

Hitachi Data Ingestor

6.4.0

Array Features Administrator's Guide for Hitachi AMS2000/HUS100 series

This administrator's guide provides instructions for using the Hitachi AMS 2000 series and HUS 100 series storage system features with Hitachi Data Ingestor.

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Preface

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

- Hitachi AMS2000 series
- HUS100 series

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

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

This manual does not apply if a single node configuration is used.

This preface includes the following information:

- ☐ [Intended Audience](#)
- ☐ [Product version](#)
- ☐ [Release Notes](#)
- ☐ [Organization of HDI manuals](#)
- ☐ [Referenced documents](#)
- ☐ [Document conventions](#)
- ☐ [Convention for storage capacity values](#)
- ☐ [Accessing product documentation](#)
- ☐ [Getting help](#)

□ [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 disk array system.

This document assumes the following:

- The user has a background in data processing and understands RAID systems and their basic functions.
- The user is familiar with the Hitachi AMS2000 series or HUS100 series disk array system.
- 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-90HDI002	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 operation, as well as the environment settings for an external server.
<i>Hitachi Data Ingestor Cluster Getting Started Guide</i> , MK-90HDI001	This manual explains how to set up an HDI system in a cluster configuration.
<i>Hitachi Data Ingestor Cluster Administrator's Guide</i> , MK-90HDI038	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</i> , MK-90HDI029	This manual provides troubleshooting information for HDI systems in a cluster configuration.

Manual name	Description
<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, MK-90HDI036</i>	This manual explains how to use program products that support storage systems of the Hitachi Universal Storage Platform V, Hitachi Universal Storage Platform VM, Hitachi Virtual Storage Platform, Hitachi Virtual Storage Platform G1000, Hitachi Virtual Storage Platform G200, Hitachi Virtual Storage Platform G400, Hitachi Virtual Storage Platform G600, Hitachi Virtual Storage Platform G800, Hitachi Virtual Storage Platform F400, Hitachi Virtual Storage Platform F600, Hitachi Virtual Storage Platform F800 or the Hitachi Unified Storage VM series.
<i>Hitachi Data Ingestor Array Features Administrator's Guide for Hitachi AMS2000/HUS100 series (This manual)</i>	This manual explains how to use program products that support storage systems of the Hitachi AMS2000 series or the HUS100 series.

Referenced documents

Hitachi AMS2000 series or HUS100 series

- Hitachi Adaptable Modular Storage Modular Volume Migration User's Guide (for AMS2000 series)
- Hitachi Cache Partition Manager User's Guide
- Hitachi Dynamic Provisioning User's Guide

- Hitachi LUN Manager User's Guide
- Hitachi Performance Monitor User's Guide
- Hitachi Storage Navigator Modular 2 Command Line Interface (CLI) User's Guide
- Hitachi Storage Navigator Modular 2 Graphical User Interface (GUI) User's Guide
- Hitachi Unified Storage 100 Dynamic Tiering User's Guide (for HUS 100 series)
- Hitachi Unified Storage 100 Modular Volume Migration User's Guide (for HUS 100 series)

Document conventions

This document uses the following typographic conventions:

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: <i>copy source-file target-file</i> <i>Note:</i> Angled brackets (<>) are also used to indicate variables.
screen/code	Indicates text that is displayed on screen or entered by the user. Example: # <code>pairdisplay -g oradb</code>
< > angled brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: # <code>pairdisplay -g <group></code> <i>Note:</i> Italic font is also used to indicate variables.

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

Capacity Unit	Physical Value	Logical Value
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](#) 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.

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Thank you!

Introduction

This chapter provides an overview of this manual

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

The program products for the disk array system provide a rich variety of functions that can be used in conjunction with the HDI.

This manual describes the features, precautions, and restrictions that apply when the functionality of the program products supplied with the mid-range Hitachi AMS2000 series or HUS100 series disk array systems are deployed on the HDI.

For details about the functions and operation of the program products supplied with the Hitachi AMS2000 series or HUS100 series, see the User's Guide for your Hitachi AMS2000 series or HUS100 series.

□ [Supported Program Products](#)

Supported Program Products

The HDI functionality provided by HDI can be used in conjunction with the functions of the various program products supported by disk array system.

The following program products are supported by HDI . For operating procedures and cautionary notes, see [Chapter 2, Volume Management Functions on page 2-1](#) onward.

- Program product for using volume management functions
 - Dynamic Provisioning
 - Dynamic Tiering
- Program products for using resource management functions
 - Hitachi Storage Navigator Modular 2
 - LUN Manager
 - LUN Expansion
 - Cache Partition Manager
 - Performance Monitor

Volume Management Functions

HDI can use Hitachi AMS2000 series or HUS100 series volume management functions to connect to and use a configured disk array system.

- ☐ [Dynamic Provisioning](#)
- ☐ [Dynamic Tiering](#)
- ☐ [Modular Volume Migration](#)

Dynamic Provisioning

Dynamic Provisioning is a program product that makes it possible to decrease the costs associated with introducing Hitachi AMS2000 series or HUS100 series disk array systems and managing volumes in Hitachi AMS2000 series or HUS100 series disk array systems. The costs associated with introducing and managing a Hitachi AMS2000 series or HUS100 series disk array system are decreased by using virtual volumes (virtual VOLs).

Before you use Dynamic Provisioning, carefully read the *Dynamic Provisioning User's Guide*, and make sure that you have a good understanding of the program functions.

If you use HDI with Dynamic Provisioning and if you configure the volumes to be used by HDI as virtual VOLs, you can both decrease the costs associated with introducing the system and eliminate the need to re-create file systems when there is not enough storage capacity. As such, both downtime and management costs due to interruptions in operation can be reduced.

Note:

- If you use a Dynamic Provisioning virtual VOL to create an HDI file system, the file system will be blocked if the threshold of the pool VOL is exceeded. Be sure to consider this when deciding on the threshold for a pool VOL. If the threshold value is exceeded, immediately add another drive to increase the capacity of the pool VOL so that the threshold value of the pool VOL is no longer exceeded.
- When using a virtual volume for an HDI shared LU, use a virtual volume for which the full capacity mode is enabled.
- To monitor the threshold value of a pool VOL, you must configure an SNMP trap to be sent out when the threshold value is exceeded.
- Before using the Dynamic Provisioning functions in an HDI, set the **DP Depletion Detail Reply** option to **ON** in Hitachi Storage Navigator Modular 2. For details about the setting, see the *Hitachi Storage Navigator Modular 2 (for GUI) User's Guide*.

Dynamic Tiering

Dynamic Tiering is a program that helps reduce storage costs in HUS100 series disk array systems. 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 *Hitachi Unified Storage 100 Dynamic Tiering User's Guide*.

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:

When using a virtual volume for an HDI shared LU, use a virtual volume for which the full capacity mode is enabled.

Modular Volume Migration

Modular 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 Modular Volume Migration, carefully read the *Hitachi Performance Monitor User's Guide* and the *Hitachi Modular Volume Migration User's Guide*, and make sure that you understand the program functions.

Volume Migration also works with user LUs in the HDI.

Note:

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

Resource Management Functions

HDI can be connected and used with a disk array system configured using the resource management functionality provided by Hitachi AMS2000 series or HUS100 series.

This chapter consists of the following sections:

- ☐ [Hitachi Storage Navigator Modular 2](#)
- ☐ [Notes on LUN Manager and LU Management](#)
- ☐ [LUN Expansion](#)
- ☐ [Cache Partition Manager](#)

Hitachi Storage Navigator Modular 2

Hitachi Storage Navigator Modular 2 is a program product for remotely operating Hitachi AMS2010/2100/2300/2500 or HUS110/130/150.

Before you use Hitachi Storage Navigator Modular 2, carefully read the *Hitachi Storage Navigator Modular 2 (for GUI) User's Guide* and *Hitachi Storage Navigator Modular 2 (for CLI) User's Guide*, and make sure that you have a good understanding of the program functions.

To perform Hitachi Storage Navigator Modular 2 operations via the GUI, you must first install the program on the workstations, PCs, and server, as described in the *Hitachi Storage Navigator Modular 2 (for GUI) User's Guide*. You must then connect the workstations, PCs, and servers on which you installed Hitachi Storage Navigator Modular 2 to the Hitachi AMS2000 series or HUS100 series disk array systems via a LAN.

To perform Hitachi Storage Navigator Modular 2 operations via the CLI, you must first install the program on the workstations, PCs, and server, as described in the *Hitachi Storage Navigator Modular 2 (for CLI) User's Guide*. You must then connect the workstations, PCs, and servers on which you installed Hitachi Storage Navigator Modular 2 to the Hitachi AMS2000 series or HUS100 series disk array systems via a LAN.

Using Hitachi Storage Navigator Modular 2, you can perform settings and operations in the following program products:

- Cache Partition Manager
- Dynamic Provisioning
- Dynamic Tiering
- LUN Expansion
- LUN Manager
- Performance Monitor

Notes on LUN Manager and LU Management

LUN Manager is a program product that helps you build a storage environment using Hitachi AMS2000 series or HUS100 series.

Before you use LUN Manager, carefully read the *Hitachi LUN Manager User's Guide*, 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 an node connects
- Add an LU and assign an H-LUN to a created host group

Adding an LU used by the HDI

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

Notes on Assigning an H-LUN to a User LU

To a user LU, assign the same H-LUN to all the host groups to which the HDI is connected.

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 disk array system so that the cluster can be used.

Ensure two LU paths from each node for a user LU. If three or more LU paths are set from an node, the message is displayed that the settings are not correct when the HDI recognizes the LU.

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 the disk array system so that they can use the alternate path.

Notes on Reusing User LU Previously Used by HDI

For reusing a user LU, which has been used by the HDI, for any of the following purposes, release the H-LUN assigned to the user LU in advance.

- For changing a user LU that has been used by the HDI to a DM-LU in the disk array system
- For changing a user LU that has been used by the HDI to a pool in the disk array system
- For changing a user LU that has been used by the HDI to a command device in the disk array system
- For integrating user LUs that have been used by the HDI by using LUN Expansion, and reusing them (refer to [LUN Expansion on page 3-3](#)).

If a user LU is reused without releasing an H-LUN assigned to the user LU, the LU creation function of the HDI might not work correctly.

LUN Expansion

LUN Expansion is a program product for integrating any two LUs created in a Hitachi AMS2000 series or HUS100 series disk array system so that they are recognized by the higher-level device as a single LU.

The LUN Expansion functionality lets you concatenate multiple LUs (two or more LUs), even if they are in different parity groups. For example, when

there is insufficient capacity to expand an LU, its size can be increased by concatenation with an LU that is no longer required. This allows you to utilize redundant LUs and overcome capacity constraints. When additional disk drives are installed, you can define new parity groups and LUs utilizing the additional drive capacity, and integrate those LUs with existing LUs using LUN Expansion.

The server recognizes the concatenated LUs as a single LU, but in reality the multiple LUs simply look like one LU.

The LUN Expansion functionality can be configured and executed from Hitachi Storage Navigator Modular 2.

Note:

- When using LUN Expansion in conjunction with the HDI, first define the size of the LUs (LDEVs) using the LUN Expansion functionality, and then have the LU sizes recognized by the HDI. If you need to subsequently change the size of those LUs, you must restart the OS on the HDI. You must also reconfigure any file system configured in the HDI.
- For the HDI to use the LUs that are integrated by using LUN Expansion, firstly release the H-LUNs assigned to the LUs before the integration.
- For integrating the LUs of which a file system has already been created into a new LU by using LU Expansion after starting the operation of the HDI, check the notes described in [Notes on Assigning an H-LUN to a User LU on page 3-3](#), and then assign H-LUNs to the LUs before or after then integration.
- For integrating LUs to each of which an H-LUN0 has been assigned, ensure that an H-LUN0 is assigned to an integrated LU. Furthermore, do not reboot the OS when there is no LU to which an H-LUN has been assigned.
For integrating LUs to each of which an H-LUN0 has been assigned, Hitachi recommends that you terminate the HDI temporarily, and reboot the HDI system when LU integration and LU path resetting has been completed.

Cache Partition Manager

About Cache Partition Manager

Cache Partition Manager is a program product that enables partitioning of the user data area in the disk array system cache memory.

HDI can be used in conjunction with the Cache Partition Manager provided by disk array system.

Before you use Cache Partition Manager, carefully read the *Hitachi Cache Partition Manager User's Guide*, and make sure that you understand the

program functions. You also read the *Hitachi Cache Partition Manager User's Guide* for details about settings of Cache Partition Manager.

Merit of Cache Partition Manager

The cache memory area partitioned by using Cache Partition Manager is called a partition. Assigning the partition to the LUs defined for disk array system enables to use the partition as the cache memory area for the LU. It can also prevent to interfere with each other while the cache memory is used. Moreover, it can avoid to affect performance by the inequality of the used amount of the cache memory.

You can specify the size of each partition, and also modify the partition segment size (size of each data management unit). Thus, you can optimize the sending and receiving of data from HDI of disk array system, by allocating the most appropriate partition size and segment size to each LU according to the type of data to be stored by using HDI.

Even if the pinned data (the data failed to be written to a disk drive) is generated when the partition is defined by using Cache Partition Manager, the extent of the impact in the recovery operation can be limited within the partition allocated in LU that a disk drive concerned belongs, and can decrease the influence on LU that belongs to other partitions.

Examples of How Cache Partition Manager is Used

Coexisting with SAS Drives and SATA Drives

When the LUs that store the file system on the SAS drives and the SATA drives coexist, providing the partitions for the LU on the SAS drives and the SATA drives makes the performance of the SAS drives less likely to be affected by the SATA drives.

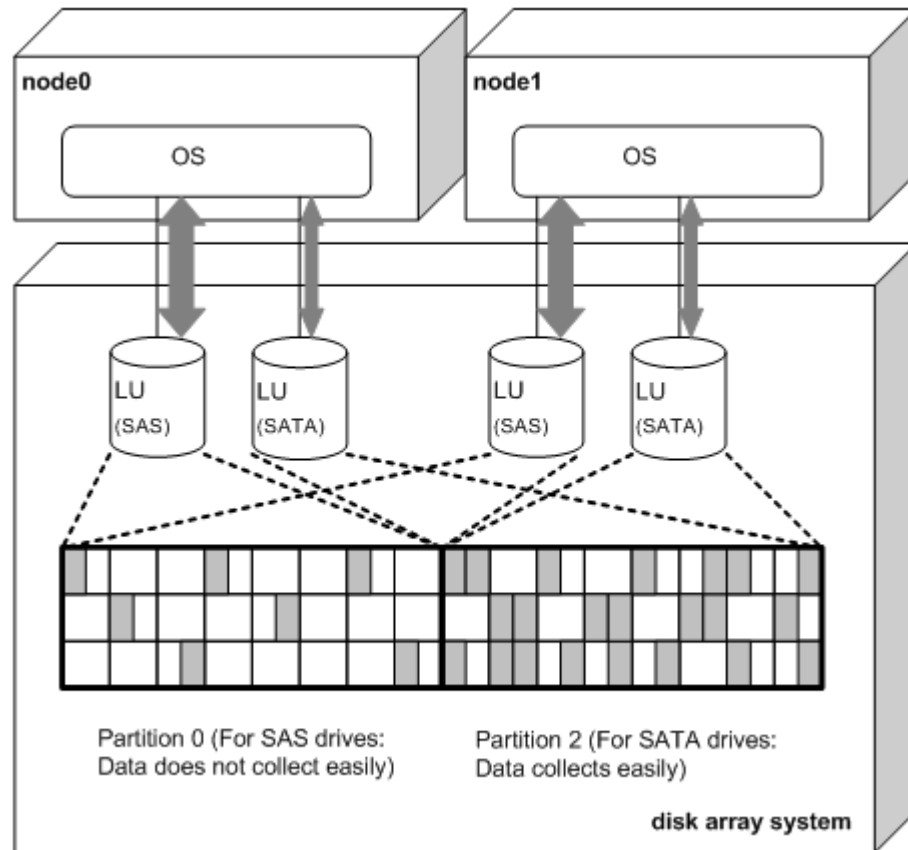


Figure 3-1 Example of How Cache Partition Manager is Used when SAS Drives and SATA Drives coexist

Connecting HDI and Another Host to One disk array system at the Same Time

If Cache Partition Manager is not used when HDI and another host are connected to one disk array system, HDI and another host will share the user data area on one cache memory.

In this case, if the I/O load between the host other than HDI and disk array system is very high, the hosts other than HDI use the majority of the cache memory. As a result, the I/O speed between the HDI and disk array system will slow because the cache memory area that can be used by HDI will be insufficient. On the other hand, if the I/O load between HDI and disk array system is very high, the I/O speed between the hosts other than HDI and disk array system will slow.

If you allocate the partitions to HDI and the hosts other than HDI using Cache Partition Manager, you can prevent the influence on the performance on each other.

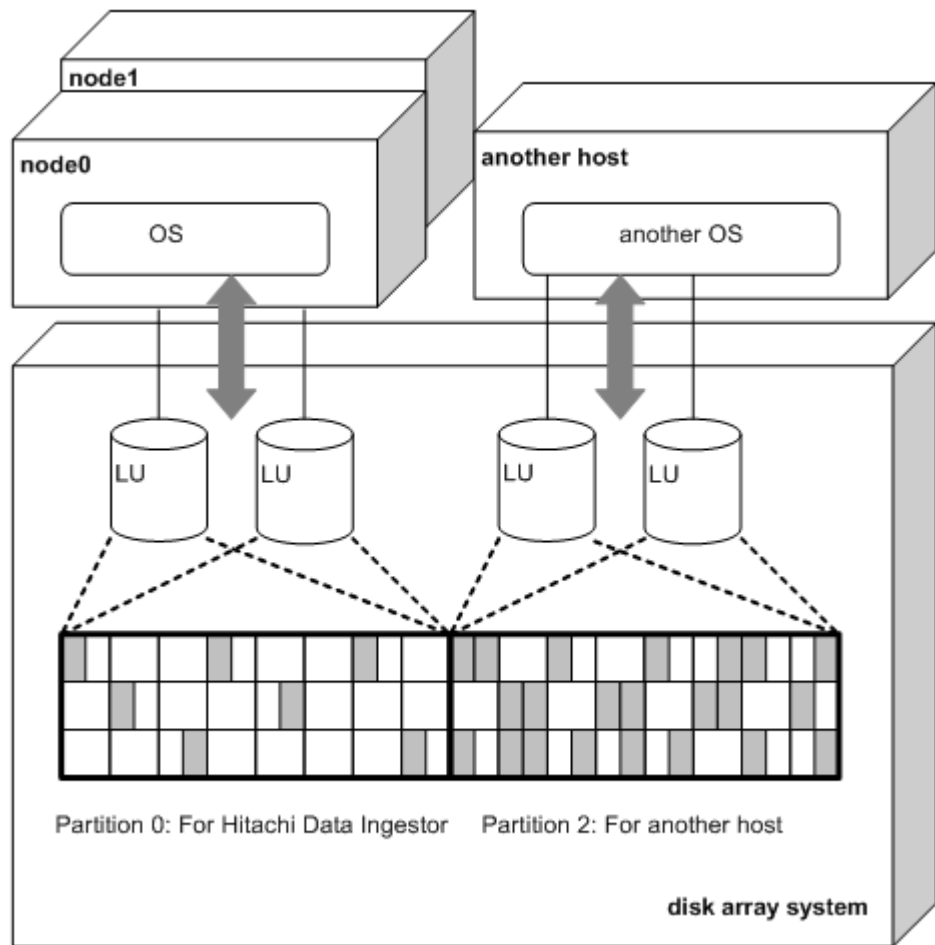


Figure 3-2 Example of Connecting HDI and Another Host to One disk array system at the Same Time

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 performance statistics about the parity groups and LUs built into the disk array system and the usage rates of resources such as built-in hard disk drives and processors. The acquired information is displayed in the form of line graphs.

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

Using Performance Monitor, you can monitor disk array system, and measure internal resource usage (disk and port workloads) and other parameters. When problems such as slow response occur in the HDI, the system administrator can use Performance Monitor to identify the source of the problem.

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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