

Hitachi Data Ingestor

6.4.4

Array Features Administrator's Guide

This administrator's guide provides instructions for using program products for the following storage systems with Hitachi Data Ingestor:

- Hitachi Universal Storage Platform V/VM
- Hitachi Virtual Storage Platform
- Hitachi Virtual Storage Platform G1000
- Hitachi Virtual Storage Platform Fx00
- Hitachi Virtual Storage Platform Gx00
- Hitachi Unified Storage VM

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Preface

This administrator's guide provides instructions for using program products for the following storage systems with Hitachi Data Ingestor:

- Hitachi Universal Storage Platform V
- Hitachi Universal Storage Platform VM
- Hitachi Virtual Storage Platform
- Hitachi Virtual Storage Platform G1000
- Hitachi Virtual Storage Platform Fx00 models
- Hitachi Virtual Storage Platform Gx00 models
- Hitachi Unified Storage VM

If you are using program products for the Hitachi AMS2000 or HUS100 series storage systems, see the *Hitachi Data Ingestor Array Features Administrator's Guide for Hitachi AMS2000/HUS100 series*.

Please read this document carefully to understand how to use this product, and maintain a copy for reference purposes.

This manual is not applicable to single-node configurations.

This preface includes the following information:

- ☐ [Intended Audience](#)
- ☐ [Product version](#)
- ☐ [Release Notes](#)
- ☐ [Organization of HDI manuals](#)
- ☐ [Referenced Documents](#)

- ☐ [Abbreviation conventions](#)
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- ☐ [Convention for storage capacity values](#)
- ☐ [Accessing product documentation](#)
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- ☐ [Comments](#)

Intended Audience

This document is intended for system administrators, Hitachi Vantara representatives, and Authorized Service Providers who are involved in installing, configuring, and operating the storage system.

This document assumes the following:

- The user roles for USP V and USP VM consist of "storage administrator" and "partitioned storage administrator". The user role for VSP, VSP G1000, VSP Fx00 models, VSP Gx00 models, and HUS VM consists of "storage administrator" only.
- This administrator's guide is written for readers whose user role is "storage administrator" and who are listed below.
- The user has a background in data processing and understands direct-access storage device (DASD) systems and their basic functions.
- The user is familiar with the supported storage system and has read the related documents.
- The user is familiar with the operating system and web browser software on the system hosting the Storage Navigator software. For details on the applicable operating systems and web browser software, please refer to *Hitachi Storage Navigator User's Guide*(*User Guide*).
- The user has read the *Installation and Configuration Guide* and is familiar with how to back up and restore file system data used in a Hitachi Data Ingestor system.

Product version

This document revision applies to Hitachi Data Ingestor version 4.2.1 or later.

Release Notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document. Release notes are available on Hitachi Vantara Support Connect: <https://knowledge.hitachivantara.com/Documents>.

Organization of HDI manuals

HDI manuals are organized as shown below:

Manual name	Description
<i>Hitachi Data Ingestor Installation and Configuration Guide</i> , MK-90HDICOM002	You must read this manual first to use an HDI system. This manual contains the information that you must be aware of before starting HDI system

Manual name	Description
	operation, as well as the environment settings for an external server.
<i>Hitachi Data Ingestor Cluster Getting Started Guide, MK-90HDICOM001</i>	This manual explains how to set up an HDI system in a cluster configuration.
<i>Hitachi Data Ingestor Cluster Administrator's Guide, MK-90HDI038</i>	This manual provides procedures for using HDI systems in a cluster configuration, as well as provides GUI references.
<i>Hitachi Data Ingestor Cluster Troubleshooting Guide, MK-90HDI029</i>	This manual provides troubleshooting information for HDI systems in a cluster configuration.
<i>Hitachi Data Ingestor Single Node Getting Started Guide, MK-90HDI028</i>	This manual explains how to set up an HDI system in a single-node configuration.
<i>Hitachi Data Ingestor Single Node Administrator's Guide, MK-90HDI039</i>	This manual explains the procedures for using HDI systems in a single-node configuration, as well as provides GUI references.
<i>Hitachi Data Ingestor Single Node Troubleshooting Guide, MK-90HDI030</i>	This manual provides troubleshooting information for HDI systems in a single-node configuration.
<i>Hitachi Data Ingestor CLI Administrator's Guide, MK-90HDI034</i>	This manual describes the syntax of the commands that can be used for HDI systems in a cluster configuration or a single-node configuration.
<i>Hitachi Data Ingestor API References, MK-90HDI026</i>	This manual explains how to use the API for HDI systems in a cluster configuration or a single-node configuration.
<i>Hitachi Data Ingestor Error Codes, MK-90HDI005</i>	This manual contains messages for HDI systems in a cluster configuration or a single-node configuration.
<i>Hitachi Data Ingestor File System Protocols (CIFS/NFS) Administrator's Guide, MK-90HDI035</i>	This manual contains the things to keep in mind before using the CIFS or NFS service of an HDI system in a cluster configuration or a single-node configuration from a CIFS or NFS client.
<i>Hitachi Data Ingestor Array Features Administrator's Guide (This manual)</i>	<p>This manual explains how to use program products that support the following storage systems.</p> <ul style="list-style-type: none"> • Hitachi Universal Storage Platform V • Hitachi Universal Storage Platform VM • Hitachi Virtual Storage Platform • Hitachi Virtual Storage Platform G1000 • Hitachi Virtual Storage Platform Fx00 models • Hitachi Virtual Storage Platform Gx00 models • Hitachi Unified Storage VM series.
<i>Hitachi Data Ingestor Array Features Administrator's Guide for Hitachi</i>	This manual explains how to use program products that support storage systems of the Hitachi AMS2000 series or the HUS100 series.

Manual name	Description
AMS2000/HUS100 series, MK-90HDI037	

Referenced Documents

Storage Systems

- *Hitachi Dynamic Provisioning User's Guide (USP V/VM)*
- *Hitachi Encryption License Key User's Guide (User Guide)*
- *Hitachi LUN Manager User's Guide (USP V/VM)*
- *Hitachi Performance Manager User's Guide (User Guide)*
- *Hitachi Storage Navigator User's Guide (User Guide)*
- *Hitachi System Operations Using Spreadsheets (VSP, HUS VM)*
- *Hitachi Universal Volume Manager User's Guide (User Guide)*
- *Hitachi Virtual LVI/LUN & Volume Shredder User's Guide (USP V/VM)*
- *Hitachi Virtual Partition Manager User's Guide (User Guide)*
- *Hitachi Volume Migration User Guide (VSP, VSP G1000, VSP Fx00 models, VSP Gx00 models, HUS VM)*
- *Hitachi Volume Shredder User Guide (VSP, VSP G1000, VSP Fx00 models, VSP Gx00 models, HUS VM)*
- *Provisioning Guide (VSP Fx00 models, VSP Gx00 models, HUS VM)*
- *Provisioning Guide for Open Systems (VSP, VSP G1000)*

Abbreviation conventions

This document uses the following abbreviations for product names:

Abbreviation	Full name or meaning
Windows	Microsoft(R) Windows(R) Operating System

Document Conventions

The terms "Universal Storage Platform VM" and "USP VM" refer to all models of the Hitachi Universal Storage Platform VM, unless otherwise noted.

The terms "Universal Storage Platform V" and "USP V" refer to all models of the Hitachi Universal Storage Platform V, unless otherwise noted.

The terms "Virtual Storage Platform" and "VSP" refer to all models of the Hitachi Virtual Storage Platform, unless otherwise noted.

The terms "Virtual Storage Platform G1000" and "VSP G1000" refer to all models of the Hitachi Virtual Storage Platform G1000, unless otherwise noted.

The terms "Hitachi Virtual Storage Platform Fx00 model" and "VSP Fx00 model" refer to all models of the following storage systems, unless otherwise noted.

- Hitachi Virtual Storage Platform F350
- Hitachi Virtual Storage Platform F370
- Hitachi Virtual Storage Platform F400
- Hitachi Virtual Storage Platform F600
- Hitachi Virtual Storage Platform F700
- Hitachi Virtual Storage Platform F800
- Hitachi Virtual Storage Platform F900

The term "Hitachi Virtual Storage Platform Gx00 model" and "VSP Gx00 model" refer to all models of the following storage systems, unless otherwise noted.

- Hitachi Virtual Storage Platform G200
- Hitachi Virtual Storage Platform G350
- Hitachi Virtual Storage Platform G370
- Hitachi Virtual Storage Platform G400
- Hitachi Virtual Storage Platform G600
- Hitachi Virtual Storage Platform G700
- Hitachi Virtual Storage Platform G800
- Hitachi Virtual Storage Platform G900

The terms "Hitachi Unified Storage VM" and "HUS VM" refer to all models of the Hitachi Unified Storage Platform VM, unless otherwise noted.

This document uses the following typographic conventions:

Typographic Convention	Description
Bold	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels. Example: Click OK .
<i>Italic</i>	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: copy <i>source-file</i> <i>target-file</i> Note: Angled brackets (< >) are also used to indicate variables.
screen/code	Indicates text that is displayed on screen or entered by the user. Example: # pairedisplay -g oradb
< > angled brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: # pairedisplay -g <group>

Typographic Convention	Description
	Note: Italic font is also used to indicate variables.
[] square brackets	Indicates optional values. Example: [a b] indicates that you can choose a, b, or nothing.
{ } braces	Indicates required or expected values. Example: { a b } indicates that you must choose either a or b.
vertical bar	Indicates that you have a choice between two or more options or arguments. Examples: [a b] indicates that you can choose a, b, or nothing. { a b } indicates that you must choose either a or b.

Convention for storage capacity values

Storage capacity values (e.g., drive capacity) are calculated based on the following values:

Capacity Unit	Physical Value	Logical Value
1 KB	1,000 bytes	1,024 (2^{10}) bytes
1 MB	1,000 KB or $1,000^2$ bytes	1,024 KB or $1,024^2$ bytes
1 GB	1,000 MB or $1,000^3$ bytes	1,024 MB or $1,024^3$ bytes
1 TB	1,000 GB or $1,000^4$ bytes	1,024 GB or $1,024^4$ bytes
1 PB	1,000 TB or $1,000^5$ bytes	1,024 TB or $1,024^5$ bytes
1 EB	1,000 PB or $1,000^6$ bytes	1,024 PB or $1,024^6$ bytes
1 block	-	512 bytes

Accessing product documentation

Product user documentation is available on Hitachi Vantara Support Connect: <https://knowledge.hitachivantara.com/Documents>. Check this site for the most current documentation, including important updates that may have been made after the release of the product.

Getting help

[Hitachi Vantara Support Connect](https://support.hitachivantara.com/en_us/contact-us.html) is the destination for technical support of products and solutions sold by Hitachi Vantara. To contact technical support, log on to Hitachi Vantara Support Connect for contact information: https://support.hitachivantara.com/en_us/contact-us.html.

[Hitachi Vantara Community](https://community.hitachivantara.com) is a global online community for Hitachi Vantara customers, partners, independent software vendors, employees, and prospects. It is the destination to get answers, discover insights, and make connections. **Join the conversation today!** Go to community.hitachivantara.com, register, and complete your profile.

Comments

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Thank you!

Introduction

The Hitachi Data Ingestor (HDI) is network-attached storage that connects to a storage system via a Fibre Channel interface in order to provide file-sharing services over NFS or CIFS protocol to clients on the network.

The HDI can be used in conjunction with the rich variety of functions provided by the program products on the storage system.

This administrator's guide describes HDI features and provides precautions and restrictions regarding HDI when it is used in conjunction with the program product functions provided by USP V/VM, VSP, VSP G1000, VSP Fx00 models, VSP Gx00 models, and HUS VM storage systems.

For details about the functions and operation of the program products supplied with USP V/VM, VSP, VSP G1000, VSP Fx00 models, VSP Gx00 models, and HUS VM storage systems, see the appropriate User's Guide.

□ [Supported Program Products](#)

Supported Program Products

The file system service functionality provided by HDI can be used in conjunction with the program product functions supported by storage systems connected to the system.

This section describes the program products that can be used in conjunction with the HDI. For notes and instructions on using these programs in this manner, read from [Chapter 2, Volume Management Functions on page 2-1](#) of this manual.

Program products for using volume management functions

- Dynamic Provisioning
- Dynamic Tiering (for VSP, VSP G1000, VSP Fx00 models, VSP Gx00 models, and HUS VM only)
- Encryption License Key
- Universal Volume Manager
- Volume Migration
- Volume Shredder

Program products for using resource management functions

- Storage Navigator
- LUN Manager
- Configuration File Loader(for USP V/VM, VSP, and HUS VM only)
- Virtual Partition Manager

Program products for using performance management functions

- Performance Monitor

Volume Management Functions

This section describes the program products providing volume management functions that can be used in conjunction with the HDI.

- ☐ [Dynamic Provisioning](#)
- ☐ [Dynamic Tiering](#)
- ☐ [Universal Volume Manager](#)
- ☐ [Volume Migration](#)
- ☐ [Volume Shredder](#)
- ☐ [Encryption License Key](#)

Dynamic Provisioning

Dynamic Provisioning is a program product that helps you reduce the cost of deployment and volume management in storage system. This is achieved by using virtual volumes (V-VOLs).

Before using the Dynamic Provisioning functionality, make sure you understand it by carefully reading the *Hitachi Dynamic Provisioning User's Guide* for USP V/VM, the *Provisioning Guide for Open Systems* for VSP and VSP G1000, or the *Provisioning Guide* for VSP Fx00 models, VSP Gx00 models, and HUS VM.

The use of Dynamic Provisioning together with HDI allows you to reduce deployment costs by virtualizing volumes via HDI. Because this eliminates the need to re-create a file system each time you run out of storage space, there are fewer interruptions to system operation, meaning lower management costs and less downtime.

Note:

- To use Dynamic Provisioning to manage the user LUs and cluster management LU in an HDI system, the user LUs must be in a different pool from the cluster management LU.
- If you want to use V-VOLs for the HDI cluster management LU, use V-VOLs that are capable of full allocation.
- File systems created as V-VOLs by Dynamic Provisioning on the HDI will become blocked if the pool volume overflows. For this reason, prevent the pool volume from overflowing by setting the appropriate thresholds for the pool volume. Immediately provide additional drives to increase the pool volume capacity when the thresholds are exceeded.
- To monitor the thresholds of pool volumes, you need to set up SNMP trap notification to be sent out whenever the thresholds are exceeded.

Dynamic Tiering

Dynamic Tiering is a program that helps reduce storage costs in VSP, VSP G1000, VSP Fx00 models, VSP Gx00 models, and HUS VM. You can improve storage cost performance by using Dynamic Tiering to configure volumes with different types of storage drives.

Before using the functionality of Dynamic Tiering, make sure you understand it by carefully reading the *Provisioning Guide for Open Systems* for VSP and VSP G1000, or the *Provisioning Guide* for VSP Fx00 models, VSP Gx00 models, and HUS VM.

When Dynamic Tiering is used with an HDI system, data is automatically and optimally placed in storage tiers depending on access frequency. This considerably reduces the burden on administrators to design systems to increase storage performance. Storage costs can also be reduced by using inexpensive disks, while still maintaining storage performance.

Note:

- To use Dynamic Tiering to manage the user LUs and cluster management LU in an HDI system, the user LUs must be in a different pool from the cluster management LU.
- If you want to use V-VOLs for the HDI cluster management LU, use V-VOLs that are capable of full allocation.

Universal Volume Manager

Universal Volume Manager is a program product that provides storage virtualization for storage systems. When Universal Volume Manager is used, an external storage system connected to the storage system via a Fibre Channel interface can be treated as part of the storage system.

Before you use Universal Volume Manager, carefully read the *Hitachi Universal Volume Manager User's Guide (User Guide)*, and make sure that you understand the program functions.

You can also use Universal Volume Manager in conjunction with the HDI to make external storage system available to the storage system.

Note:

An external volume controlled by Universal Volume Manager can be used as a user LU in the HDI, but cannot be used as a system LU.

Note:

If you create an HDI file system in an external volume controlled by Universal Volume Manager, and the LU of the external storage system becomes unreachable due to an error in the external storage system or other reason, the file system will become blocked. To restore the blocked file system, first resolve the error in the external storage system, and then use Universal Volume Manager to unblock the external volume. The file system will be usable again after you restart the OS on the HDI.

Troubleshooting for the HDI Including External Storage System

In this section, the procedure to stop the external storage system on purpose for the maintenance and the procedure to recover the external storage system from the failure are described for the HDI system including the external storage system. This section consists of the following sections:

- [Stopping and Restarting External Storage System on Purpose on page 2-3](#)
- [Recovery Procedure in Case of Error in External Storage System on page 2-5](#)

Stopping and Restarting External Storage System on Purpose

[Figure 2-1 An Example of HDI System Configuration Including an External Storage System on page 2-4](#) shows an example of an HDI configuration

including an external storage system. The procedure to stop the external storage system on purpose for maintenance, and the procedure to restart the external storage system after the maintenance to restore the HDI system are described below, referring to the case of [Figure 2-1 An Example of HDI System Configuration Including an External Storage System on page 2-4](#).

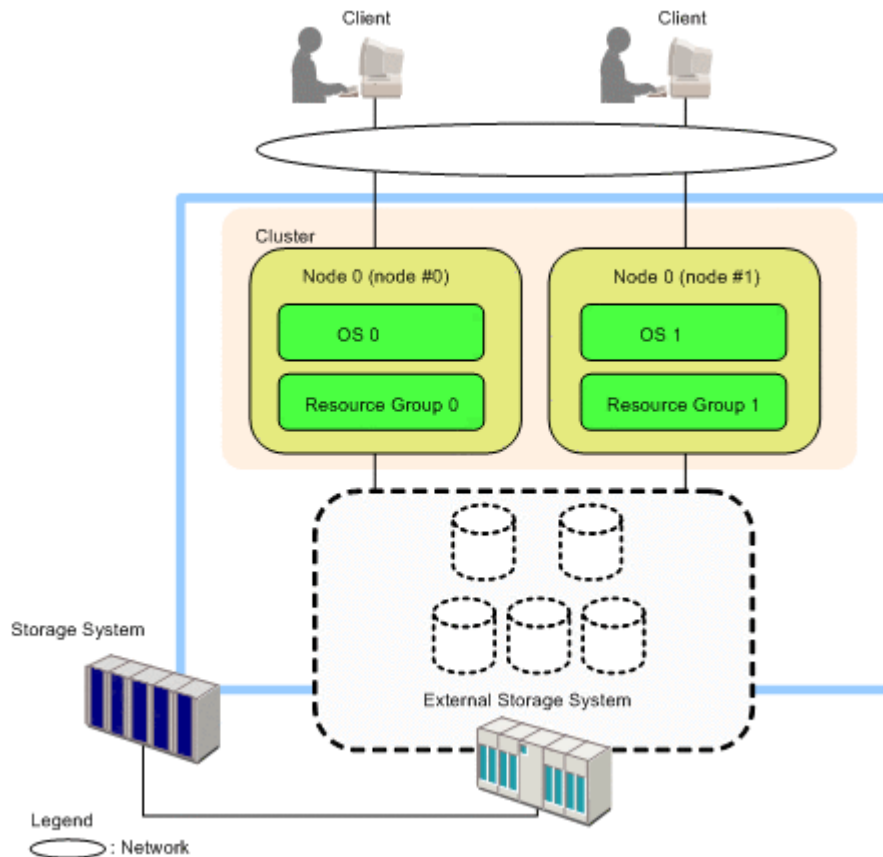


Figure 2-1 An Example of HDI System Configuration Including an External Storage System

Note:

When you need to stop the external storage system on purpose, execute the procedure according to the following description. If you execute the wrong procedure, an error occurs in the HDI system (e.g., the file system may be blocked, the status of resource group may become inappropriate).

To stop the external storage system on purpose:

1. Stop the accesses from the client.
2. Stop the cluster using File Services Manager.
3. Stop the OS 0 and the OS 1 using File Services Manager.
4. Disconnect the external storage system using Universal Volume Manager.
For the procedure to disconnect an external storage system, see the *Hitachi Universal Volume Manager User's Guide (User Guide)*.
5. Stop the external storage system.

For the procedure to stop an external storage system, see the *Hitachi Universal Volume Manager User's Guide (User Guide)*.

To restart the storage system and restore the HDI system

1. Turn the external storage system power supply on.
For the procedure to turn an external storage system power supply on, see the *Hitachi Universal Volume Manager User's Guide (User Guide)*.
2. Confirm that the status of the external storage system is normal.
3. Execute the `Check Paths & Restore Vol.` command using Universal Volume Manager to restore the path to the external storage system.
For the procedure to execute the `Check Paths & Restore Vol.` command, see the *Hitachi Universal Volume Manager User's Guide (User Guide)*.
4. Confirm that the connection between the storage system and the external storage system has become normal.
5. Start the OS 0 and the OS 1 using File Services Manager.
6. Start the cluster using File Services Manager.
7. Resume the accesses from the client.

Recovery Procedure in Case of Error in External Storage System

This section describes the recovery procedures in case when an error occurs in the external storage system that is in the HDI system. The recovery procedures are described using examples as follows.

- [In Case of Error in a Disk in the External Storage System on page 2-5](#)
- [In Case of Error in a Path to the External Storage System on page 2-7](#)
- [In Case of Error in All the Paths to the External Storage System on page 2-9](#)

In Case of Error in a Disk in the External Storage System

[Figure 2-2 In Case of Error in a Disk in the External Storage System on page 2-6](#) shows an example of the case when an error occurs in a disk in the external storage system. The situation of [Figure 2-2 In Case of Error in a Disk in the External Storage System on page 2-6](#) is as follows:

- The data itself that has been stored in the error disk of external storage system 1 cannot be restored. If you need to restore the data to the original disk after the recovery of the HDI system, the data should have been backed up in the disk other than the error disk.
- The clients cannot access the volumes of the error disk. The clients can only access the volumes other than the error disk.
- The storage system recognizes that the status of the file system and the volume of the error disk is blocked.

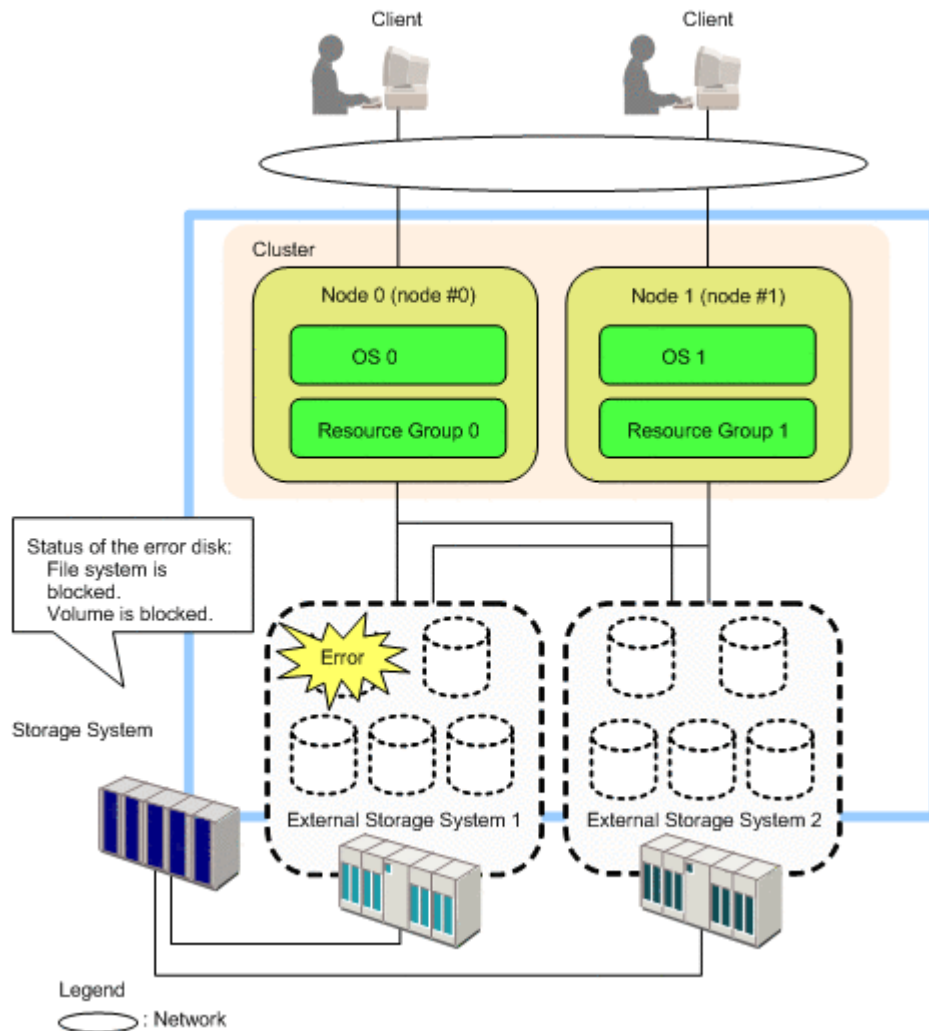


Figure 2-2 In Case of Error in a Disk in the External Storage System

The recovery procedure of the error such as [Figure 2-2 In Case of Error in a Disk in the External Storage System on page 2-6](#) is as follows:

1. Perform the following operations on the node 0.
 - Delete the NFS[®] share, CIFS share, and file system using File Services Manager.
2. Change the execution node of the resource group 0 to the node 1 using File Services Manager (failover).
If the status of the resource group 0 has been Offline, this operation is not required.
3. Stop the node 0 using File Services Manager.
4. Restart the OS 0 using File Services Manager.
5. Start the node 0 using File Services Manager.
6. Perform one of the following operations using File Services Manager.

- When the status of the resource group 0 has been Online, change the execution node of the resource group 0 to the node 0 (failback).
 - When the status of the resource group 0 has been Offline, start the resource group 0.
7. Perform the following operations on the node 1.
 - Delete the NFS[®] share, CIFS share, and file system using File Services Manager.
 8. Change the execution node of the resource group 1 to the node 0 using File Services Manager (failover).
If the status of the resource group 1 has been Offline, this operation is not required.
 9. Stop the node 1 using File Services Manager.
 10. Restart the OS 1 using File Services Manager.
 11. Start the node 1 using File Services Manager.
 12. Perform one of the following operations using File Services Manager.
 - When the status of the resource group 1 has been Online, change the execution node of the resource group 1 to the node 1 (failback).
 - When the status of the resource group 1 has been Offline, start the resource group 1.
 13. Change the error disk in the external storage system to restore the status of the external storage system.
 14. Execute the `Check Paths & Restore Vol.` command using Universal Volume Manager.
For the procedure to execute the `Check Paths & Restore Vol.` command, see the *Hitachi Universal Volume Manager User's Guide (User Guide)*.
 15. Perform the following operations on both of the node 0 and node 1.
 - Create the file system and then create the NFS[®] share and CIFS share using File Services Manager.
 16. Put back the backed up data to the restored disk of the external storage system if you have had the backed up data in the disk other than the error disk.

In Case of Error in a Path to the External Storage System

[Figure 2-3 In Case of Error in a Path to the External Storage System on page 2-8](#) shows an example of the case when an error occurs in a path between the storage system and an external storage system. In [Figure 2-3 In Case of Error in a Path to the External Storage System on page 2-8](#), an error occurs in the path between the storage system and the external storage system 1, however, the path between the storage system and the external storage system 2 is normal.

The situation of [Figure 2-3 In Case of Error in a Path to the External Storage System on page 2-8](#) is as follows:

- The clients cannot access the volumes of the external storage system 1, but they can access the volumes of the external storage system 2.
- The storage system recognizes that the status of all the file systems and volumes of the external storage system 1 are blocked.

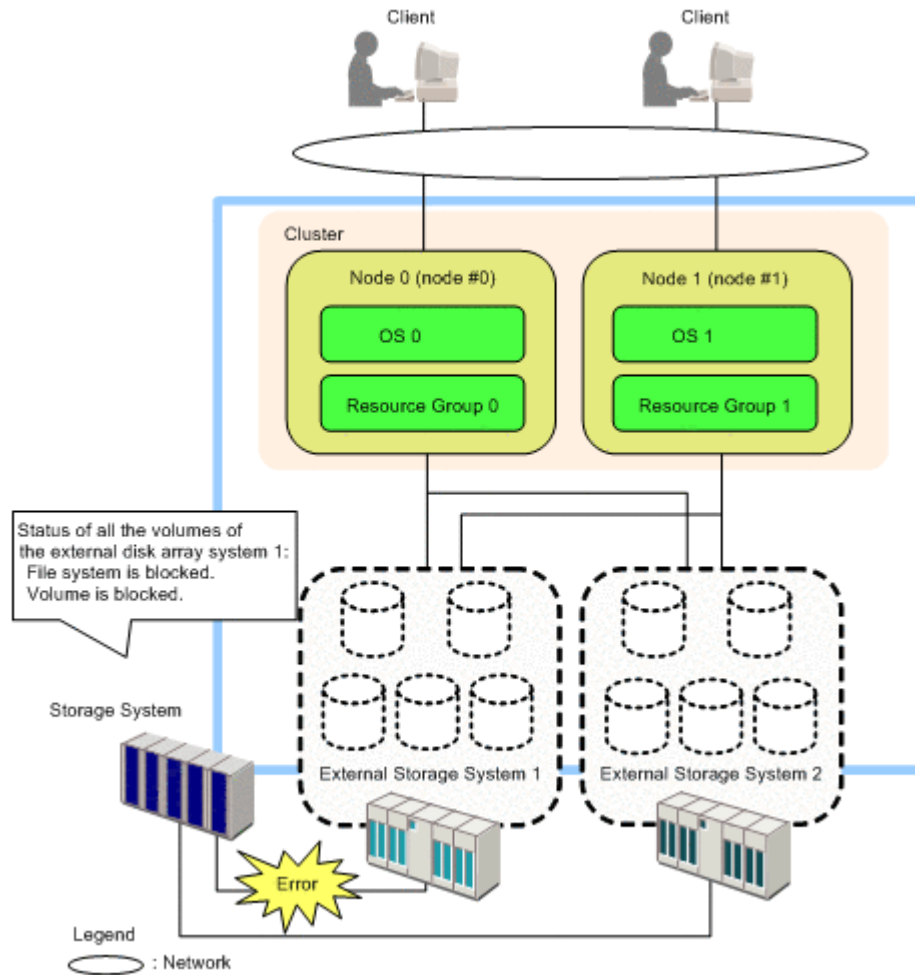


Figure 2-3 In Case of Error in a Path to the External Storage System

The recovery procedure of the error such as [Figure 2-3 In Case of Error in a Path to the External Storage System on page 2-8](#) is as follows:

1. Restore (e.g., checking the connection status of the cable, changing switch, and so on) the status of the error path between the storage system and the external storage system 1.
2. Execute the `Check Paths & Restore Vol.` command using Universal Volume Manager.
For the procedure to execute the `Check Paths & Restore Vol.` command, see the *Hitachi Universal Volume Manager User's Guide (User Guide)*.
3. Change the execution node of the resource group 0 to the node 1 using File Services Manager (failover).
If the status of the resource group 0 has been Offline, this operation is not required.

4. Stop the node 0 using File Services Manager.
5. Restart the OS 0 using File Services Manager.
6. Start the node 0 using File Services Manager.
7. Perform one of the following operations using File Services Manager.
 - When the status of the resource group 0 has been Online, change the execution node of the resource group 0 to the node 0 (failback).
 - When the status of the resource group 0 has been Offline, start the resource group 0.
8. Change the execution node of the resource group 1 to the node 0 using File Services Manager (failover).
If the status of the resource group 1 has been Offline, this operation is not required.
9. Stop the node 1 using File Services Manager.
10. Restart the OS 1 using File Services Manager.
11. Start the node 1 using File Services Manager.
12. Perform one of the following operations using File Services Manager.
 - When the status of the resource group 1 has been Online, change the execution node of the resource group 1 to the node 1 (failback).
 - When the status of the resource group 1 has been Offline, start the resource group 1.

In Case of Error in All the Paths to the External Storage System

The following subsections describe the recovery procedures with two examples of the case when the error occurs in all the paths connected to the external storage system.

- In cases where both nodes use different external storage systems
- In cases where both nodes use the same external storage system

In Case that Each Node Uses Different External Storage System

In the configuration of [Figure 2-4 In Case that Error Occurs on the Path to the External Storage System that is Used for Node 1 on page 2-10](#), all user LUs of the HDI system are the volumes of the external storage system. Each node uses the volume of different storage system. All user LUs of the node 0 are the volumes of the external storage system 1. Therefore, if an error occurs in the path between the storage system and the external storage system 1, this means that the error has occurred in all the paths connected from the node 0 to the external storage system 1. In this situation, no user LU is available for the node 0.

The situation of [Figure 2-4 In Case that Error Occurs on the Path to the External Storage System that is Used for Node 1 on page 2-10](#) is as follows:

- The HDI system attempts to change the execution node of the resource group 0 to the node 1 because no user LU can be used from node 0 (failover). However, the node 1 cannot access the volumes of the external

storage system 1, the processing of the failover function has failed, and **srmd executable error** is displayed as the error information of the resource group 0.

- The status of the file system is blocked on the node 1 because of the failure of the processing of the failover of the resource group 0.
- The clients cannot access the volumes of the external storage system 1, but they can access the volumes of the external storage system 2.
- The storage system recognizes that the status of all the file systems and volumes of the external storage system 1 are blocked.

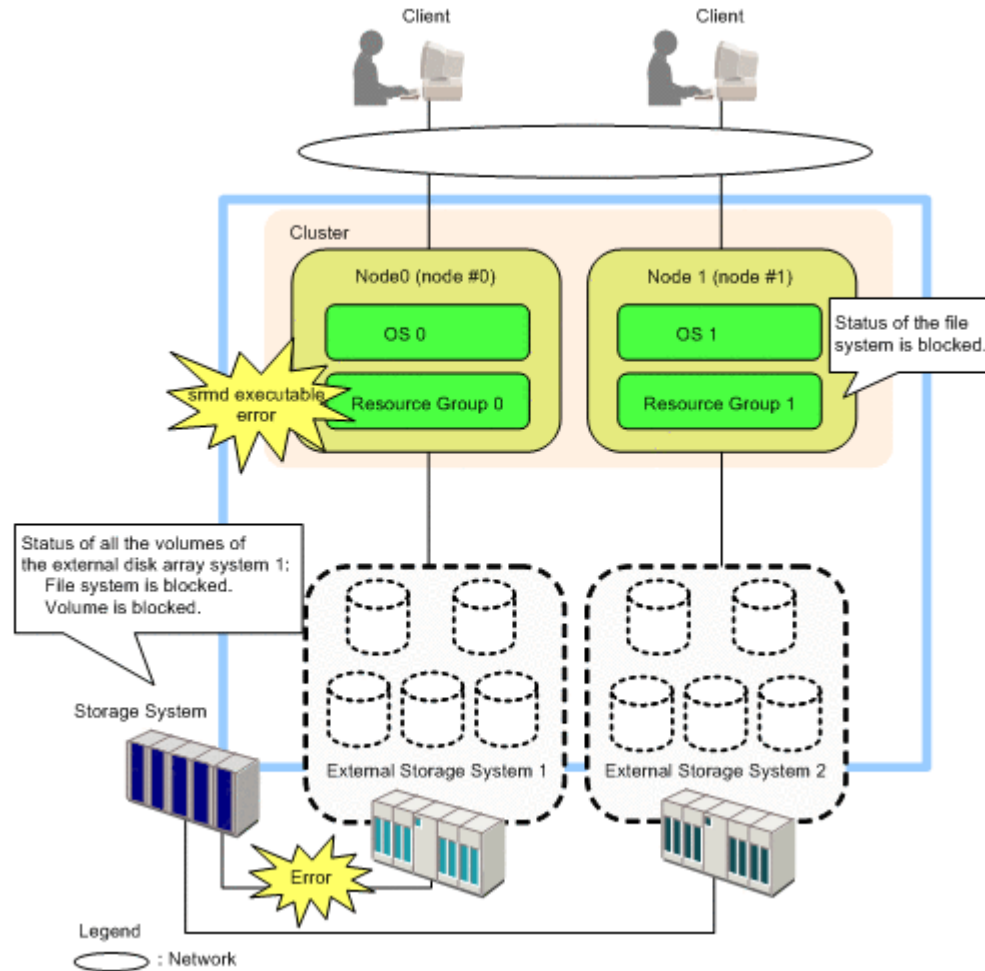


Figure 2-4 In Case that Error Occurs on the Path to the External Storage System that is Used for Node 1

The recovery procedure of the error such as [Figure 2-4 In Case that Error Occurs on the Path to the External Storage System that is Used for Node 1 on page 2-10](#) is as follows:

1. Restore (e.g., checking the connection status of the cable, changing switch, and so on) the status of the error path between the storage system and the external storage system 1.
2. Execute the `Check Paths & Restore Vol.` command using Universal Volume Manager.

For the procedure to execute the `Check Paths & Restore Vol.` command, see the *Hitachi Universal Volume Manager User's Guide (User Guide)*.

3. Perform a forced stop operation using File Services Manager for the resource group 0 for which the status is displayed as **srmd executable error**.
4. Stop the node 0 using File Services Manager.
5. Restart OS 0 using File Services Manager.
6. Start the node 0 using File Services Manager.
7. Release the blocked status of the file system of the node 1.
To release the blocked status of the file system of the node 1, perform the operations in the following order:
 - a. Change the execution node of the resource group 1 to the node 0 using File Services Manager (failover).
 - b. Restart the OS 1 using File Services Manager.
 - c. Change the execution node of the resource group 1 to the node 1 (failback).
8. Start the resource group 0 on the node 0 using File Services Manager.

In Case that Both Nodes Use the Same External Storage System

In the configuration of [Figure 2-5 In Case that Both Nodes Use the Same External Storage System on page 2-12](#), all user LUs of the HDI system are the volumes of the external storage system. Only one external storage system is connected to the storage system. Also only one path is set between the storage system and the external storage system. In this case, if an error has occurred in the only set path, all the volumes in the external storage system cannot be used.

Note:

In the configuration such as [Figure 2-5 In Case that Both Nodes Use the Same External Storage System on page 2-12](#), setting alternate paths is recommended to prevent the HDI system to be blocked because of the path failure. For detailed information about the alternate paths, see the *Hitachi Universal Volume Manager User's Guide (User Guide)*.

The situation of [Figure 2-5 In Case that Both Nodes Use the Same External Storage System on page 2-12](#) is as follows:

- All user LUs cannot be used neither from the node 0 nor the node 1.
- The clients cannot access the volumes.
- The storage system recognizes that the status of all the file systems and volumes are blocked.

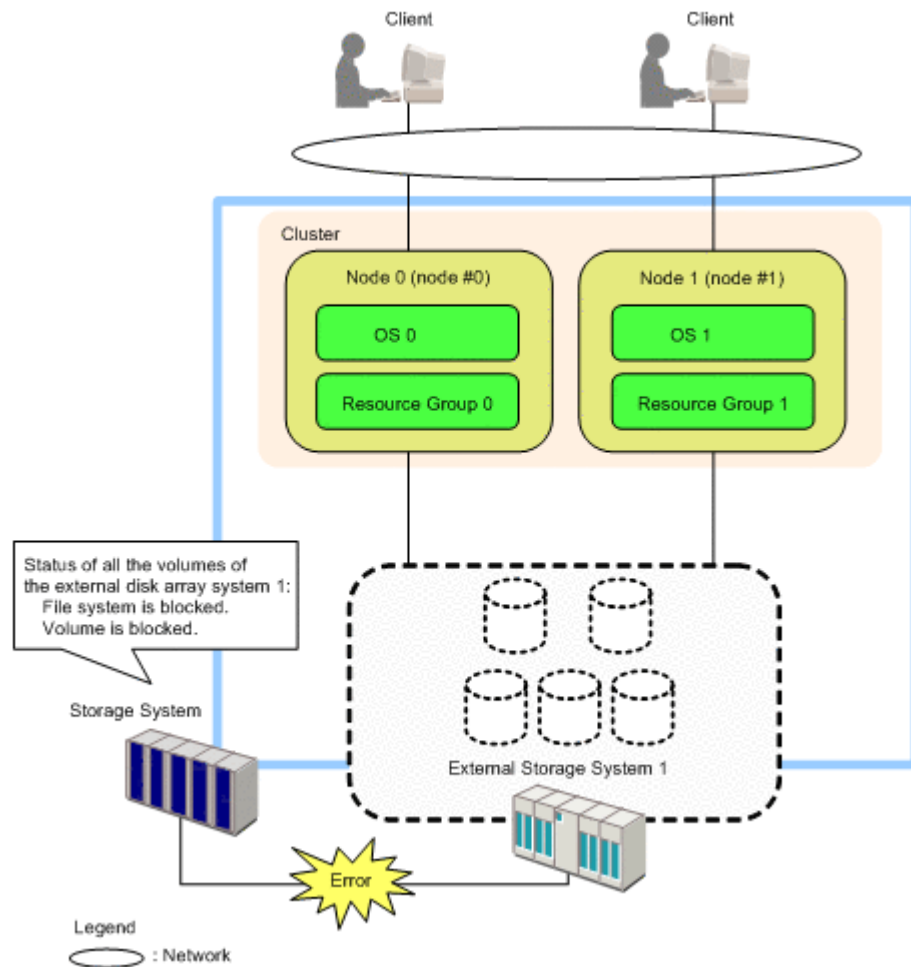


Figure 2-5 In Case that Both Nodes Use the Same External Storage System

The recovery procedure of the error such as [Figure 2-5 In Case that Both Nodes Use the Same External Storage System on page 2-12](#) is as follows:

1. Restore (e.g., checking the connection status of the cable, changing switch, and so on) the status of the error path between the storage system and the external storage system 1.
2. Execute the `Check Paths & Restore Vol.` command using Universal Volume Manager.
For the procedure to execute the `Check Paths & Restore Vol.` command, see the *Hitachi Universal Volume Manager User's Guide (User Guide)*.
3. Perform the forced stop operations using File Services Manager for both of the resource group 0 and resource group 1.
4. Stop the cluster using File Services Manager.
5. Restart OS 0 and OS 1 using File Services Manager.
6. Start the cluster using File Services Manager.
7. Start both of the resource group 0 and resource group 1 using File Services Manager.

Volume Migration

Volume Migration is a program product that helps you eliminate system bottlenecks by distributing the load concentrated on a specific disk or processor to other disks or processors in a storage system. If the usage statistics collected by Performance Monitor show that the access load is concentrated on a specific hard disk drive, the system administrator can use Volume Migration to distribute the load to another drive.

Before you use Volume Migration, carefully read the *Hitachi Performance Manager User's Guide (User Guide)* and the *Hitachi Volume Migration User Guide* for VSP, VSP G1000, VSP Fx00 models, VSP Gx00 models, and HUS VM, and make sure that you understand the program functions.

Volume Migration also works with user LUs in the HDI.

You can use Volume Migration in conjunction with Universal Volume Manager. When Universal Volume Manager is used to map volumes on an external storage system to internal volumes, you can check the usage of the volumes on the external storage system (external volumes), and of the external volume groups that contain these volumes.

Note:

In the HDI, only user LUs can be used with Volume Migration. System LUs are excluded.

Volume Shredder

Volume Shredder is a software product that erases all of the data in a volume in storage system. Data erased by this software cannot be recovered.

Before using the Volume Shredder functionality, make sure you understand it by carefully reading the *Virtual LVI/LUN & Volume Shredder User's Guide* for USP V/VM or the *Hitachi Volume Shredder User Guide* for VSP, VSP G1000, VSP Fx00 models, VSP Gx00 models, and HUS VM.

Volume Shredder can be used to completely erase volumes used in the HDI.

Note:

When Volume Shredder is used to erase data from a system LU or user LU used in the HDI, the erased data can never be recovered. Exercise adequate caution before erasing the data.

Encryption License Key

Encryption License Key is a program product used to encrypt data on storage system volumes. By encrypting data, information leaks can be prevented in the event that a storage system or hard disk in the storage system is swapped out (and accidentally used for another purpose) or stolen.

Please read the *Encryption License Key User's Guide (User Guide)* before using any Encryption License Key functionality.

Volumes used by HDI can be encrypted by using the Encryption License Key.

Resource Management Functions

HDI can be connected and used with a storage system configured using the resource management functionality provided by storage system.

- ☐ [Storage Navigator](#)
- ☐ [LUN Manager](#)
- ☐ [Configuration File Loader](#)
- ☐ [Virtual Partition Manager](#)

Storage Navigator

Storage Navigator is a program product for remotely operating storage system.

Before you use Storage Navigator, you must first prepare an environment that allows use of the Web browser specified for use with storage system.

Using Storage Navigator, you can perform settings and operations in the following program products:

- Configuration File Loader (for USP V/VM, VSP, and HUS VM only)
- Dynamic Provisioning
- Encryption License Key
- LUN Manager
- Performance Monitor
- Universal Volume Manager
- Virtual Partition Manager
- Volume Migration
- Volume Shredder

LUN Manager

LUN Manager is a program product that helps you build a storage environment using storage system.

Before you use LUN Manager, carefully read the *Hitachi LUN Manager User's Guide* for USP V/VM, the *Provisioning Guide for Open Systems* for VSP and VSP G1000, or the *Provisioning Guide* for VSP Fx00 models, VSP Gx00 models, and HUS VM, and make sure that you understand the program functions.

LUN Manager can be used with the HDI to perform the following tasks:

Installing the HDI

- Create a host group for a Fibre-channel port to which a node connects
- Assign an LU to a created host group

Adding an LU used by the HDI

- Add a host group to a Fibre-channel port to which a node is connected
- Add an LU to a registered host group

Note:

The HDI allows you to create an alternate path if the LU path should become unavailable for some reason. To ensure that the alternate path behaves correctly, configure the host group and its LUs in advance in storage system so that they can use the alternate path.

Note:

The HDI allows you to set a cluster encompassing the two nodes node0 and node1. To ensure that the cluster works correctly, configure the host group and its LUs in advance in the storage system so that the cluster can be used.

Configuration File Loader

Configuration File Loader is a program product that allows you to define the configuration information for storage system in a single file, thus allowing for the batch setting of configuration information. (Configuration File Loader supports only the following: USP V/VM, VSP, and HUS VM.)

Before you use the Configuration File Loader functionality, carefully read the *Hitachi Storage Navigator User's Guide (User Guide)* and the *Hitachi LUN Manager User's Guide* for USP V/VM, the *Hitachi System Operations Using Spreadsheets* for VSP and HUS VM, and make sure that you understand the program functions.

Configuration File Loader outputs the configuration information as a spreadsheet. You can then use spreadsheet software or a text editor to define or edit the configuration for storage system.

In a storage system to which a node used by the HDI connects, you can use Configuration File Loader to configure the host group used by the node and the LUs allocated to that host group as a batch.

The LUN Manager provided with Storage Navigator can also be used to configure storage system. LUN Manager is useful when defining or changing individual settings. However, Configuration File Loader, because it loads the entire configuration as one file, is more useful in situations that require batch processing, such as when you create or modify settings on a large scale.

Virtual Partition Manager

Virtual Partition Manager is a program product that enables logical partitioning of the resources of storage system. Virtual Partition Manager provides cache partitioning and storage administration partitioning functionality.

The cache partitioning functionality allows you to create multiple units of virtual cache from the storage system cache memory, which can be allocated among the hosts in the system. This means that when a specific host has a high I/O workload, it does not have a negative impact on the I/O performance of the other hosts in the system.

The storage administration partitioning functionality allows you to partition a single USP V/VM storage system into multiple virtual storage system. Because the administrator of a given virtual storage system is prevented from accessing the resources in another, there is no danger of data being destroyed or disclosed by the administrators of other virtual storage system.

Before you use Virtual Partition Manager, carefully read the *Hitachi Virtual Partition Manager User's Guide (User Guide)*, and make sure that you understand the program functions.

HDI can be used in conjunction with the Virtual Partition Manager provided by storage system.

Cache partitioning

When one storage system is shared among a large number of hosts including the host running the HDI, a large proportion of the storage system cache memory may be occupied by a specific host as it handles a large amount of data. Such a situation may cause a reduction in write speeds, as other hosts will need to wait for their turn to write to the cache.

The cache partitioning functionality of Virtual Partition Manager partitions the storage system cache memory into multiple units of virtual cache memory. Because each host is allocated a specific amount of cache memory, you can avoid situations in which one host uses more than its fair share.

Each unit of virtual cache memory created by the cache partitioning functionality is called a CLPR (Cache Logical Partition).

Storage administration partitioning

USP V/VM can be shared among multiple organizations (for example a number of different businesses, or different departments within the same business). This means that administrators from different organizations share access to a single storage system. If an administrator from one organization inadvertently destroys a volume belonging to another organization, or misuses the storage system in a way that affects another organization's data, management of the storage system as a whole can become quite difficult and contentious.

The storage administration partitioning functionality of Virtual Partition Manager divides the resources (ports and CLPRs) of a single USP V/VM storage system into multiple virtual storage system, each of which can only be accessed by its administrator. This means that there is no danger of an administrator destroying or disclosing data in a volume belonging to another organization.

The virtual storage system created by dividing the storage system are called SLPRs (Storage Management Logical Partitions).

Note:

When using HDI in conjunction with the cache partitioning functionality of Virtual Partition Manager, make sure that the storage system LUs used by the node pair that makes up the HDI cluster are in the same CLPR defined on the storage system device.

Note:

When using HDI in conjunction with the Storage administration partitioning functionality of Virtual Partition Manager, make sure that the

USP V/VM LUs used by the node pair that makes up the HDI cluster are in the same SLPR defined on the USP V/VM.

Performance Management Functions

The HDI can be used in conjunction with the performance management functionality provided by storage system.

- [Performance Monitor](#)

Performance Monitor

Performance Monitor is a program product that collects information about the utilization of resources such as hard disk drives, logical volumes and processors built into the storage system.

Before you use Performance Monitor, carefully read the *Hitachi Performance Monitor User's Guide (User Guide)*, and make sure that you understand the program functions.

Using Performance Monitor, you can also monitor disk workloads and traffic between a host and a storage system. In the Performance Monitor windows, resource utilization, loading, and traffic patterns are displayed in the form of line graphs. The system administrator can use the information displayed in Performance Monitor to analyze trends in disk access or identify when I/O access is busiest.

When using the HDI, you can use Performance Monitor with storage system to view information about utilization of resources such as hard disk drives, logical volumes, and processors used by the HDI.

Acronyms

This section lists the acronyms used in the HDI manuals.

- ☐ [Acronyms used in the HDI manuals.](#)

Acronyms used in the HDI manuals.

Following acronyms used in the HDI manuals.

ABE	Access Based Enumeration
ACE	access control entry
ACL	access control list
AJP	Apache JServ Protocol
API	application programming interface
ARP	Address Resolution Protocol
ASCII	American Standard Code for Information Interchange
ASN	Abstract Syntax Notation
BDC	Backup Domain Controller
BMC	baseboard management controller
CA	certificate authority
CHA	channel adapter
CHAP	Challenge-Handshake Authentication Protocol
CIFS	Common Internet File System
CIM	Common Information Model
CLI	command line interface
CPU	central processing unit
CSR	certificate signing request
CSV	comma-separated values
CTL	controller
CU	control unit
CV	custom volume
DACL	discretionary access control list
DAR	Direct Access Recovery
DB	database
DBMS	database management system
DC	domain controller
DDNS	Dynamic Domain Name System
DEP	data execution prevention
DES	Data Encryption Standard
DFS	distributed file system
DHCP	Dynamic Host Configuration Protocol
DIMM	dual in-line memory module

DLL	dynamic-link library
DN	distinguished name
DNS	Domain Name System
DOM	Document Object Model
DOS	Disk Operating System
DRAM	dynamic random access memory
DSA	digital signal algorithm
DTD	Document Type Definition
ECC	error-correcting code
EUC	Extended UNIX Code
FC	Fibre Channel
FIB	forwarding information base
FIFO	First In, First Out
FQDN	fully qualified domain name
FTP	File Transfer Protocol
FV	Fixed Volume
FXP	File Exchange Protocol
GbE	Gigabit Ethernet
GID	group identifier
GMT	Greenwich Mean Time
GPL	GNU General Public License
GUI	graphical user interface
HBA	host bus adapter
H-LUN	host logical unit number
HPFS	High Performance File System
HSSO	HiCommand single sign-on
HTML	HyperText Markup Language
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
I/O	input/output
ICAP	Internet Content Adaptation Protocol
ICMP	Internet Control Message Protocol
ID	identifier
IP	Internet Protocol
IP-SW	IP switch

JDK	Java Development Kit
JIS	Japanese Industrial Standards
JSP	JavaServer Pages
KDC	Key Distribution Center
LACP	Link Aggregation Control Protocol
LAN	local area network
LBA	logical block addressing
LCD	Local Configuration Datastore
LDAP	Lightweight Directory Access Protocol
LDEV	logical device
LDIF	LDAP Data Interchange Format
LDKC	logical disk controller
LED	light-emitting diode
LF	Line Feed
LTS	long term support
LU	logical unit
LUN	logical unit number
LUSE	logical unit size expansion
LVI	Logical Volume Image
LVM	Logical Volume Manager
MAC	Media Access Control
MD5	Message-Digest algorithm 5
MIB	management information base
MMC	Microsoft Management Console
MP	microprocessor
MSS	maximum segment size
MTU	maximum transmission unit
NAS	Network-Attached Storage
NAT	network address translation
NDMP	Network Data Management Protocol
NetBIOS	Network Basic Input/Output System
NFS	Network File System
NIC	network interface card
NIS	Network Information Service
NTFS	New Technology File System

NTP	Network Time Protocol
OID	object identifier
ORB	object request broker
OS	operating system
PAP	Password Authentication Protocol
PC	personal computer
PCI	Peripheral Component Interconnect
PDC	Primary Domain Controller
PDU	protocol data unit
PID	process identifier
POSIX	Portable Operating System Interface for UNIX
PP	program product
RADIUS	Remote Authentication Dial In User Service
RAID	Redundant Array of Independent Disks
RAM	random access memory
RAS	Reliability Availability Serviceability
RCS	Revision Control System
RD	relational database
RFC	Request for Comments
RID	relative identifier
RPC	remote procedure call
RSA	Rivest, Shamir, and Adleman
SACL	system access control list
SAN	storage area network
SAS	Serial Attached SCSI
SATA	serial ATA
SAX	Simple API for XML
SCSI	Small Computer System Interface
SFTP	SSH File Transfer Protocol
SHA	secure hash algorithm
SID	security identifier
SJIS	Shift JIS
SLPR	Storage Logical Partition
SMB	Server Message Block
SMD5	Salted Message Digest 5

SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOAP	Simple Object Access Protocol
SP	service pack
SSD	solid-state drive
SSH	Secure Shell
SSHA	Salted Secure Hash Algorithm
SSL	Secure Sockets Layer
SSO	single sign-on
SVGA	Super Video Graphics Array
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
TOS	type of service
TTL	time to live
UAC	User Account Control
UDP	User Datagram Protocol
UID	user identifier
UNC	Universal Naming Convention
UPnP	Universal Plug and Play
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UTC	Coordinated Universal Time
UTF	UCS Transformation Format
VDEV	Virtual Device
VLAN	virtual LAN
VLL	Virtual LVI/LUN
WADL	Web Application Description Language
WAN	wide area network
WINS	Windows Internet Name Service
WORM	Write Once, Read Many
WS	workstation
WWN	World Wide Name
WWW	World Wide Web
XDR	External Data Representation
XFS	extended file system

XML	Extensible Markup Language
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