx00/VSP Fx00 models. The SVP enables managing VSP Gx00/VSP Fx00 systems via HCS or Storage Navigator.</td>
</tr>
</tbody>
</table>

Table 1. System Configuration Element Roles (Continued)
When a timeout occurs during VVol operation, review the environment and refer to Table 2.

### Table 2. VVol Validation Configuration

<table>
<thead>
<tr>
<th>Server</th>
<th>CPU</th>
<th>Intel Xeon CPU E5-2660 v3 @ 2.60GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- The number of CPUs: 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The number of cores for each CPU: 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Hyperthreading: Valid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The number of the logic processors: 40 ((2 \times 10 \times 2))</td>
<td></td>
</tr>
<tr>
<td>Main Memory</td>
<td>128 GB</td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>1Gbps Ethernet</td>
<td></td>
</tr>
<tr>
<td>HBA</td>
<td>Emulex LPe12000 8 Gb Fibre Channel Host Adapter (Inbox driver)</td>
<td></td>
</tr>
<tr>
<td>Storage Provider for VMware vCenter and VVols with HCS Virtual Appliance</td>
<td>The number of logic cores</td>
<td>4 cores</td>
</tr>
<tr>
<td>Memory</td>
<td>8 GB</td>
<td></td>
</tr>
</tbody>
</table>

**Note**—This system configuration does not guarantee the number of VMs that you can operate simultaneously. If the operation fails, reduce the number of VMs that are executing a process simultaneously.

Ensuring High Availability for Storage Provider for VMware vCenter, VVols with HCS and SVP required for VSP Gx00 and Fx00 that comprise of out-of-band in VVol Block environment are the key design from a VVol operational standpoint. When one of these components is unavailable, only storage management operations related to VVol object metadata manipulation will be impacted (clone, snapshot, power on/off etc.). The out-of-band communication on Hitachi VVol Block implementation in a down situation does not impact VM I/O as it flows through the data path (PEs).

- For Storage Provider for VMware vCenter and VVols with HCS that are packed in an OVA and deployed as a single VM, both vSphere FT and vSphere HA are supported from Storage Provider for VMware vCenter version 3.3 or later and Hitachi Command Suite version 8.4.1 or later respectively. Enabling vSphere FT or vSphere HA with both Storage Provider for VMware vCenter and VVol with HCS is deployed as a single VM is recommended for continuous VVol operations.

- Deploying an external SVP required for VSP Gx00 and Fx00 in a management cluster as a VM is supported from Storage Micro code version 83-03-23/00 or later. Enabling vSphere FT with the external SVP VM is also supported and recommended for continuous VVol operations. Enabling vSphere HA with the external SVP will be supported in a subsequent release.

Subsequently, if an error occurs, set the environment using the following procedure:

- Lower the number of run operations in the VVol environment.

- Change the host to a CPU or disk with better performance

**Note** - VMware Fault Tolerance provides zero-downtime, zero-data-loss continuous availability for any applications, without the cost or complexity of traditional solutions. On the other hand, one of the most common performance observations of virtual machines under FT protection is a variable increase in the network latency of the virtual machine. Some applications that are highly sensitive to network latency have a higher performance cost under FT protection. Please take into account both the pros and cons when you adopt either vSphere FT or vSphere HA for Storage Provider for VMware vCenter/VVol with HCS and SVP and please refer to the related VMware document.
## Prerequisites

### Prerequisite Software Components

Table 3 shows the software requirements required for VVol delivery.

<table>
<thead>
<tr>
<th>#</th>
<th>Component</th>
<th>Software</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VMware</td>
<td>VMware vSphere Web Client 6.0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>VMware vCenter Server 6.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VMware vCenter Server Appliance 6.0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>VMware ESXi Server 6.0*3 *4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>HCS *1</td>
<td>VSP G1000</td>
<td>Hitachi Device Manager 8.2.0-01 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VSP G200, VSP G400, VSP G600, VSP G800</td>
<td>Hitachi Device Manager 8.2.1-00 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VSP F400, VSP F600, VSP F800</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Storage Provider for VMware vCenter*2</td>
<td>VSP G1000</td>
<td>Storage Provider for VMware vCenter 03.1.0 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VSP G200, VSP G400, VSP G600, VSP G800</td>
<td>Storage Provider for VMware vCenter 03.2.0 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VSP F400, VSP F600, VSP F800</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Storage *4 *5 VSP G1000, G200, G400, G600, G800</td>
<td>VSP G1000</td>
<td>80-03 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VSP G200, VSP G400, VSP G600, VSP G800</td>
<td>83-02 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VSP F400, VSP F600, VSP F800</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>VSP F400, F600, F800</td>
<td>Hitachi Storage Virtualization Operating System (SVOS)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Hitachi Local Replication Software</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hitachi ShadowImage Software</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hitachi Thin Image Software</td>
<td></td>
</tr>
</tbody>
</table>

*1 For other detailed requirements such as hardware requirements for HCS, see the Hitachi Command Suite System Requirements.

*2 For other detailed requirements such as hardware requirements for Storage Provider for VMware vCenter, see the *Hitachi Storage Provider for VMware vCenter Deployment Guide*.

*3 For end-to-end VVol support, the ESXi hosts must have VVol-aware HBA drivers. Refer to the *List of I/O devices and drivers that support the Virtual Volumes feature* from VMware Compatibility Guides.
*4 Confirm the following settings in the Hitachi VVol with vSphere 6.0 environment:

(1) Enable host mode option 63.
(2) Disable the VAAI Plugin.

See the VSP G1000 / VSP G200, VSP G400, VSP G600, VSP G800 / VSP F400, VSP F600, VSP F800 Functional Release Schedule (FRS) for the Disable VAAI Plugin procedure.

*5 Both Fibre Channel and iSCSI are supported for VSPG1000, VSP Gx00 and VSP Fx00 as a VVol supported protocol.

Precondition for Installation

Table 4 shows the software requirements necessary for installing HCS, VVols with HCS and Storage Provider for VMware vCenter.

<table>
<thead>
<tr>
<th>#</th>
<th>Software Name</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HCS</td>
<td>See the Hitachi Command Suite System Requirements</td>
</tr>
<tr>
<td>2</td>
<td>VVols with HCS</td>
<td>Storage Provider for VMware vCenter and VVols with HCS are distributed as a single Open Virtualization Format (OVF) file.</td>
</tr>
<tr>
<td>3</td>
<td>Storage Provider for VMware vCenter</td>
<td>See the Hitachi Storage Provider for VMware vCenter Deployment Guide</td>
</tr>
<tr>
<td>4</td>
<td>Web browser</td>
<td>Microsoft® Internet Explorer 10 or later</td>
</tr>
<tr>
<td>5</td>
<td>Mozilla Firefox</td>
<td>Mozilla Firefox 35.0 or later</td>
</tr>
<tr>
<td>6</td>
<td>Google Chrome 41.0</td>
<td>Google Chrome 41.0 or later</td>
</tr>
</tbody>
</table>
## Reference Documents

Table 5 lists reference documents.

### Table 5. Reference Documents

<table>
<thead>
<tr>
<th>#</th>
<th>Document Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hitachi Storage Provider for VMware vCenter Deployment Guide</td>
</tr>
<tr>
<td>2</td>
<td>Hitachi Command Suite User Guide</td>
</tr>
<tr>
<td>3</td>
<td>Hitachi Command Suite Installation and Configuration Guide</td>
</tr>
<tr>
<td>4</td>
<td>Hitachi Command Suite Administrator Guide</td>
</tr>
<tr>
<td>5</td>
<td>Hitachi Virtual Storage Platform G1000 Provisioning Guide for Open Systems</td>
</tr>
<tr>
<td>6</td>
<td>Provisioning Guide</td>
</tr>
<tr>
<td></td>
<td>Hitachi Virtual Storage Platform G200, G400, G600, G800</td>
</tr>
<tr>
<td></td>
<td>Hitachi Virtual Storage Platform F400, F600, F800</td>
</tr>
<tr>
<td>7</td>
<td>Hitachi Thin Image User Guide</td>
</tr>
<tr>
<td></td>
<td>Hitachi Virtual Storage Platform G200, G400, G600, G800</td>
</tr>
<tr>
<td></td>
<td>Hitachi Virtual Storage Platform F400, F600, F800</td>
</tr>
<tr>
<td></td>
<td>Hitachi Virtual Storage Platform G1000</td>
</tr>
</tbody>
</table>
VVol Environment Storage Settings

Deploying the OVF Storage Provider for VMware vCenter and VVols with HCS

Workflow for Deploying the OVF which Installs Storage Provider for VMware vCenter and VVols with HCS

Figure 6 shows the workflow for deploying the OVF which installs Storage Provider for VMware vCenter and VVols with HCS.

---

**Operation Procedures**

For details regarding the VMware specific procedures in this section, refer to VMware documentation.

**[Step 1] VMware vCenter Server:** Deploying the OVF which installs Storage Provider for VMware vCenter and VVols with HCS.

- Deploy Storage Provider for VMware vCenter and VVols with HCS by using the "Deploy OVF Template" option from vSphere web Client.

---

![Deploy OVF Template](image-url)
Configuring Storage System Settings Using HCS for the VVol Environment

This section describes configuring the storage system settings for the VVol environment using HCS.

After configuring the storage system for the VVol environment, execute the storage settings to build the VVol environment using VVols with HCS.

Workflow for Setting the Storage System Using HCS for the VVol Environment Configuration

Figure 7 shows the workflow for configuring the storage system settings using HCS for the VVol environment.

Figure 7

Operation Procedures

For details regarding the procedures in this section, see the list of Reference Documents on page 11.

[Step 1] HCS: Changing a property

- Change the property of the Device Manager server to use a function of VVol.
[Step 2] HCS : Setting a user and an access control

- Click **Add User** on the **Users and Permissions** window of HCS to create a user.

[Step 3] HCS : Registering a storage system

- Click **Add Storage System** to add the target storage system.
[Step 4] HCS : Creating a DP pool

- This operation is based on the prerequisite that a pool volume has already been created.
- Click Create Pool.

- Select the target storage system and pool type on the Create Pool window and click Add Parity Groups to select the parity group that was used when creating the DP pool volume.
[Step 5] **HCS (Storage Navigator)**: Creating a Thin Image pool

- This operation is based on the prerequisite that a pool volume has already been created.

**Note** — To use VMware snapshot or VM clone from vCenter on Hitachi VVol environment with VSPs, create a HTI pool and register it in ResourceGroup (Storage Container). Otherwise, snapshot operations will fail. HTI pools can also be added to the Resource Group after the SC has been created.

- Open the **Pools** window on HCS and click **Create Pools** to create a Thin Image pool.
Specify **Thin Image** for the pool type on the **Create Pools** window and click **Select Pool VOLs** to select the **Thin Image** pool volume that was previously created.
[Step 6] HCS: Creating a resource group

- Click **Create Resource Group**.

- Specify the target storage system on the **Create Resource Group** window and register the DP pool and Thin Image pool. Specify the DP pool from **DP Pools** tab and the LDEV ID of the pool volume for Thin Image pool from **LDEV IDs** tab.

- In addition, register the unused LDEV ID in the resource group. This unused LDEV ID is used on demand for virtual volumes provisioned by VMware operations such as virtual machine creation.
[Step 7] **HCS**: Adding to a user group.

- Click **Create User Group** to create a user group, and then register the user created in Step 2 and the resource group created in Step 6.
[Step 8] **HCS (Storage Navigator) : Creating a host group or an iSCSI Target**

- Select the target storage system and click **Set Protocol Endpoints** to create a host group or an iSCSI target to allocate PE (ALU).

- Click **Create Host Groups** on the **Set Protocol Endpoints** window and create a host group or an iSCSI target to allocate PE (ALU).

- Specify **21[VMware Extension]** for host mode on the **Create Host Groups** window and enable “63” for the Host Mode option.
In a Fibre Channel environment (**Create Host Groups** window) refer to the following:
In an iSCSI environment (Create iSCSI Targets window) refer to the following:
[Step 9] HCS (Storage Navigator) : Creating PE (ALU) and allocating PE (ALU)

- Select the target storage system and click Set Protocol Endpoints to create PE (ALU) and allocate PE (ALU).

- Click Allocate ALUs on the Set Protocol Endpoints window to create PE (ALU), and then allocate the PE (ALU) to the host group created in Step 8.
- Specify the ALU for the provisioning type on the Create LDEVs window.

- After creating the PE (ALU), select the target PE (ALU) on the Logical Devices window, click Add LUN Paths, and set the LUN path of the PE (ALU).
Setting the Storage System Using VVols with HCS for the VVol Environment Configuration

After setting the storage system to build the VVol environment using HCS, execute storage settings to build the VVol environment using VVols with HCS.

Workflow for Setting the Storage System using VVols with HCS for the VVol Environment Configuration

Figure 8 shows the workflow to set the storage system using VVols with HCS for the VVol environment configuration.

Operation Procedure
For details regarding the procedures in this section, see the list of Reference Documents on page 11.
[Step 1] **VVols with HCS** : Registering a storage system

- Click **Add Storage System** and add the target storage system.

[Step 2] **VVols with HCS** : Registering a resource group

- Click **Edit User Group** and register a resource group.
[Step 3] VVols with HCS : Creating a storage container and defining a storage capability profile

- Click **Create Storage Container** using VVols with HCS to create a storage container.

- On the **Create Storage Container** window, specify a target storage system and resource group in Step 1 of the screen, select a DP pool in Step 2 of the screen, and click **Define Profile** to define a storage capability profile.

**Note** - Storage Container for Hitachi VVol implementation can comprise multiple DP pools, so you can also define multiple storage capabilities for each pool in a single Storage Container. When you define storage capabilities for each pool in a Storage Container, HTI pools added to the Resource group (Storage Container) will automatically reflect the snapshot capability and capacity of the Snapshot capacity for the SC.
Click **Advanced Options** on the **Create Storage Container** window and define a default profile as needed.
Editing a PE (ALU) and a Storage Container
This section describes editing a PE (ALU) and a storage container.

Editing a Storage Container (Expanding a DP pool or a Thin Image pool)
This section describes editing a storage container (Expanding a DP pool or a Thin Image pool) using VVols with HCS.

This operation is based on a precondition that a pool volume has been previously created.

Workflow for Editing Storage Container (Expanding a DP pool or a Thin Image pool)
Figure 9 shows the workflow to edit storage containers (Expanding a DP pool or a Thin Image pool).

Figure 9
Operation Procedures
For details regarding the procedures in this section, see the list of Reference Documents on page 11.
[Step 1] **VVols with HCS**: Expanding a DP pool

- Select the target DP pool on the **DP Pools** window of VVols with HCS and click **Expand Pool** to expand a pool.
[Step 2] VVols with HCS (Storage Navigator) : Expanding a Thin Image pool

- Open the Pools window of Storage Navigator using HCS, select the target Thin Image pool, and click Expand Pool to expand the pool.

- When you expand the Thin Image pool, update the information of the target storage system.

Editing a Storage Container (Editing a Storage Capability Profile)

Edit a storage container (Editing a storage capability profile) using VVols with HCS.

Workflow for Editing a Storage Container (Editing a Storage Capability Profile)

Figure 10 shows the workflow to edit a storage container (Editing a storage capability profile).

```
START

[Step 1] VVols with HCS: Editing a storage capability profile

END
```

Figure 10

Operation Procedures

For details regarding the procedures in this section, see the list of Reference Documents on page 11.
[Step 1] VVols with HCS : Editing a storage capability profile

- Select a target storage container using VVols with HCS and click Edit Storage Container to edit a storage capability profile.
- On the Edit Storage Container window, select the pool profile to edit and click Define Profile to edit a storage capability profile.

Editing a PE (ALU) LUN Path

This section describes editing a PE (ALU) LUN path using HCS.

Workflow for Editing a PE (ALU) LUN Path

Figure 11 shows the workflow for editing a PE (ALU) LUN path.

Figure 11

Operation Procedure

For details regarding the procedures in this section, see the list of Reference Documents on page 11.
[Step 1] VVols with HCS (Storage Navigator) : Editing a PE (ALU) LUN path

- Open the Logical Devices window of Storage Navigator using HCS and select a target PE (ALU) and click LUN path operation to edit a PE (ALU) LUN path.
- To start Storage Navigator using HCS, see the Hitachi Command Suite User Guide.
- To a LUN path to an existing PE (ALU), click Add LUN Paths.

Deleting a PE (ALU) or a Storage Container

This section describes deleting a PE (ALU) and a storage container using VVols with HCS.

This operation is based on the prerequisite that a virtual machine has previously been deleted.

In an iSCSI environment, this operation is based on the prerequisite that dynamic or static iSCSI targets have previously been deleted.
Workflow for Deleting a PE (ALU) and a Storage Container

Figure 12 shows the workflow for deleting a PE (ALU) and a storage container.

```
START

[Step1] VVol with HCS (Storage Navigator): Unallocating a PE (ALU) and deleting a PE (ALU)

[Step2] VVol with HCS (Storage Navigator): Deleting a host group or an iSCSI target

[Step3] VVol with HCS: Deleting a storage container

[Step4] VVol with HCS: Deleting a DP pool

[Step5] VVol with HCS (Storage Navigator): Deleting a Thin Image pool

[Step6] VVol with HCS: Deleting a resource group

[Step7] VVol with HCS: Deleting a user

END
```

(Legend)

--- : Operation to perform as needed.

Figure 12

Operation Procedure

For details regarding the procedures in this section, see the list of Reference Documents on page 11.
[Step 1] VVols with HCS (Storage Navigator): Unallocating a PE (ALU) and Deleting a PE (ALU)

- Open the Logical Devices window of Storage Navigator using HCS. Select the target PE (ALU) for deletion and select **More Actions > Delete LUN Paths** to delete a LUN path.

- On the Logical Devices window of Storage Navigator, select a target PE (ALU) for deletion and select **More Actions > Delete LDEVs** to delete a PE (ALU).
[Step 2] **VVols with HCS (Storage Navigator)**: Deleting a host group or an iSCSI target

- Use VVols with HCS to open the **Port/Host Groups/iSCSI Targets** window of Storage Navigator. Select a target host group or an iSCSI target for deletion and delete it.

- For Fibre Channel environments: **More Actions > Delete Host Groups**

- For iSCSI environments: **More Actions > Delete iSCSI Targets**
### Step 3: VVol with HCS

Deleting a storage container

- Select a target storage container for deletion and click **Delete Storage Containers** to delete a storage container.
[Step 4] **VVols with HCS**: Deleting a DP pool

- Select a target DP pool for deletion and click **Delete Pools** to delete a DP pool.
[Step 5] **VVol with HCS (Storage Navigator)**: Deleting a Thin Image pool

- Open the **Pools** window of Storage Navigator. Select a target Thin Image pool for deletion and select **More Actions > Delete Pools** to delete a Thin Image pool.

- When you delete ALU or Thin Image pools, update the information of the target storage system.
[Step 6] **VVols with HCS**: Deleting a resource group

- Select a target resource group for deletion and click **Delete Resource Groups** to delete a resource group.

![Screen shot of Hitachi Command Suite showing resource group deletion process.]

[Step 7] **VVols with HCS**: Deleting a user

- Select a target user group for deletion and click **Edit User Group** to delete a user group that the Storage Provider for VMware vCenter has used.

![Screen shot of Hitachi Command Suite showing user group deletion process.]

---

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Select a target user for deletion on the Users and Permissions window and click **Delete User** to delete a user that the Storage Provider for VMware vCenter has used.
Creating a Virtual Machine

This section describes creating a virtual machine.

Workflow for Creating a Virtual Machine

Figure 13 shows the workflow for creating a virtual machine.

Figure 13

Operation Procedures

For details regarding the procedures in this section, see the list of Reference Documents on page 11.

For details regarding the procedures of VMware in this section, follow VMware documentation.

[Step 1] **Storage Provider for VMware vCenter**: Registering the vCenter Single Sign-on credentials

- Storage administrators select **Block** tab with **Landing page** window of **Storage Provider Web UI**.

- In the **Storage Provider Web UI** window, enter "system" and "manager" as the user ID and password and click Login.
Storage administrators select **Single Sign-on Setting** and register using the vCenter Single Sign-on credentials.
[Step 2] VMware vCenter Server: Registering the Storage Provider for VMware vCenter in the vCenter server

- Click the **Register a new storage provider** by the VMware vCenter Server (vSphere Web Client) and register the Storage Provider for VMware vCenter in the VMware vCenter Server.
[Step 3] VMware vCenter Server: Rescanning storage

- For Fibre Channel environments, click **Rescan Storage** by the VMware vCenter Server (vSphere Web Client) to discover a PE (ALU) as a storage device.
[Step 4] VMware vCenter Server: Setting up dynamic discovery for iSCSI

- For iSCSI environments, select the iSCSI host adapter from the VMware vCenter Server (vSphere Web Client), click *Dynamic Discovery*, and click *Add*.
On the **Add Send Target Server** window, specify the IP address of the iSCSI port of the storage system.
Click **Rescan Storage** on the VMware vCenter Server (vSphere Web Client) to discover a PE (ALU) as a storage device.
[Step 5] VMware vCenter Server: Creating a datastore

- Select **New Datastore** in the Actions > Storage menu of the VMware vCenter Server (vSphere Web Client) to create a Datastore.

- Select **VVOL** on the **Type** window.
- Type a datastore name on the **Name and container selection** window and select the target storage container from the list of storage containers.

- On the **Select Host Accessibility** window, select the host that requires access to the datastore.
[Step 6] VMware vCenter Server: Defining a VM storage policy

- Click **Create a new VM storage policy** on the VMware vCenter Server (vSphere Web Client) to define a VM storage policy.

- Select VMware **vCenter Server** on the **Name and description** window and type the name of the VM storage policy.
On the 2a Rule-Set 1 window, select `com.hitachi.storageprovider.vvol` from the Rules based on data services dropdown and set a rule as needed.
[Step 7] VMware vCenter Server: Creating a virtual machine

- Select **New Virtual Machine** in the Actions menu of the VMware vCenter Server (vSphere Web Client) to create a virtual machine.

- Select the VM storage policy created in Step 7 on the **2c Select storage** window and select a datastore matching the VM storage policy.
Uninstalling the VVol Environment

This section describes uninstalling the VVol environment.

Workflow for Uninstalling the VVol Environment

Figure 14 shows the workflow for uninstalling the VVol environment.

![Workflow Diagram](image)

Figure 14

Operation Procedures

For details regarding the procedures in this section, see the list of Reference Documents on page 11.
For details regarding the VMware procedures in this section, see the VMware documentation.

[Step 1] VMware vCenter Server: Deleting virtual machines

- Select the target virtual machine to be deleted from the VMware vCenter Server (vSphere Web Client) and select Delete from Disk from the Actions menu to delete a virtual machine.

[Step 2] VMware vCenter Server: Unmounting a datastore

- Select a target datastore for deletion from the VMware vCenter Server (vSphere Web Client) and click Unmount datastore from the Actions menu to delete a datastore.
[Step 3] VMware vCenterServer: Remove both dynamic and static iSCSI targets

- For iSCSI environments, select a target iSCSI adapter from the VMware vCenter Server (vSphere Web Client) and click **Dynamic Discovery**. Select an iSCSI server for deletion and click **Remove**.

- For iSCSI environments, select a target iSCSI adapter from the VMware vCenter Server (vSphere Web Client) and click **Static Discovery**. Select an iSCSI server for deletion and click **Remove**.
Click **Rescan Storage** by the VMware vCenter Server (vSphere Web Client).

[Step 4] VMware **vCenterServer** : Deleting Storage Provider for VMware vCenter and VVols with HCS

- Delete the Storage Provider for VMware vCenter and VVols with HCS virtual machine.
- In addition, Hitachi Data Systems recommends removing Storage Provider for VMware vCenter from VMware vCenter Server after having carried out the deletion of the VVol environment on VMware vCenter Server before the uninstallation of the Storage Provider for VMware vCenter
[Step 5] **HCS**: Returning a property to the original state

- Return the setting of a Device Manager server’s property that changed in order to return a VVol function back to its original state.

[Step 6] **HCS (Storage Navigator)**: Unallocating a PE (ALU) and a deleting a PE (ALU)

- See [Step 1] of “Deleting a PE (ALU) or a Storage Container” on page 33.

[Step 7] **HCS (Storage Navigator)**: Deleting a host group

- See [Step 2] of Deleting a PE (ALU) or a Storage Container.

[Step 8] **HCS**: Deleting a DP pool

- See [Step 4] of Deleting a PE (ALU) or a Storage Container.

[Step 9] **HCS (Storage Navigator)**: Deleting a Thin Image pool

- See [Step 5] of Deleting a PE (ALU) or a Storage Container.

[Step 10] **HCS**: Deleting a resource group

- See [Step 6] of Deleting a PE (ALU) or a Storage Container.
## Terms and Abbreviations

### Table 6. Terms and Abbreviations used in this Document

<table>
<thead>
<tr>
<th>#</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ALU</td>
<td>Abbreviation for Administrative Logical Unit. This indicates a volume that is an access pointer for a virtualization server. An ALU must be allocated to a virtualization server in order to use VVol. With the virtual machine, an ALU is equivalent to a PE.</td>
</tr>
<tr>
<td>2</td>
<td>HCS</td>
<td>Abbreviation for Hitachi Command Suite. Hitachi Command Suite consists of a number of storage management software products used for managing storage resources in large-scale and complex SAN environments. HCS uses Device Manager, which is a base product for storage management in the VVol environment.</td>
</tr>
<tr>
<td>3</td>
<td>PE</td>
<td>Abbreviation for Protocol Endpoint. This indicates a volume with ALU attributes.</td>
</tr>
<tr>
<td>4</td>
<td>SLU</td>
<td>Abbreviation for Subsidiary Logical Unit. This indicates a volume that stores the data of the virtual machine. When creating a virtual machine, an SLU is created from a DP pool or Thin Image pool, and it is bound (using path allocation) to an ALU. With the virtual machine, SLU is equivalent to VVol.</td>
</tr>
<tr>
<td>5</td>
<td>SPBM</td>
<td>Abbreviation for Storage Policy-Based Management. Based on the volume requirements (VM storage policy) that VM administrators define, Storage Provider for VMware vCenter automatically chooses the storage resources suitable for the requirements and creates/allocates volumes by SPBM.</td>
</tr>
<tr>
<td>6</td>
<td>Storage Container</td>
<td>This is a set of resources such as DP pools or the Thin Image pools to use to make a virtual machine, snapshot, and a clone.</td>
</tr>
<tr>
<td>7</td>
<td>VASA</td>
<td>Abbreviation for vSphere API for Storage Awareness. This indicates the overall storage management functions of vSphere.</td>
</tr>
<tr>
<td>8</td>
<td>Storage Provider for VMware vCenter</td>
<td>This indicates VMware APIs for Storage Awareness for Hitachi Storage Provider for VMware vCenter. This software performs various processing for the storage system based on the VASA API from VMware vCenter Server and VMware ESXi.</td>
</tr>
<tr>
<td>9</td>
<td>VVol</td>
<td>Abbreviation for Virtual Volumes. This indicates a volume that can be used in policy-based datastore operation, which is a function that is available with VSPs.</td>
</tr>
<tr>
<td>10</td>
<td>VVol with HCS</td>
<td>Abbreviation for VMware vSphere Virtual Volumes (VVols) with Hitachi Command Suite (HCS)</td>
</tr>
</tbody>
</table>