HITACHI
Inspire the Next

Hitachi Storage Command Suite

Hitachi Device Manager Software

Server Configuration and Operation Guide

FASTFIND LINKS

Document Organization

Software Version

Getting Help

Contents

Hitachi Data Systems

MK-08HC157-04

Hitachi and Hitachi Data Systems reserve the right to make changes to this document at any time without notice and assume no responsibility for its use. This document contains the most current information available at the time of publication. When new and/or revised information becomes available, this entire document will be updated and distributed to all registered users.

All of the features described in this document may not be currently available. Refer to the most recent product announcement or contact your local Hitachi Data Systems sales office for information on feature and product availability.

Notice: Hitachi Data Systems products and services can be ordered only under the terms and conditions of Hitachi Data Systems’ applicable agreement(s). The use of Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

By using this software, you agree that you are responsible for:

a) Acquiring the relevant consents as may be required under local privacy laws or otherwise from employees and other individuals to access relevant data; and

b) Ensuring that data continues to be held, retrieved, deleted or otherwise processed in accordance with relevant laws.

Contents

Overview and Setup of VDS 1

Specifying Properties..1

Preface

This manual describes system requirements for Hitachi Device Manager (abbreviated hereafter to *Device Manager*), Hitachi Provisioning Manager (abbreviated hereafter to *Provisioning Manager*), and Hitachi Storage Command Suite Common Component (abbreviated hereafter to *Common Component*), and also describes environment setup and troubleshooting on the management server.

This preface includes the following information:

Notice: The use of Hitachi Device Manager and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

Intended Audience

This guide assumes that its audience has a basic knowledge of the following:

- Management tools appropriate to the individual storage subsystem
- Storage Area Networks (SANs)
- OSs supported for Device Manager
- Cluster software supported for Device Manager

Please contact your Hitachi Data Systems account team or see the Hitachi Data Systems worldwide Web site (http://www.hds.com) for additional information on subsystem features and functions.

Software Version

This document revision applies to Hitachi Device Manager software and Hitachi Provisioning Manager software version 6.4.

Release Notes

Release notes can be found on the documentation CD. Release notes contain requirements and more recent product information that may not be fully described in this manual. Be sure to review the release notes before installation.

Document Revision Level

Revision	Date	Description
MK-08HC157-00	February 2009	Initial Release
MK-08HC157-01	July 2009	Revision 01, supersedes and replaces MK-08HC157-00
MK-08HC157-02	October 2009	Revision 02, supersedes and replaces MK-08HC157-01
MK-08HC157-03	December 2009	Revision 03, supersedes and replaces MK-08HC157-02
MK-08HC157-04	June 2010	Revision 04, supersedes and replaces MK-08HC157-03

Document Organization

The following table provides an overview of the contents and organization of this document. Click the chapter title in the left column to go to that chapter. The first page of each chapter provides links to the sections in that chapter.

Chapter	Description
Overview	This chapter describes the system configuration and system requirements for Device Manager and Provisioning Manager.
Settings for Various Network Configurations	This chapter describes the settings required on a Device Manager server for various network configurations.
Settings Required for Managing User Accounts	This chapter describes the settings required for Device Manager to manage user accounts.
Security Settings for Device Manager	This chapter describes the security settings required to operate Device Manager.
Settings Required for Linking with Related Products	This chapter describes the Device Manager settings required for linking with related products.
Settings for Logs and Alerts	This chapter describes the settings required to use Device Manager to monitor the status of the system and monitor for errors.
Settings for CIM/WBEM	This chapter explains how to set up CIM/WBEM.
Starting and Stopping the Device Manager Server	This chapter describes how to start and stop the Device Manager server.
Managing the Database	This chapter describes how to back up or restore the Device Manager server database.
Troubleshooting	This chapter describes how to resolve problems that can occur during Device Manager operation and how to read the contents of log files.
Overview and Setup of VDS	This chapter provides an overview of Device Manager VDS Provider, and explains the setup procedure.
Specifying Properties	This chapter describes the property files of a Device Manager server and Provisioning Manager server.
Acronyms and Abbreviations	Defines the acronyms and abbreviations used in this document.
Index	Lists the topics in this document in alphabetical order.

Referenced Documents

The following Hitachi referenced documents can be found on the applicable Hitachi documentation CD:

Hitachi Storage Command Suite documents:

- Hitachi Storage Command Suite Server Installation Guide, MK-98HC150
- Hitachi Device Manager Command Line Interface (CLI) User's Guide, MK-91HC007
- Hitachi Device Manager Agent Installation Guide, MK-92HC019
- Hitachi Tuning Manager Server Administration Guide, MK-92HC02
- Hitachi Tuning Manager User's Guide, MK-92HC022
- Hitachi Tuning Manager Installation Guide, MK-96HC14

Hitachi Enterprise Storage Systems documents:

- Hitachi Storage Navigator User's Guide, MK-96RD621
- Hitachi TagmaStore Universal Storage Platform and Hitachi TagmaStore Network Storage Controller Storage Navigator Users Guide, MK-94RD206

Hitachi Modular Storage Systems document:

- Account Authentication User's Guide, MK-96DF797

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

Convention	Description
| 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.

This document uses the following icons to draw attention to information:

Icon	Label	Description
⚠	Note	Calls attention to important and/or additional information.
💡	Tip	Provides helpful information, guidelines, or suggestions for performing tasks more effectively.
⚠	Caution	Warns the user of adverse conditions and/or consequences (for example, disruptive operations).
⚠	WARNING	Warns the user of severe conditions and/or consequences (for example, destructive operations).

Conventions for Storage Capacity Values

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

Physical Capacity Unit	Value
1 KB	1,000 bytes
1 MB	$1,000^2$ bytes
1 GB	$1,000^3$ bytes
1 TB	$1,000^4$ bytes
1 PB	$1,000^5$ bytes
1 EB	$1,000^6$ bytes

Logical storage capacity values (e.g., logical device capacity) are calculated based on the following values:

Logical Capacity Unit	Value
1 KB	1,024 (2^{10}) bytes
1 MB	1,024 KB or $1,024^2$ bytes
1 GB	1,024 MB or $1,024^3$ bytes
1 TB	1,024 GB or $1,024^4$ bytes

Logical Capacity Unit	Value
1 PB	1,024 TB or 1,024^{5} bytes
1 EB	1,024 PB or 1,024^{6} bytes
1 BLOCK	512 BYTES

Getting Help

The Hitachi Data Systems Support Center staff is available 24 hours a day, seven days a week. To reach us, please visit the support Web site for current telephone numbers and other contact information: http://www.hds.com/services/support/. If you purchased this product from an authorized HDS reseller, contact that reseller for support.

Before calling the Hitachi Data Systems Support Center, please provide as much information about the problem as possible, including:

- The circumstances surrounding the error or failure.
- The exact content of any error message(s) displayed on the host system(s).

Comments

Please send us your comments on this document: doc.comments@hds.com. Include the document title, number, and revision, and refer to specific section(s) and paragraph(s) whenever possible.

Thank you! (All comments become the property of Hitachi Data Systems Corporation.)

1

Overview

This chapter describes the system configuration and system requirements for Device Manager and Provisioning Manager.

System Configuration

Figure 1-1 shows a basic system configuration in which Device Manager and Provisioning Manager are being used.

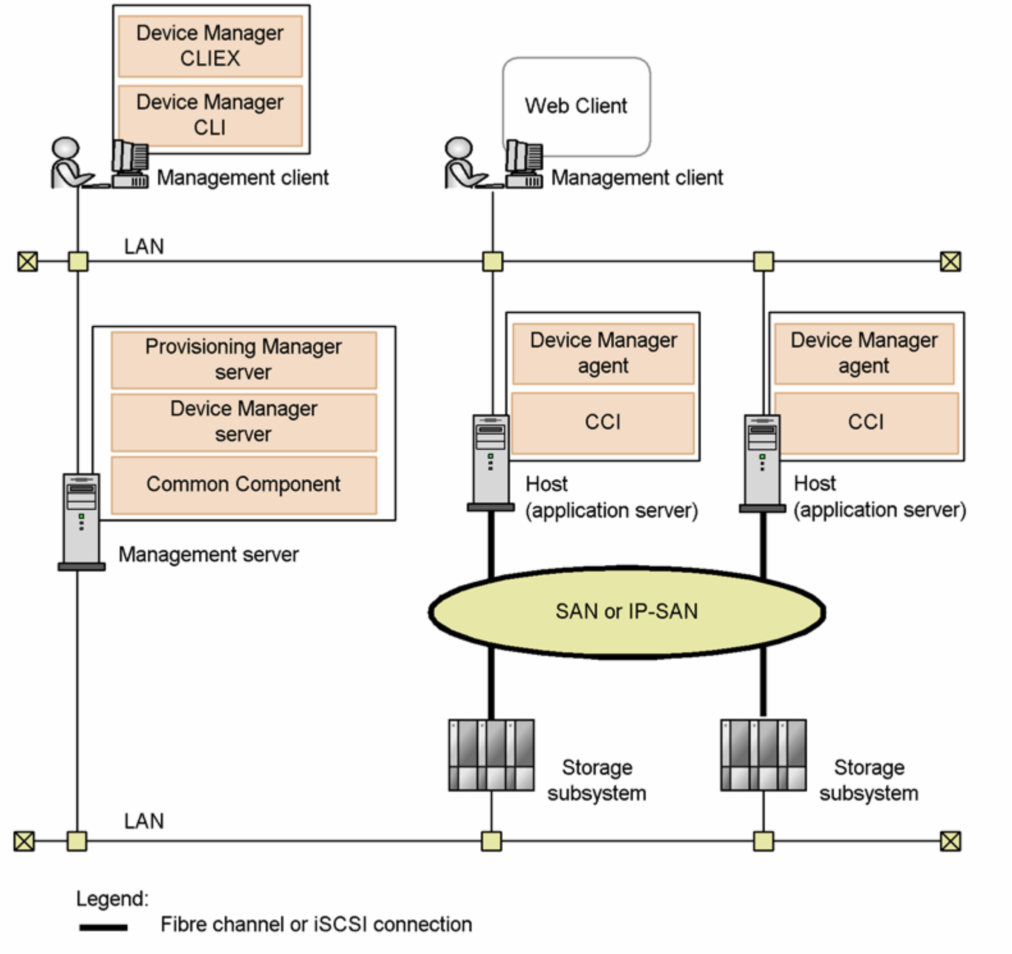


Figure 1-1 Basic System Configuration

A TCP/IP network must be used to connect a management server to management clients, and the management server to storage subsystems. Also, a Fibre Channel SAN must be configured between a host and a storage subsystem.

Hitachi AMS 2000, Hitachi SMS, and Hitachi AMS/WMS support an IP-SAN configuration that uses iSCSI rather than Fibre Channel.

The important configuration components in the above figure are as follows:

Management server

A management server is a computer on which the Device Manager server and the Provisioning Manager server are running. The management server also supports active-standby clustering using two computers. For details about the requirements for a management server computer, see Management Server Requirements.

Device Manager server

A Device Manager server is a program that controls storage subsystems and hosts based on requests from management clients (Web Client and CLI).

Provisioning Manager server

A Provisioning Manager server is a program that controls storage subsystems and hosts based on requests from management clients (Web Client). This program is automatically installed when you install the Device Manager server.

Common Component

Common Component is a program that provides various features used in common by Hitachi Storage Command Suite products. This program is automatically installed when you install the Device Manager server. Table 1-1 describes the major features of Common Component.

Table 1-1 Common Component Features

Feature	Description
Single Sign-On	A user who operates multiple Hitachi Storage Command Suite products is not prompted to re-enter their user ID and password if that user uses those products simultaneously. Single Sign-On provides a unified user authentication mechanism.
Integrated logging information	Operation and other types of logs are gathered together by an integrated logging information feature. Providing a common log repository allows the data from all Hitachi Storage Command Suite log files to be gathered into one file.

Caution:

- On a single Device Manager server, you cannot use multiple storage administrator accounts to manage multiple storage partitions. If you want to manage storage partitions individually, you must provide a Device Manager server for each storage partition.
- Use one management server to manage one storage subsystem. Do not configure a system such that multiple management servers manage a single storage subsystem.

Management client

A management client is a computer used to operate Device Manager and Provisioning Manager. A management client and a management server can be the same computer.

Web Client

Web Client is a Web-based graphical interface supported by Device Manager and Provisioning Manager. For details on computer requirements for using Device Manager Web Client and how to use it, see the Device Manager online Help. For details on the computer requirements for using Provisioning Manager Web Client and how to use it, see the Provisioning Manager online Help.

CLI and CLIEX

CLI and CLIEX are text-based interfaces supported by Device Manager. Using CLI and CLIEX enables you to perform certain tasks (such as the initial installation of a system or applying the same changes to settings in many locations) more efficiently. For details on the computer requirements for using CLI or CLIEX and how to use them, see the *Hitachi Device Manager Software Command Line Interface (CLI) User's Guide*.

Host (application server)

A host (application server) is a computer that uses the volumes in a storage subsystem.

Device Manager agent

A Device Manager agent is a program that collects information about hosts and storage subsystems, and reports that information to the Device Manager server. This program must be installed if you use Device Manager to manage host information and the volume usage states on each host, or if you use Provisioning Manager. For details on the computer requirements for using the Device Manager agent and how to use it, see the *Hitachi Device Manager Agent Installation Guide*.

CCI

CCI is a program that controls copy pairs on a storage subsystem.

This program must be installed to use Device Manager to provide consolidated management of copy-pair configurations and statuses. For details about how to install the CCI, see the CCI documentation.

Storage subsystem

The storage subsystems (shown in the figure) are managed by Device Manager and Provisioning Manager. For details on the system requirements for storage subsystems, see System Requirements for Storage Subsystems.

⚠ ***Note:***

- Windows Server® 2003 environments support Device Manager VDS Provider, which is a program that provides storage subsystem information in response to requests from VDS (Virtual Disk Service) and that can also change the storage subsystem configuration. For details about how to install and set up Device Manager VDS Provider, see Overview and Setup of VDS.

Network Configuration

Universal Storage Platform V/VM, Hitachi USP, Lightning 9900V, and Lightning 9900 come equipped with a *service processor*, or *SVP*. The SVP has two Ethernet adapters. The first adapter is for a private (internal) Ethernet LAN, which is only intended for intra-array communications. There are two devices that can access the internal LAN:

- The Service Processor (SVP)
- The remote Console for Lightning 9900

The second adapter is used for other applications to communicate with the SVP, and it is called the public LAN, because it is visible to other computers outside the array. Device Manager uses the public LAN to communicate with a storage subsystem and with an SVP used to make configuration changes to a storage subsystem.

While Universal Storage Platform V/VM, Hitachi USP, Lightning 9900V, and Lightning 9900 are managed through their SVP interfaces, other managed storage subsystems (such as Hitachi AMS 2000, Hitachi SMS, Hitachi AMS/WMS, Thunder 9500V, and Thunder 9200) do not have private LANs. Instead, they have Ethernet network interfaces that are intended to be directly attached to a public LAN. Once attached, each has its own remote management API, which can be accessed by a variety of management applications.

WARNING: Universal Storage Platform V/VM, Hitachi USP, Lightning 9900V, and Lightning 9900 have a public LAN and a private LAN. Device Manager uses the public LAN to communicate with the SVP about the array and configuration changes. Do not ever attach the private LAN to an external network because this can cause serious problems on the array.

Figure 1-2 illustrates an incorrect LAN connection.

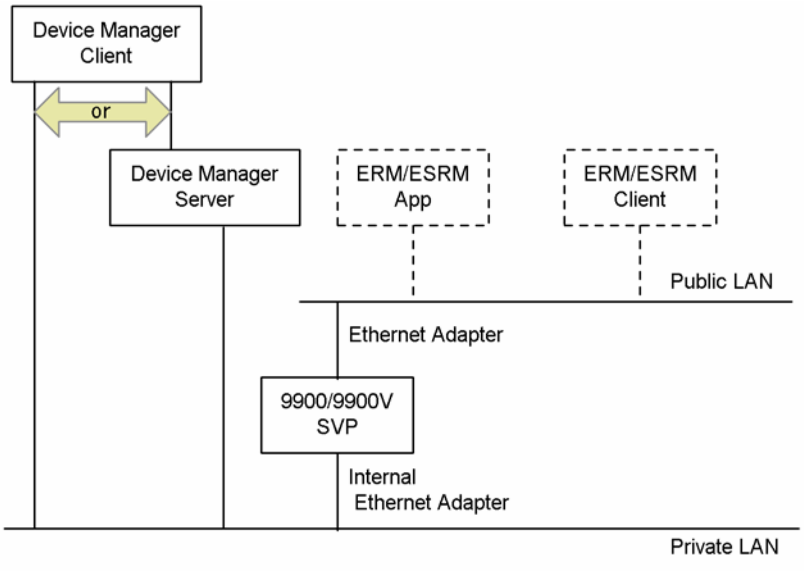


Figure 1-2 Incorrect Lightning 9900 and 9900V LAN Connection

Common Security Risks

Hitachi AMS 2000, Hitachi SMS, Hitachi AMS/WMS, Thunder 9500V, and Thunder 9200 are designed to be connected to public LANs, so you must pay particular attention to security risks when you connect these subsystems to a public network.

System administrators frequently separate production LANs from management LANs. In such cases, management LANs act as a separate network, which isolates management traffic from a production network and reduces the risk of security-related threats. If a management controller such as the SVP exists on a production LAN, the storage subsystems are left open for any entity on the IP network to access. Whether the access is intentional or not, the resulting security risks can lead to DoS (Denial of Service) attacks and actual loss of storage availability. DoS attacks may lead to a management session being hijacked for malicious purposes, such as unbinding a storage extent from a port during an I/O operation.

The following are guidelines for constructing management LANs:

- Traffic from the production LAN should not flow through, or be routed to the management LAN.

- If possible, all hosts with management interfaces or controllers on the management LAN should be hardened to their maximum level to reduce the potential that software other than the management interface will not lead to an exploit of the entire station or device. (In this case hardening should include removal of unnecessary software, shutting down nonessential services, and updating to the latest patches.)
- The management LAN should only intersect a production LAN on those computers acting as an interface between the management LAN and the production LAN (for example, the Device Manager server).
- If possible, those computers intersecting both private LAN and management LAN should be behind a firewall of some kind, further inhibiting unintended access.

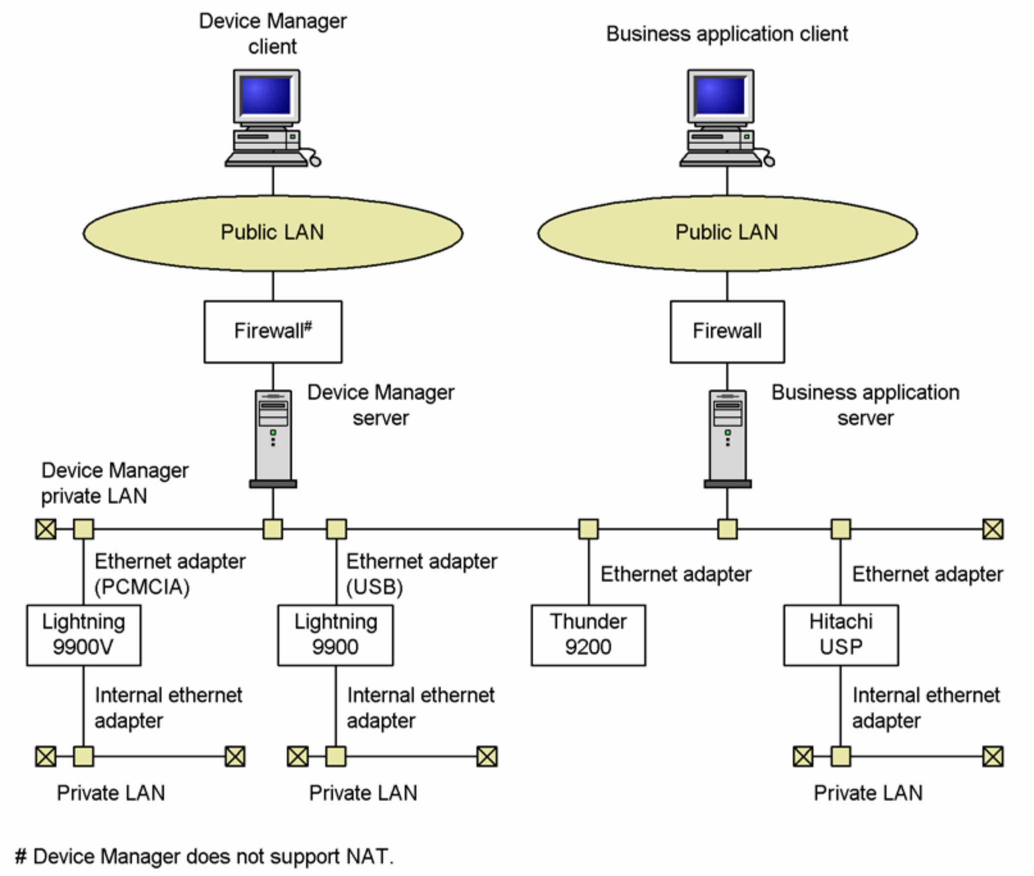
Most Secure Configuration: Separate Management LAN Plus Firewall

In this case, the computer hosting Device Manager server must either be dual-homed or have two NICs, and every other management application must be of a similar configuration. The first NIC for each computer is attached to a LAN dedicated to manage traffic between the management computer and managed storage subsystems. A second NIC is attached to a LAN where access is governed by a firewall. As shown in Figure 1-3, each application server could also be connected to a different LAN that has a different firewall. The firewall contains strict access rules that allow the management servers to be accessed only by Device Manager clients or by specified management application clients.

This configuration is the most secure but is the least flexible implementation, as it requires overhead to manage all of the various network components, servers, and devices under management. Adding further security to this configuration requires that the underlying management application OS be hardened to the maximum possible limit. This might include disabling services such as Telnet, FTP, SMTP, or IIS. Additionally, all unnecessary packages should be removed.

⚠ ***Caution:*** When Physical View of Universal Storage Platform V/VM or Hitachi USP, or Storage Navigator of Lightning 9900V is launched, Java™ Web Start and the web browser on the Web Client computer directly communicate with the storage subsystem. For this reason, if the Web Client computer and the storage subsystem exist on different networks, you must set up the networks so that the computer and the storage subsystem can directly communicate with each other.

Figure 1-3 illustrates a separate management LAN with a firewall configuration.



Device Manager does not support NAT.

Figure 1-3 Most Secure Configuration: Separate Management LAN Plus Firewall

Second-Most Secure Configuration: Separate Management LAN Plus Firewalled Devices Under Management

In this configuration, the machine hosting the Device Manager server and all other application servers must be single-homed, and the actual managed devices must be separated from Device Manager by a firewall. The firewall's rules allow a storage subsystem to be accessed only by the Device Manager server or by any other required management application. Management clients accessing Device Manager are not allowed to pass traffic through the firewall to directly talk to a managed storage subsystem, but can directly participate in management operations via Device Manager or a management application.

This configuration is the second most secure, and is more flexible than the most secure option. While this configuration protects the devices under management, it does not protect the management application servers themselves. Therefore, all management application servers should be hardened to the maximum possible extent.

Caution: When Physical View of Universal Storage Platform V/VM or Hitachi USP, or Storage Navigator of Lightning 9900V is launched, Java Web Start and the web browser on the Web Client computer directly communicate with the storage subsystem. For this reason, if the Web Client computer and the storage subsystem exist on different networks, you must set up the networks so that the computer and the storage subsystem can directly communicate with each other.

Figure 1-4 illustrates a separate management LAN plus firewalled devices under management.

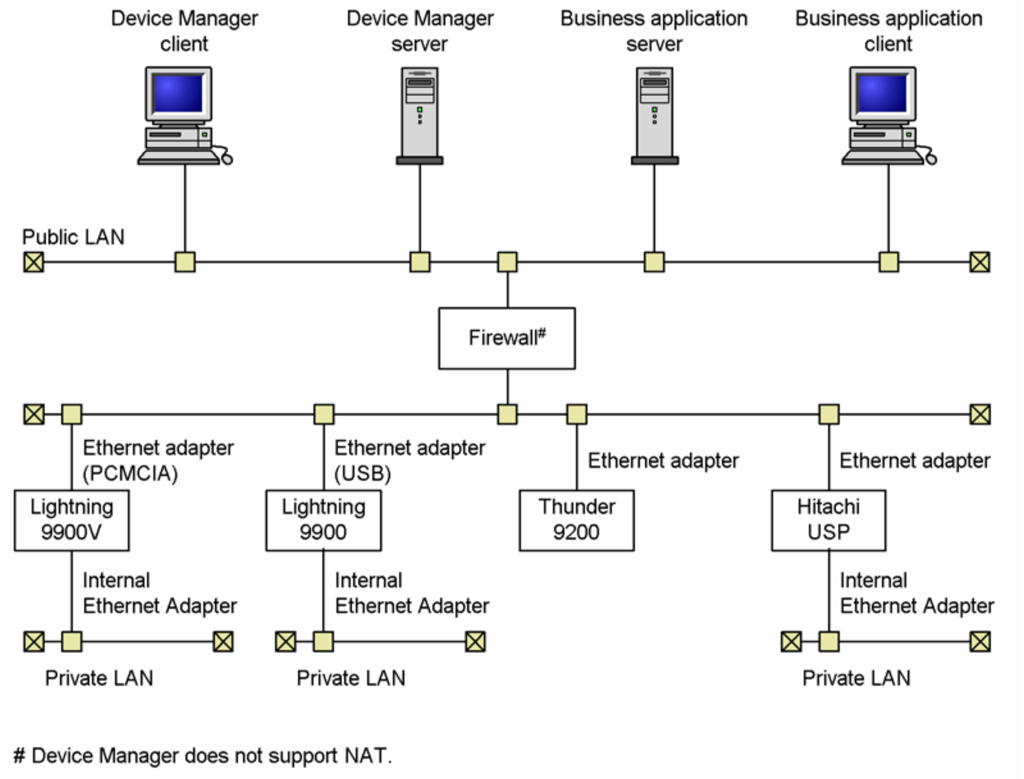


Figure 1-4 Second-Most Secure Configuration: Separate Management LAN Plus Firewalled Devices

Third-Most Secure Configuration: Dual-Homed Management Servers Plus Separate Management LAN

In this configuration, the management servers themselves act as the intersection point between the management LAN and a production LAN. The server running Device Manager or management applications is dual-homed. One NIC is attached to the management LAN along with the devices under management, and the second NIC is attached to a production LAN along with the management clients (for example, the Device Manager GUI). Because the management application servers actually act as the gateway between the production LAN and the management LAN, and there is no additional firewall, you must be very sure that the server itself will not route traffic between the two networks.

This configuration is the third most secure, and is more flexible than either the most or second-most secure configurations. While it protects the devices under management, it does not protect the management application servers themselves. Therefore, all management application servers should be hardened to the maximum possible extent. Additionally, because the management application servers themselves act as gateways between the two LANs, OS hardening is very important.

Caution: When Physical View of Universal Storage Platform V/VM or Hitachi USP, or Storage Navigator of Lightning 9900V is launched, Java Web Start and the web browser on the Web Client computer directly communicate with the storage subsystem. For this reason, if the Web Client computer and the storage subsystem exist on different networks, you must set up the networks so that the computer and the storage subsystem can directly communicate with each other.

Figure 1-5 illustrates dual-homed management servers plus a separate management LAN.

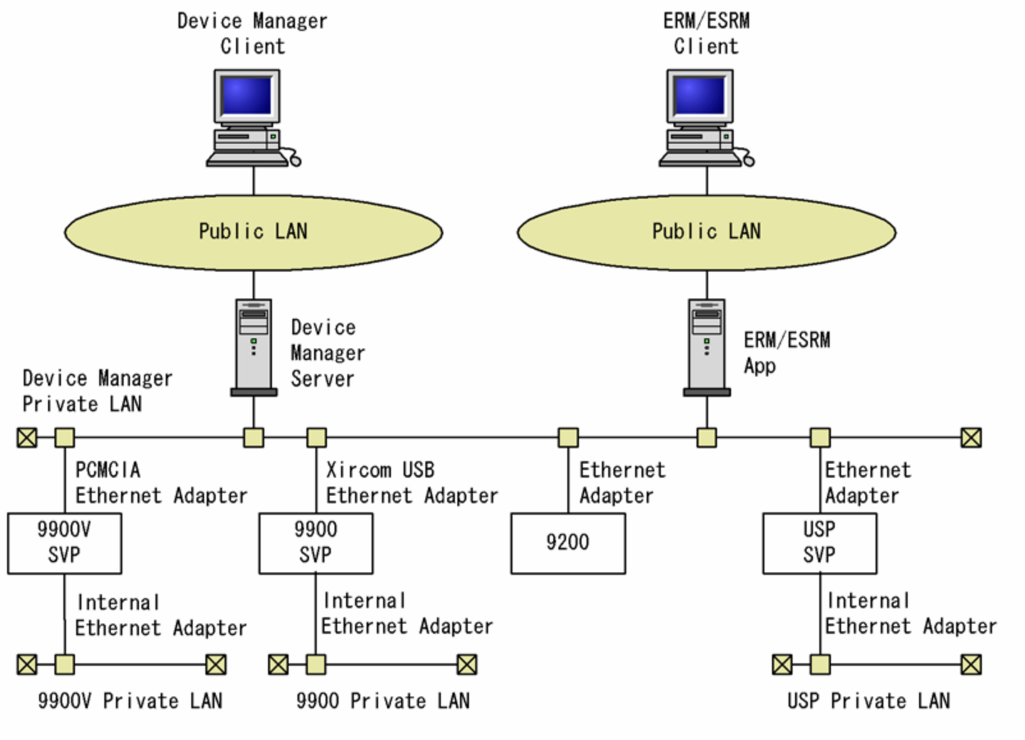


Figure 1-5 Third-Most Secure Configuration:Dual-Homed Management Servers Plus Separate Management LAN

Least Secure Configuration: Flat Network

Here, the management application servers, managed devices, and managed clients all coexist on the same network.

This configuration is the least secure, though it is the most flexible. It affords no protection to any of the components required for storage management operations, so management application server hardening is paramount. Additionally, you need to consider updating the microcode of devices under management, especially if they are related in any way to security for the device management controllers themselves.

⚠ ***Note:*** This configuration may be a requirement if the implementation cannot accommodate a management LAN. For example, if you intend to use HDvM Client to launch the physical view of a Hitachi USP, you must use a flat network configuration. In other configurations, differences between public and private LANs prevent HDvM from launching Storage Navigator on a client machine.

Figure 1-6 illustrates a flat network.

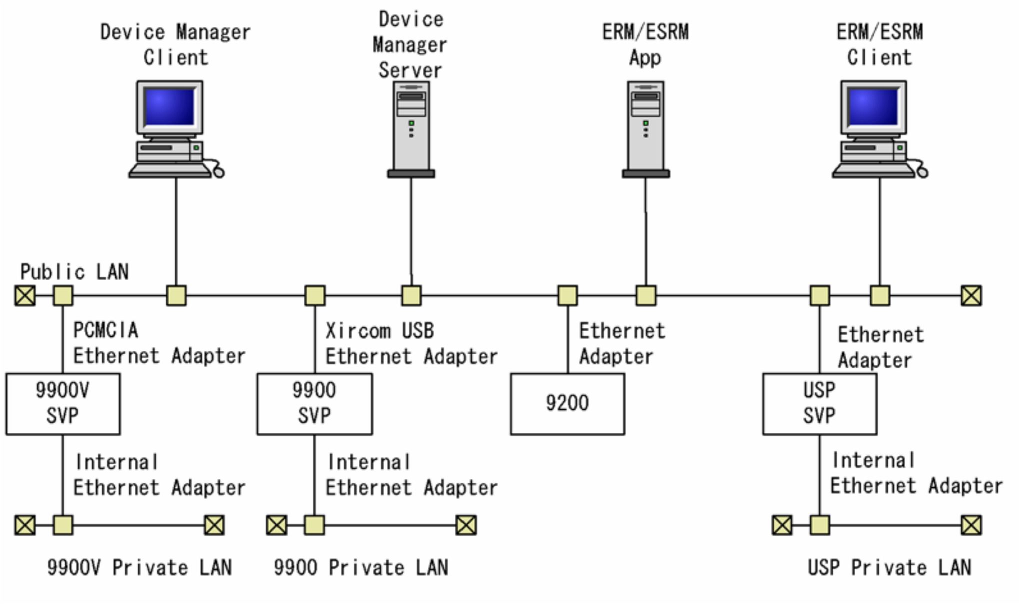


Figure 1-6 Least Secure Configuration: Flat Network

Management Server Requirements

This section describes the management server requirements.

Computer Requirements

The Device Manager server and Provisioning Manager server can be used in the following OS environments:

- Windows®
- Solaris
- Linux®

The following sections describe the computer requirements for each OS. For details about the installation, see the *Hitachi Storage Command Suite Server Installation Guide*.

Requirements When Using Windows as the Management Server OS

Table 1-2 shows the OSs that can be used on a management server in a Windows environment.

Table 1-2 Usable Management Server OSs (Windows)

OS	Edition	Service Pack	Cluster Environment Support	IPv6 Environment Support
Windows Server 2003 (x86)	Datacenter Edition Enterprise Edition Standard Edition	SP2	Y	Y
Windows Server 2003 (x64)	Datacenter x64 Edition Enterprise x64 Edition Standard x64 Edition	SP2	--	Y
Windows Server 2003 R2 (x86)	Datacenter Edition Enterprise Edition Standard Edition	SP2	Y	Y
Windows Server 2003 R2 (x64)	Datacenter x64 Edition Enterprise x64 Edition Standard x64 Edition	SP2	--	Y

OS	Edition	Service Pack	Cluster Environment Support	IPv6 Environment Support
Windows Server 2008 (x86)[#]	Datacenter 32-bit Edition Datacenter without Hyper-V™ 32-bit Edition Enterprise 32-bit Edition Enterprise without Hyper-V 32-bit Edition Standard 32-bit Edition Standard without Hyper-V 32-bit Edition	No SP	Y	Y
		SP2	Y	Y
Windows Server 2008 (x64)[#]	Datacenter Edition Datacenter without Hyper-V Edition Enterprise Edition Enterprise without Hyper-V Edition Standard Edition Standard without Hyper-V Edition	No SP	Y	Y
		SP2	Y	Y
Windows Server 2008 R2 (x64)[#]	Datacenter Edition Enterprise Edition Standard Edition	No SP	--	Y
Windows XP	Professional	SP2	--	--
		SP3	--	--
Windows Vista® (x86)	Business Enterprise Ultimate	No SP	--	Y
		SP1	--	Y
		SP2	--	Y
Windows 7 (x86)	Enterprise Edition Professional Edition Ultimate Edition	No SP	--	Y
Windows 7 (x64)	Enterprise Edition Professional Edition Ultimate Edition	No SP	--	Y

Legend

Y: Supported.

--: Not supported.

#: Operation on Server Core is not supported.

The Device Manager server also runs on the virtual machine OSs listed in the following table.

Table 1-3 Virtual Machine OSs on Which the Device Manager Server Can Run (Windows)

Virtual Machine			Virtualization Software	
OS	**Edition**	**Service Pack**	**VMware® ESX**[#1]	**Hyper-V**[#2]
Windows Server 2003 (x86)	Datacenter Edition Enterprise Edition Standard Edition	SP2	Y	Y
Windows Server 2003 (x64)	Datacenter x64 Edition Enterprise x64 Edition Standard x64 Edition	SP2	Y	Y
Windows Server 2003 R2 (x86)	Datacenter Edition Enterprise Edition Standard Edition	SP2	Y	Y
Windows Server 2003 R2 (x64)	Datacenter x64 Edition Enterprise x64 Edition Standard x64 Edition	SP2	Y	Y
Windows Server 2008 (x86)	Datacenter 32-bit Edition Datacenter without Hyper-V 32-bit Edition Enterprise 32-bit Edition Enterprise without Hyper-V 32-bit Edition Standard 32-bit Edition Standard without Hyper-V 32-bit Edition	No SP	Y	Y
		SP2	Y	Y

Virtual Machine			Virtualization Software	
OS	Edition	Service Pack	VMware® ESX[#1]	Hyper-V[#2]
Windows Server 2008 (x64)	Datacenter Edition Datacenter without Hyper-V Edition Enterprise Edition Enterprise without Hyper-V Edition Standard Edition Standard without Hyper-V Edition	No SP	Y	Y
		SP2	Y	Y
Windows Server 2008 R2 (x64)	Datacenter Edition Enterprise Edition Standard Edition	No SP	Y	Y
Windows XP	Professional	SP2	Y	--
		SP3	Y	--
Windows Vista (x86)	Business Enterprise Ultimate	No SP	Y	--
		SP1	Y	--
		SP2	Y	--

Virtual Machine			Virtualization Software	
OS	**Edition**	**Service Pack**	**VMware® ESX[#1]**	**Hyper-V[#2]**
Windows 7 (x86)	Enterprise Edition Professional Edition Ultimate Edition	No SP	Y	--
Windows 7 (x64)	Enterprise Edition Professional Edition Ultimate Edition	No SP	Y	--

Legend

Y: Supported.

--: Not supported.

Note:

To run the Device Manager server on a virtual machine, configure the virtual machine to satisfy the requirements in Table 1-4.

#1: Version 3. *x* or 4. *x* can be used.

#2: Version 1.0 or 2.0 can be used.

Table 1-4 lists the requirements for a management server computer in a Windows environment.

Table 1-4 Computer Requirements (Windows)

Item	Requirements
Processor	Minimum: 1.0 GHz Recommended: 2.0 GHz or faster
Physical memory	Minimum: 512 MB Recommended: At least 1 GB[#1]
Disk space	Minimum: 4 GB Recommended: At least 5 GB
Monitor	XGA (1024 x 768 resolution) or higher.

Item	Requirements
LAN card	10/100 Ethernet LAN card If the computer and the LAN cable are compatible with Gigabit Ethernet, you can use a Gigabit-class card.
CD-ROM drive	None
Prerequisite program	J2SE Java Runtime Environment 5.0.*xx* (*xx*: 03 or later)[#2] Microsoft® Windows Installer 3.1[#2]
Supported cluster software	In Windows Server 2003 or Windows Server 2003 R2: Microsoft Cluster Service (MSCS) In Windows Server 2008 Microsoft Failover Cluster
Note: If adequate virtual memory is not allocated on the management server, the Hitachi Storage Command Suite products and any other installed programs might become unstable or might not start. To ensure stable operation of the management server, in addition to the virtual memory required for the OS and other programs, the management server also requires the amount of virtual memory required for both the products shown in Table 1-5 and Common Component. In addition to the virtual memory required for all the products installed on a management server, be sure to secure enough virtual memory (500MB) for Common Component. Table 1-5 shows the virtual memory requirements for each product in version 6.4. #1: If the Device Manager server is used simultaneously with other software products, the physical memory requirements of all of the software products must be taken into account. #2: This program is automatically installed when you install the Device Manager server.	

Table 1-5 Virtual Memory Requirements for Each Product (Windows)

Product Name	Virtual Memory Requirement (MB)
Device Manager[#1]	1,024
Provisioning Manager	(Included in Device Manager)
Tiered Storage Manager	600
Tuning Manager[#2]	1,500
Replication Manager[#3]	100

Product Name	Virtual Memory Requirement (MB)
Global Link Manager	300
Hitachi NAS Manager[#4]	512
Storage Navigator Modular 2[#4]	192

Note: If you plan to install Device Manager, Tiered Storage Manager, and Replication Manager, and if 1,000 MB of virtual memory is already used by the OS and other programs, you must secure more than 3,224 MB of virtual memory.

1,024 (for Device Manager) + 600 (for Tiered Storage Manager) + 100 (for Replication Manager) + 500 (for Common Component) + 1,000 (already used virtual memory) = 3,224

#1: If the Device Manager agent is installed on the management server, you need to allocate additional virtual memory for it. For details on virtual memory requirements and allocating virtual memory, see the description of the `server.agent.maxMemorySize` property in the *Hitachi Device Manager Agent Installation Guide*.

#2: If the Tuning Manager agent is installed on the management server, you need to allocate additional virtual memory for it. For details on virtual memory requirements, see the description of memory requirements in the *Hitachi Tuning Manager Installation Guide*.

#3: If Replication Manager Application Agent is installed on the management server, you need to allocate additional virtual memory for it. For details on virtual memory requirements, see the *Hitachi Replication Manager Installation and Configuration Guide*.

#4: The virtual memory requirements listed in the table are for Hitachi NAS Manager version 6.3 and Storage Navigator Modular 2 version 9.00. For details on the latest virtual memory requirements, see the documentation for each product.

When you install the Device Manager server, folders require the disk space in the table below.

Note that the *program-files-folder*\HiCommand portion can be changed. Read it as the folder specified during installation.

Table 1-6 Installation Folders and Required Disk Space (in Windows)

Item	Default Installation Folder	Required Disk Space
Installation folder for the Device Manager server	*program-files-folder*\HiCommand\DeviceManager	1.6 GB
Installation folder for the Provisioning Manager server	*program-files-folder*\HiCommand\ProvisioningManager	
Installation folder for Common Component	*program-files-folder*\HiCommand\Base[#1]	
Storage folder of the database for the Device Manager server	*program-files-folder*\HiCommand\database\DeviceManager	0.6 GB

Item	Default Installation Folder	Required Disk Space
Storage folder of the database for Common Component[#2]	*program-files-folder*\HiCommand\database	1.2 GB
	program-files-folder\HiCommand\database\Base	
Installation folder for the common library[#2]	*program-files-folder*\Hitachi\HNTRLib2	1.0 MB
	common-program-files-folder\Hitachi	
Output folder for common trace log files[#2][#3]	*program-files-folder*\Hitachi\HNTRLib2\spool	1.0 MB
A temporary folder[#4]	A folder specified by the environment variable TMP	0.3 GB

Note:

If the architecture is x86, *program-files-folder* and *common-program-files-folder* are the folders specified in the Windows environment variables %ProgramFiles% and %CommonProgramFiles%. By default, these folders are as follows:

system-drive\Program Files\

system-drive\Program Files\Common Files

If the architecture is x64, *program-files-folder* and *common-program-files-folder* are the folders specified in the Windows environment variable %ProgramFiles(x86)% and %CommonProgramFiles(x86)%. By default, these folders are as follows:

system-drive\Program Files(x86)\

system-drive\Program Files (x86)\Common Files

#1: If you are installing the Device Manager server in an environment where Common Component has already been installed, install it on the same drive.

#2: This is not required if version 4.0 or later of a Hitachi Storage Command Suite product has already been installed.

#3: You can change the size and number of generations of common trace log files. For details about how to do this, see Settings for Integrated Logs.

#4: This is required only during installation, and is unnecessary after installation.

Requirements When Using Solaris as the Management Server OS

Table 1-7 lists the OSs that can be used on a management server in a Solaris environment.

Table 1-7 Usable Management Server OSs (Solaris)

OS	Architecture	Required Patches	Cluster Environment Support	IPv6 Environment Support
Solaris 8	SPARC® (32 and 64 bit)	Apply the following patches: ▪ Patch Cluster ▪ 121972-04 ▪ 108652-59 ▪ 108921-15 ▪ 112003-03 ▪ 108773-15 ▪ 111293-04 ▪ 111310-01 ▪ 112472-01 ▪ 109147-20 ▪ 108714-07 ▪ 111111-03 ▪ 112396-02 ▪ 108940-46 ▪ 108987-09 ▪ 108528-17 ▪ 108989-02 ▪ 108827-30	--	--
Solaris 9	SPARC (32 and 64 bit)	Apply the following patch: 118335-08	Y	--

OS	Architecture	Required Patches	Cluster Environment Support	IPv6 Environment Support
Solaris 10[#1]	SPARC (32 and 64 bit)[#2]	Apply the following patch: ▪ 120664-01 or later ▪ 127127-11 ▪ 138064-03[#4] Do not apply the following patch: 127111-*xx* (*xx* is 02 or later)	Y	Y
	x64 Edition[#3]	Apply the following patch: ▪ 120665-01 ▪ 127128-11 ▪ 138065-03[#4] Do not apply the following patch: 127112-*xx* (*xx* is 02 or later)	Y	Y

Legend

Y: Supported.

--: Not supported.

#1: The Device Manager server only runs in the usual global environment (global zone). If a non-global zone has been created, install the Device Manager server in the global zone.

#2: The Device Manager server also runs on a guest OS on Solaris Logical Domains (LDoms) version 1.2 or 1.3. To run the Device Manager server on a virtual machine, configure the virtual machine to satisfy the requirements in Table 1-8.

#3: The Device Manager server runs only in the 64-bit kernel mode on the Sun™ Fire x64 Servers hardware. Do not change the kernel mode to a mode other than the 64-bit kernel mode after installing the Device Manager server.

#4: Apply this patch if you use Solaris 10 11/06 (update 3), Solaris 10 8/07 (update 4), or Solaris 10 5/08 (update 5). Check the `/etc/release` file for the update number. The following shows an example of the `/etc/release` file for Solaris 10 11/06:

```
Solaris 10 11/06 s10s_u3wos_10 SPARC
Copyright 2006 Sun Microsystems, Inc.  All Rights Reserved.
Use is subject to license terms.
Assembled 14 November 2006
```

Table 1-8 lists the requirements for a Device Manager server computer in a Solaris environment.

Table 1-8 Computer Requirements (Solaris)

Item	Requirements
Processor	In Solaris (SPARC): Minimum: 1.0 GHz Recommended: 1.2 GHz or faster In Solaris10 (x64): Minimum: 1.8 GHz Recommended: 2.2 GHz or faster
Physical memory	Minimum: 1 GB Recommended: At least 2 GB[#1]
Disk space	Minimum: 4 GB Recommended: At least 5 GB
LAN card	10/100 Ethernet LAN card If the computer and the LAN cable are compatible with Gigabit Ethernet, you can use a Gigabit-class card.
CD-ROM drive	None
Prerequisite program	In Solaris (SPARC): ▪ SUNWgzip[#2] ▪ J2SE Java Runtime Environment 5.0.*xx* (*xx* is 03 or later)[#3] In Solaris10 (x64): ▪ SUNWgzip[#2] ▪ J2SE Java Runtime Environment 5.0.0[#4]

Item	Requirements

Supported Cluster Software	In Solaris 9 (SPARC):
	VERITAS Cluster Server 4.0 or Sun Cluster 3.1
	In Solaris10 (SPARC):
	VERITAS Cluster Server 4.1 MP2 or Veritas Cluster Server 5.0 MP1

Note: If adequate virtual memory is not allocated on the management server, the Hitachi Storage Command Suite products and any other installed programs might become unstable or might not start. To ensure stable operation of the management server, in addition to the virtual memory required for the OS and other programs, the management server also requires the amount of virtual memory required for both the products shown in Table 1-9 and Common Component.

In addition to the virtual memory required for all the products installed on a management server, be sure to secure enough virtual memory (500MB) for Common Component.

Table 1-9 shows the virtual memory requirements for each product in version 6.4.

#1: If the Device Manager server is used simultaneously with other software products, the physical memory requirements of all of the software products must be taken into account.

#2: This program is required for decompressing the installer.

#3: The JRE is installed automatically when you install the Device Manager server.

#4: Install JDK™ 1.5.0, provided by Sun Microsystems, Inc.

Table 1-9 Virtual Memory Requirements for Each Product (Solaris)

Product Name	Virtual Memory Requirement (MB)
Device Manager[#1]	1,024
Provisioning Manager	(Included in Device Manager)
Tiered Storage Manager	600
Tuning Manager[#2]	1,500
Replication Manager[#3]	100
Storage Navigator Modular 2[#4]	192

Note: If you plan to install Device Manager, Tiered Storage Manager, and Replication Manager, and if 1,000 MB of virtual memory is already used by the OS and other programs, you must secure more than 3,224 MB of virtual memory.

1,024 (for Device Manager) + 600 (for Tiered Storage Manager) + 100 (for Replication Manager) + 500 (for Common Component) + 1,000 (already used virtual memory) = 3,224

#1: If the Device Manager agent is installed on the management server, you need to allocate additional virtual memory for it. For details on virtual memory requirements and allocating virtual memory, see the description of the `server.agent.maxMemorySize` property in the *Hitachi Device Manager Agent Installation Guide*.

#2: If the Tuning Manager agent is installed on the management server, you need to allocate additional virtual memory for it. For details on virtual memory requirements, see the description of memory requirements in the Hitachi Tuning Manager Software Installation Guide.

#3: If Replication Manager Application Agent is installed on the management server, you need to allocate additional virtual memory for it. For details on virtual memory requirements, see the *Hitachi Replication Manager Installation and Configuration Guide*.

#4: The virtual memory requirements listed in the table are for Storage Navigator Modular 2 version 9.00. For details on the latest virtual memory requirements, see the documentation for Storage Navigator Modular 2.

When you install the Device Manager server, directories require the disk space in the table below.

In Solaris 10 (x64), the `/opt/HiCommand` portion in the table can be changed. Read it as the directory specified during installation.

Table 1-10 Installation Directories and Required Disk Space (Solaris)

Item	Default Installation Directory	Required Disk Space
Installation directory for the Device Manager server	`/opt/HiCommand`	1.5 GB
Installation directory for the Provisioning Manager server	`/opt/HiCommand/ProvisioningManager`	
Installation directory for Common Component	`/opt/HiCommand/Base`	
Storage directory of the database for the Device Manager server	`/var/opt/HiCommand/database/DeviceManager`	0.6 GB
Storage directory of the database for Common Component[#1]	`/var/opt/HiCommand/database`	1.2 GB
	`/var/opt/HiCommand/database/Base`	
Installation directory for the common library[#1]	`/opt/hitachi`	1.0 MB
Output directory for common trace log files[#1#2]	`/var/opt/hitachi/HNTRLib2/spool`	1.0 MB
A temporary directory[#3]	`/var/tmp`	1.5 GB

#1: This is not required if version 4.0 or later of a Hitachi Storage Command Suite product has already been installed.

#2: You can change the size and number of generations of common trace log files. For details about how to do this, see Settings for Integrated Logs.

#3: This is required only during installation, and is unnecessary after installation.

Requirements When Using Linux as the Management Server OS

Table 1-11 lists the OSs that can be used on a management server in a Linux environment.

Table 1-11 Usable Management Server OSs (Linux)

OS	Version	Architecture	Cluster Environment Support	IPv6 Environment Support
Red Hat Enterprise Linux AS 4 Red Hat Enterprise Linux ES 4	Update4	x86	--	Y
	4.5	x86	--	--
	4.6	x86	--	--
	4.7	x86	--	Y

OS	Version	Architecture	Cluster Environment Support	IPv6 Environment Support
Red Hat Enterprise Linux 5 Red Hat Enterprise Linux 5 Advanced Platform	5.2	x86	--	Y
	5.3	x86	--	Y
		x64	--	Y
	5.4	x86	--	Y
		x64	--	Y
SUSE Linux Enterprise Server 10	SP2	x86	--	Y
		x64	--	Y
	SP3	x86	--	Y
		x64	--	Y
SUSE Linux Enterprise Server 11	No SP	x86	--	Y
		x64	--	Y
Legend Y: Supported. --: Not supported.				

Table 1-12 lists the requirements for a Device Manager server computer in a Linux environment.

Table 1-12 Computer Requirements (Linux)

Item	Requirements
Processor	Minimum: 1.0 GHz Recommended: 2.0 GHz or faster
Physical memory	Minimum: 1 GB Recommended: At least 2 GB#1
Disk space	Minimum 4 GB Recommended At least 5 GB
LAN card	10/100 Ethernet LAN card If the computer and the LAN cable are compatible with Gigabit Ethernet, you can use a Gigabit-class card.

Item	Requirements
CD-ROM drive	None
Prerequisite program	▪ gzip[#2] ▪ J2SE Java Runtime Environment 5.0.*xx* (*xx* is 03 or later)[#3] ▪ libstdc++33-32bit-3.3.3-7.8.1[#4]

Note: If adequate virtual memory is not allocated on the management server, the Hitachi Storage Command Suite products and any other installed programs might become unstable or might not start. To ensure stable operation of the management server, in addition to the virtual memory required for the OS and other programs, the management server also requires the amount of virtual memory required for both the products shown in Table 1-13 and Common Component.

In addition to the virtual memory required for all the products installed on a management server, be sure to secure enough virtual memory (500MB) for Common Component.

Table 1-13 shows the virtual memory requirements for each product in version 6.4.

#1: If the Device Manager server is used simultaneously with other software products, the physical memory requirements of all of the software products must be taken into account.

#2: This program is required for decompressing the installer.

#3: The JRE is installed automatically when you install the Device Manager server.

#4: This program is required if SUSE Linux Enterprise Server 10 SP3 (x64) is used for the management server OS. Make sure that `libstdc++33-32bit-3.3.3-7.8.1` is installed before you install the Device Manager server.

Table 1-13 Virtual Memory Requirements for Each Product (Linux)

Product Name	Virtual Memory Requirement (MB)
Device Manager[#1]	1,024
Provisioning Manager	(Included in Device Manager)
Tiered Storage Manager	600
Tuning Manager[#2]	--
Storage Navigator Modular 2[#3]	192

Legend:

--: The Tuning Manager server is not supported.

Note: If you plan to install Device Manager and Tiered Storage Manager, and if 1,000 MB of virtual memory is already used by the OS and other programs, you must secure more than 3,124 MB of virtual memory.

1,024 (for Device Manager) + 600 (for Tiered Storage Manager) + 500 (for Common Component) + 1,000 (already used virtual memory) = 3,124

#1: If the Device Manager agent is installed on the management server, you need to allocate additional virtual memory for it. For details on virtual memory requirements and allocating virtual memory, see the description of the `server.agent.maxMemorySize` property in the *Hitachi Device Manager Agent Installation Guide*.

#2: If the Tuning Manager agent is installed on the management server, you need to allocate additional virtual memory for it. For details on virtual memory requirements, see the description of memory requirements in the *Hitachi Tuning Manager Installation Guide*.

#3: The virtual memory requirements listed in the table are for Storage Navigator Modular 2 version 9.00. For details on the latest virtual memory requirements, see the documentation for Storage Navigator Modular 2.

When you install the Device Manager server, directories require the disk space in the table below.

Note that the `/opt/HiCommand` portion can be changed. Read it as the directory specified during installation.

Table 1-14 Installation Directories and Required Disk Space (Linux)

Item	Default Installation Directory	Required Disk Space
Installation directory for the Device Manager server	`/opt/HiCommand`	1.5 GB
Installation directory for the Provisioning Manager server	`/opt/HiCommand/ProvisioningManager`	
Installation directory for Common Component	`/opt/HiCommand/Base`	
Storage directory of the database for the Device Manager server	`/var/opt/HiCommand/database/DeviceManager`	0.6 GB
Storage directory of the database for Common Component[#1]	`/var/opt/HiCommand/database`	1.2 GB
	`/var/opt/HiCommand/database/Base`	
Installation directory for the common library[#1]	`/opt/hitachi`	1.0 MB
Output directory for common trace log files[#1][#2]	`/var/opt/hitachi/HNTRLib2/spool`	1.0 MB
A temporary directory[#3]	`/var/tmp`	1.5 GB

#1: This is not required if version 4.0 or later of a Hitachi Storage Command Suite product has already been installed.

#2: You can change the size and number of generations of common trace log files. For details about how to do this, see Settings for Integrated Logs.

#3: This is required only during installation, and is unnecessary after installation.

Setting the Memory Heap Size According to the Number of Managed Resources

Table 1-15 lists the numbers of resources that can be managed by the Device Manager server. We recommend that you operate Device Manager within these limits.

Table 1-15 Maximum Numbers of Resources Manageable by the Device Manager Server

Resource	Maximum Setting
Number of LUNs	128,000
Number of security settings	192,000
Number of LDEVs	128,000 (The maximum number of LDEVs only for open systems is 64,000.)

Note: The number of LDEVs in the table is the total of the number of LDEVs for mainframes and the number of LDEVs for open systems. Also, the number of security settings in the table is the total number of WWNs that are assigned to set up the security for LUNs in the storage subsystems managed by Device Manager.

In an environment using Device Manager, you need to set the memory heap sizes of HBase Storage Mgmt Web Service and the Device Manager server according to the expected number of managed resources.

Setting the Memory Heap Size of HBase Storage Mgmt Web Service

To set the memory heap size of HBase Storage Mgmt Web Service:

1. If HiCommand Suite products whose versions are earlier than 5.7 are installed, stop their services.

   For details about how to stop these services, see the manual for your product version.

2. Stop the Hitachi Storage Command Suite product services and Common Component.

   In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server with Common Services**.

   In Solaris or Linux:

   ```
   installation-directory-for-Common-Component/bin/hcmdssrv -stop
   ```

3. Check the current setting for the memory heap size.

   In Windows:

   ```
   installation-folder-for-Common-Component\bin\hcmdschgheap
   /print
   ```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdschgheap -
print
```

4. Change the memory heap size.

   In Windows:

   ```
   installation-folder-for-Common-Component\bin\hcmdschgheap /set
   [Small|Medium|Large]
   ```

   In Solaris or Linux:

   ```
   installation-directory-for-Common-Component/bin/hcmdschgheap -
   set [Small|Medium|Large]
   ```

   Use the Table 1-16 to decide whether to specify `Small`, `Medium`, or `Large`. Specify the larger of the values determined by using the number of LDEVs and the number of copy pairs, respectively. Execute this command if you need to change the setting you checked in step 3.

Table 1-16 Appropriate Memory Heap Size for HBase Storage Mgmt Common Service

Number of LDEVs	Number of Copy Pairs	Setting Value#	Memory Size to Be Set (unit: MB)
8,000 or less	5,000 or less	`Small`	Minimum: 128 Maximum: 256
8,001 to 14,000	5,001 or more	`Medium`	Minimum: 256 Maximum: 512
14,001 or more	--	For 32-bit (x86) Edition:`Medium` For 64-bit (x64) Edition:`Large`	Minimum: 512 maximum: 1,024

#: If you specify a small memory heap size, operations might slow down.

Caution: If you already specified the memory heap size by using the `hcmdsweb` or `hcmdsweb2` command in version 5.9 or earlier, you cannot reduce that value. If you want to reduce the value, uninstall the Device Manager server, re-install it, and then change the heap size.

Note: When setting the memory heap size of the Device Manager server at the same time, before starting the services in the next step, perform steps 1 and 2 as described in Setting the Memory Heap Size of the Device Manager Server. If you do this, you do not have to stop and start the services when setting the memory heap size of the Device Manager server.

5. Start the Hitachi Storage Command Suite product services and Common Component.

   In Windows:

Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server with Common Services**.

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdssrv -start
```

6. If HiCommand Suite products whose versions are earlier than 5.7 have been installed, start their services as required.

   For details about how to start these services, see the manual for your product version.

Setting the Memory Heap Size of the Device Manager Server

To set the memory heap size of the Device Manager server:

1. Use a text editor to open the following file.

   In Windows:

   ```
   installation-folder-for-the-Device-Manager-server\HiCommandServer\Server.ini
   ```

   In Solaris or Linux:

   ```
   installation-directory-for-the-Device-Manager-server/hicommand.sh
   ```

2. Specify an appropriate memory heap size.

   In Windows:

   Specify an appropriate memory heap size for `JVM_XOPT_HEAP_MAX` using the following format:

   ```
   JVM_XOPT_HEAP_MAX=-Xmxnew-setting-valuem
   ```

   In Solaris or Linux:

   Specify an appropriate memory heap size for the `-Xmx` option of the `java` command specified in the script for the `start` option.

   This example shows how to change the value from 256 MB to 512 MB:

   Before: `java -Xmx256m -classpath ...`

   After: `java -Xmx512m -classpath ...`

Table 1-17 Appropriate Memory Heap Size for the Device Manager Server

Number of LDEVs	Memory Heap Size (MB)
2,000 or less	256
2,000 to 6,000	512
6,001 or more	1,024

3. Restart the Device Manager server.

   In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**.

After the Device Manager server stops, select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.

In Solaris or Linux:

```
installation-directory-for-the-Device-Manager-server/suitesrvcntl -stop_hdvm
```

```
installation-directory-for-the-Device-Manager-server/suitesrvcntl -start_hdvm
```

⚠ ***Caution:*** If you overwrite or upgrade the Device Manager server from the following version, the memory heap size setting is retained.

If the management server OS is Windows:

Version 5.9 or later

If the management server OS is Solaris or Linux:

Version 6.2 or later

If you upgrade the Device Manager server from a version earlier than those listed above, the memory heap size setting is initialized to the value listed in Table 1-17 and will need to be specified again.

Setting the Memory Heap Size When Using the CIM/WBEM Function

If CIM/WBEM functions are being used, you might have to increase the memory heap size of the Device Manager server, depending on the conditions. Note that the required memory heap size differs depending on the CIM client you are using.

To change the memory heap size:

1. Use a text editor to open the following file.

   In Windows:

   ```
   installation-folder-for-the-Device-Manager-server\HiCommandServer\Server.ini
   ```

   In Solaris or Linux:

   ```
   installation-directory-for-the-Device-Manager-server/hicommand.sh
   ```

2. Specify an appropriate memory heap size.

   In Windows:

   Specify an appropriate memory heap size for `JVM_XOPT_HEAP_MAX` using the following format:

   ```
   JVM_XOPT_HEAP_MAX = -Xmxnew-setting-valuem
   ```

   In Solaris or Linux:

   Change the value of the `-Xmx` option of the `java` command specified in the script for the `start` option.

   This example shows how to change the value from 256 MB to 512 MB:

Before: `java -Xmx256m -classpath ...`

After: `java -Xmx512m -classpath ...`

Table 1-18 Appropriate Memory Heap Size When Using the CIM/WBEM Function

Number of LDEVs	Memory Heap Size (MB)
2,000 or less	256
2,001 to 6,000	512
6,001 or more	1,024

The memory heap sizes listed in this table are the sizes required for obtaining information of the class that belongs to the bottom layer in a CIM class. Depending on the SMI-S client, if an upper-layer class is specified, information of all the classes below that class might be obtained at the same time. In this case, the required memory heap size will be larger than the value specified in this step. If the memory heap size becomes insufficient, you cannot obtain class information. If this happens, increase the memory heap size.

3. Restart the Device Manager server.

In Windows:

Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**.

After the Device Manager server stops, select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.

In Solaris or Linux:

installation-directory-for-the-Device-Manager-server/`suitesrvcntl -stop_hdvm`

installation-directory-for-the-Device-Manager-server/`suitesrvcntl -start_hdvm`

Caution: If you overwrite or upgrade the Device Manager server from the following version, the memory heap size setting is retained.

If the management server OS is Windows:

Version 5.9 or later

If the management server OS is Solaris or Linux:

Version 6.2 or later

If you upgrade the Device Manager server from a version earlier than those listed above, the memory heap size setting is initialized to the value listed in Table 1-18 and will need to be specified again.

System Requirements for Storage Subsystems

To use Device Manager to manage storage subsystems, you need storage subsystem management tools and software in addition to Device Manager. This section describes these requirements.

Caution: If you want to update the microcode or firmware of a storage subsystem, follow the procedure below. While the microcode or firmware is being updated, do not change the configuration by, for example, refreshing the storage subsystem or performing path operations.

To update the microcode or firmware:

1. Make sure that no Device Manager refresh or setup operations are being executed on the target storage subsystem.

   You need to ensure that operations such as adding or removing storage, creating or deleting LDEVs, and setting the host mode have finished.

   Note: You do not need to stop the Device Manager server.
2. Temporarily change the settings in the property file so that the Device Manager database is not updated while the microcode or firmware is being updated.

   Change the property settings in the server.properties file as follows:

   – Change the setting for the `server.dispatcher.daemon.configUpdate.detection.interval` property to `0`.

   – Change the setting for the `server.dispatcher.daemon.autoSynchro.doRefresh` property to false.
3. Update the microcode or firmware.

   During the update, an error might be output to the trace log or error log because of storage subsystem polling. This error will not be output after the microcode is changed successfully.
4. Set the SVP tuning parameters, and then restart the SVP.
5. For Universal Storage Platform V/VM, restart the Device Manager server.
6. Manually refresh the storage subsystem.
7. Restore the property settings that you changed in step 2.

System Requirements for Universal Storage Platform V/VM

Table 1-19 lists the prerequisite firmware versions and software products.

Table 1-19 Prerequisite Firmware Versions and Software Products (Universal Storage Platform V/VM)

Prerequisite Firmware Versions	Prerequisite Software Products
Controller microcode: 60-01-24-*xx*/*xx* or later Controller microcode to use a Universal Replicator function or a Hitachi Universal Replication for Mainframe function: 60-03-28-*xx*/*xx* or later Controller microcode to use a LUSE: 60-04-10-xx/xx or later Controller microcode to use the function that allows LU creation and LU formatting to be performed separately: 60-01-24-*xx*/*xx* or later Controller microcode to use when a copy pair of Hitachi ShadowImage for Mainframe or of Hitachi TrueCopy for Mainframe exists on a managed Universal Storage Platform V/VM: 60-01-62-xx/xx or later Controller microcode to use the setup function of the Dynamic Provisioning functionality: 60-02-*xx*-*xx*/*xx* or later Controller microcode to perform a quick format: 60-02-2x-*xx*/*xx* or later Controller microcode to use the performance information acquisition feature: 60-01-42-*xx*/*xx* or later	▪ Java API ▪ SNMP API ▪ LUN Manager To use functions for creating a LUSE or LDEV (CVS): ▪ OPEN Volume Management To use the copy pair functionality: ▪ ShadowImage ▪ Hitachi ShadowImage for Mainframe# ▪ TrueCopy ▪ Hitachi TrueCopy for Mainframe# ▪ TrueCopy Asynchronous ▪ Hitachi TrueCopy Asynchronous for Mainframe# ▪ Universal Replicator ▪ Hitachi Universal Replicator for Mainframe# ▪ Copy-on-Write Snapshot# To use Physical View: ▪ Storage Navigator To use Universal Volume Manager: ▪ Universal Volume Manager To use storage logical partitioning (SLPR) or cache logical partitioning (CLPR): ▪ Virtual Partition Manager

Prerequisite Firmware Versions	Prerequisite Software Products
Controller microcode to use the function that links Dynamic Provisioning and TrueCopy, and the function that links Dynamic Provisioning and Universal Replicator: 60-02-4*x*-*xx*/*xx* or later Controller microcode to use Universal Volume Manager for mapping external volumes to internal volumes: 60-02-4*x*-*xx*/*xx* or later Controller microcode to use Universal Volume Manager for removing the mapping between external and internal volumes: 60-06-00-*xx*/*xx* or later Controller microcode to manage storage subsystems by using IPv6 addresses: 60-02-4*x*-*xx*/*xx* or later Controller microcode to use `23 REC Command Support` as the host mode option 60-02-24-*xx*/*xx* or later Controller microcode to use when the Device Manager server periodically checks changes in the Universal Storage Platform V/VM configuration: 60-04-10-*xx*/*xx* or later	To use 3DC functionality: ▪ Disaster Recovery Extended To use the Dynamic Provisioning functionality: ▪ Dynamic Provisioning
#: From Device Manager, you can only check configuration information of copy pairs. You cannot change the copy pair configuration.	

⚠ ***Note:*** Do not use DHCP if you use Device Manager to manage the storage subsystem.

System Requirements for Hitachi USP

Table 1-20 describes the prerequisite firmware versions and software products.

Table 1-20 Prerequisite Firmware Versions and Software Products (Hitachi USP)

Prerequisite Firmware Versions	Prerequisite Software Products
Controller microcode: 50-00-00-*xx*/*xx* or later Controller microcode to use CLIEX functions: 50-03-95-*xx*/*xx* or later Controller microcode to use the Virtual Partition Manager view function: 50-03-*xx*-*xx*/*xx* or later Controller microcode to use Universal Replicator functions: 50-09-85-*xx*/*xx* or later Controller microcode to use Universal Volume Manager to view the setting status of a remote command device: 50-07-00-*xx*/*xx* or later	▪ Java API ▪ SNMP API ▪ LUN Manager To use functions for creating a LUSE or LDEV (CVS): ▪ OPEN Volume Management To use the copy pair functionality: ▪ ShadowImage ▪ Hitachi ShadowImage for Mainframe# ▪ TrueCopy ▪ Hitachi TrueCopy for Mainframe# ▪ TrueCopy Asynchronous ▪ Hitachi TrueCopy Asynchronous for Mainframe# ▪ Universal Replicator ▪ Hitachi Universal Replicator for Mainframe# ▪ Copy-on-Write Snapshot# To use Physical View: ▪ Storage Navigator To link with NAS Manager: ▪ NAS Blade Manager

Prerequisite Firmware Versions	Prerequisite Software Products
Controller microcode to use 3DC functionality: 50-08-00-*xx*/*xx* or later Controller microcode to use the function that allows LU creation and LU formatting to be performed separately: 50-09-00-*xx*/*xx* or later Controller microcode to use the function for acquiring the status of an LDEV: 50-09-00-*xx*/*xx* or later Controller microcode to use the performance information acquisition feature: 50-09-34-*xx*/*xx* or later Controller microcode to use 19 VMware as the host mode option: 50-09-00-*xx*/*xx* or later Controller microcode to use 27 iSCSI Delayed ACK improvement as the host mode option: 50-09-37-*xx*/*xx* or later Controller microcode to use 23 REC Command Support as the host mode option: 50-09-*7x*-*xx*/*xx* or later	To use Universal Volume Manager: ▪ Universal Volume Manager To use storage logical partitioning (SLPR) or cache logical partitioning (CLPR): ▪ Virtual Partition Manager
#: From Device Manager, you can only check configuration information of copy pairs. You cannot change the copy pair configuration.	

Note: Do not use DHCP if you use Device Manager to manage the storage subsystem.

System Requirements for Lightning 9900V

Table 1-21 describes the prerequisite firmware versions and software products.

Table 1-21 Prerequisite Firmware Versions and Software Products (Lightning 9900V)

Prerequisite Firmware Versions	Prerequisite Software Products
Controller microcode: 21-01-25-*xx*/*xx* or later Controller microcode to perform in-context launching of the Storage Navigator: 21-04-04-*xx*/*xx* or later Controller microcode to launch NAS Manager: 21-04-00-*xx*/*xx* or later Controller microcode to use CLIEX functions: 21-14-02-*xx*/*xx* or later Controller microcode to use Open LDEV Guard function: 21-07-00-*xx*/*xx*	▪ Java API ▪ SNMP API ▪ LUN Management To use functions for creating a LUSE or LDEV (CVS): ▪ Open Volume Management To use the copy pair functionality: ▪ Hitachi ShadowImage ▪ Hitachi TrueCopy ▪ Hitachi TrueCopy Asynchronous To link with Storage Navigator: ▪ Storage Navigator To link with NAS Manager: ▪ NAS/Management

⚠ ***Note:*** Do not use DHCP if you use Device Manager to manage the storage subsystem.

System Requirements for Lightning 9900

Table 1-22 describes the prerequisite firmware versions and software products.

Table 1-22 Prerequisite Firmware Versions and Software Products (Lightning 9900)

Prerequisite Firmware Versions	Prerequisite Software Products
Controller microcode: 01-18-09-00/00 or later Controller microcode to use CLIEX functions: 01-19-59-*xx*/*xx* or later	▪ SNMP Agent ▪ LUN Manager (LUNM) To set up security for LUNs: LUN Security To use functions for creating a LUSE or LDEV (CVS): ▪ LU Size Expansion (LUSE) ▪ Open Customizable Volume Size (OCVS) To use the copy pair functionality: ▪ Hitachi Open Multiple RAID Coupling Feature ▪ Hitachi Open Remote Copy ▪ Hitachi Open Remote Copy Asynchronous

If you are setting up an alias for HPAV (Hitachi Parallel Access Volume), the LDEV number assigned for both the base volume and the alias volume must be in the same 32-LDEV boundary (for example, 0 to 31, 32 to 63). If they are not the same, you may get the following error message when you try to create an LDEV:

```
The volume to be created by the CVS operation is being used as the
MAV function.
```

For more information about HPAV, see *Hitachi Parallel Access Volume (HPAV) User and Reference Guide*.

Note: Do not use DHCP if you use Device Manager to manage the storage subsystem.

System Requirements for Hitachi AMS 2000

The Device Manager server supports Hitachi AMS 2000 only in Windows and Solaris (SPARC). Table 1-23 lists the prerequisite firmware versions and software products.

Table 1-23 Prerequisite Firmware Versions and Software Products (Hitachi AMS 2000)

Prerequisite Firmware Versions	Prerequisite Software Products
Hitachi AMS 2000 firmware version: Any Firmware version required to use TrueCopy: Any Firmware version required to use TrueCopy Modular Distributed: *x*862/*x*-*x* Firmware version required to use iSCSI: Any Firmware version required to use SSL communication: *x*84*x*/*x*-*x* Firmware version required to manage storage subsystems by using IPv6 addresses: *x*86*x*/*x*-*x* Firmware version required to use the Dynamic Provisioning functionality: *x*87*x*/*x*-*x* Firmware version required to use Discovery CHAP as the host mode 2 (host connection mode 2): *x*860/A-*x* Firmware version required to use Unique Extended COPY Mode or Unique Write Same Mode as the host mode 2 (host connection mode 2): *x*890/A-*x*	To set up security for LUNs: ▪ LUN Manager[#1] To use LUSE: ▪ LUN Expansion To use a lock system for devices accessed from Device Manager: ▪ Password Protection ▪ Account Authentication To use the copy pair functionality: ▪ ShadowImage in-system replication ▪ TrueCopy remote replication ▪ TrueCopy Extended Distance ▪ TrueCopy Modular Distributed ▪ Copy-on-write SnapShot To link with Storage Navigator Modular 2: ▪ Storage Navigator Modular 2[#2] To use the Dynamic Provisioning functionality: ▪ Dynamic Provisioning To use SMI-S to acquire performance information: ▪ Performance Monitor To use or cache logical partitioning : ▪ Cache Partition Manager
#1: To use Device Manager to configure LUN security, you must use Storage Navigator Modular 2 to enable the mapping mode of LUN Manager. While the mapping mode is disabled, you cannot use LUN Manager. #2: Configure a management server in a non-cluster configuration.	

Prerequisite Firmware Versions	Prerequisite Software Products

Caution:

- If you use both Storage Navigator Modular 2 and Device Manager that are installed on the same computer to manage a storage subsystem, the setting for the following items must be the same in Storage Navigator Modular 2 and Device Manager:
  - IP address of the storage subsystem (or the resolved IP address if a host name is specified)
  - Communication protocol
- Do not use DHCP if you use Device Manager to manage the storage subsystem. Use Storage Navigator Modular 2 to make sure that DHCP is not selected.
- If you upgrade the model of a storage subsystem, device information such as the serial number and model name might be changed. For this reason, if you perform a refresh operation by using Device Manager after the upgrade, an error (KAIC07299-E) might occur. If an error occurs, delete the storage subsystem in which an error occurred from Device Manager, re-register it, and then set the following Device Manager information again:
  - Information about storage that has been added to logical groups
  - Information about LDEVs that have been allocated to the resource group
  - Information of links to URLs (URLLink) set up by using the CLI
  - Labels that have been set for LDEVs
  - Storage subsystem names (if the names have been changed from the default)
  - Storage subsystem device information written in CLI batch and script files

  Note that, if you are using Hitachi Storage Command Suite products other than Device Manager, also check, and if necessary, revise the settings for those products.

Note: If the following OSs are used on the management server, you can use IPv6 for communication between Hitachi AMS 2000 and the management server:

- Windows Server 2003 SP2 (x86)
- Windows Server 2003 SP2 (x64)
- Windows Server 2003 R2 SP2 (x86)
- Windows Server 2003 R2 SP2 (x64)
- Windows Vista SP1 (x86)
- Solaris 10 (SPARC)

System Requirements for Hitachi SMS

The Device Manager server supports Hitachi SMS only in Windows and Solaris (SPARC). Table 1-24 lists the prerequisite firmware versions and software products.

Table 1-24 Prerequisite Firmware Versions and Software Products (Hitachi SMS)

Prerequisite Firmware Versions	Prerequisite Software Products
Hitachi SMS firmware version: Any	To set up security for LUNs: ▪ LUN Manager[#1]
Firmware version required to use SSL communication: *x*84*x*/*x*-*x*	To use LUSE: ▪ LUN Expansion
Firmware version required to manage storage subsystems by using IPv6 addresses: *x*86*x*/*x*-*x*	To use a lock system for devices accessed from Device Manager: ▪ Password Protection ▪ Account Authentication ▪
Firmware version required to use Discovery CHAP as the host mode 2 (host connection mode 2): *x*860*x*/A-*x*	To use the copy pair functionality: ▪ ShadowImage in-system replication ▪ TrueCopy remote replication[#2] ▪ Copy-on-write SnapShot ▪ Simple Data Recovery[#2]
	To link with Storage Navigator Modular 2: ▪ Storage Navigator Modular 2[#3]
	To use SMI-S to acquire performance information: ▪ Performance Monitor

#1: To use Device Manager to configure LUN security, you must use Storage Navigator Modular 2 to enable the mapping mode of LUN Manager. While the mapping mode is disabled, you cannot use LUN Manager.

#2: From Device Manager, you can only check configuration information of copy pairs. You cannot change the copy pair configuration.

#3: Configure a management server in a non-cluster configuration.

Caution:

- If you use both Storage Navigator Modular 2 and Device Manager that are installed on the same computer to manage a storage subsystem, the setting for the following items must be the same in Storage Navigator Modular 2 and Device Manager:
  - IP address of the storage subsystem (or the resolved IP address if a host name is specified)
  - Communication protocol
- Do not use DHCP if you use Device Manager to manage the storage subsystem. Use Storage Navigator Modular 2 to make sure that DHCP is not selected.

Note: For IP-SAN configurations, if the following OSs are used on the management server, you can use IPv6 for communication between Hitachi SMS and the management server:

- Windows Server 2003 SP2 (x86)
- Windows Server 2003 SP2 (x64)
- Windows Server 2003 R2 SP2 (x86)
- Windows Server 2003 R2 SP2 (x64)
- Windows Vista SP1 (x86)
- Solaris 10 (SPARC)

System Requirements for Hitachi AMS/WMS

The Device Manager server supports Hitachi AMS/WMS only when the Windows or Solaris (SPARC) version is being used. Table 1-25 describes the prerequisite firmware versions and software products.

Table 1-25 Prerequisite Firmware Versions and Software Products (Hitachi AMS/WMS)

Prerequisite Firmware Versions	Prerequisite Software Products
Hitachi AMS/WMS firmware version: Any Firmware version required to use TrueCopy: For Hitachi AMS 500 or Hitachi AMS 1000: Any For Hitachi AMS 200 or Hitachi WMS 100: 0760/A or later Firmware version required to use iSCSI: For Hitachi AMS 200, Hitachi AMS 500, or Hitachi WMS 100: 0730/B or later For Hitachi AMS 1000: 0732/A or later	To set up security for LUNs: ▪ LUN Manager[#1] To use LUSE: ▪ LUN Expansion To use a lock system for devices accessed from Device Manager: ▪ Password Protection ▪ Account Authentication[#2] To use the copy pair functionality:[#3] ▪ ShadowImage in-system replication ▪ TrueCopy remote replication ▪ TrueCopy Extended Distance ▪ Copy-on-write SnapShot To use Physical View: ▪ Storage Navigator Modular (for Web)[#2] ▪ Storage Navigator Modular 2[#4] To use SMI-S to acquire performance information: ▪ Performance Monitor To use or cache logical partitioning : ▪ Cache Partition Manager

#1: To use Device Manager to configure LUN security, you need to use Storage Navigator Modular (for Web) or Storage Navigator Modular 2 to enable the mapping mode of LUN Manager. While the mapping mode is disabled, you cannot use LUN Manager.

#2: If you want to use Account Authentication, the firmware version of the storage subsystem must be 0760/A or later and the firmware version of Storage Navigator Modular (for Web) must be 6.0 or later.

#3: To expand the mirror configuration, the firmware version of the storage subsystem must be 0750/A or later.

#4: Configure a management server in a non-cluster configuration.

Prerequisite Firmware Versions	Prerequisite Software Products

Caution:

- If you use both Storage Navigator Modular 2 and Device Manager that are installed on the same computer to manage a storage subsystem, the setting for the IP address of the storage subsystem (or the resolved IP address if a host name is specified) must be the same in Storage Navigator Modular 2 and Device Manager.
- Do not use DHCP if you are using Device Manager to manage the storage subsystems. Use Storage Navigator Modular (for Web) or Storage Navigator Modular 2 to make sure that DHCP is not selected.

Notes:

- IPv6 is not supported for IP-SAN configurations.
- For a NAS Modular system of Hitachi AMS/WMS, Device Manager only allows you to add storage subsystems and to launch Storage Navigator Modular or Storage Navigator Modular 2. To operate a NAS Modular subsystem, perform the operations from Storage Navigator Modular.

System Requirements for Thunder 9500V

The Device Manager server supports Thunder 9500V only when the Windows or Solaris (SPARC) version is used. Table 1-26 describes the prerequisite firmware versions and software products.

Table 1-26 Prerequisite Firmware Versions and Software Products (Thunder 9500V)

Prerequisite Firmware Versions	Prerequisite Software Products
Thunder 9570V or Thunder 9530V firmware version: 0651 or later	To set up security for LUNs: ▪ Fibre security control functionality or LUN Management#
Thunder 9580V firmware version: 1655/B or later	To use LUSE: ▪ LUN Expansion
Thunder 9585V firmware version: 1657/A or later	To use a lock system for devices accessed from Device Manager: ▪ Password Protection
Thunder 9520V firmware version: 0659/M or later	To use the copy pair functionality: ▪ Hitachi ShadowImage ▪ Hitachi TrueCopy Basic ▪ Hitachi QuickShadow
Firmware version required to use QuickShadow: For Thunder 9570V or Thunder 9530V: 0655/D or later For Thunder 9580V: 1655/D or later For Thunder 9585V: 1657/A or later For Thunder 9520V: 0659/M or later	To use SMI-S to acquire performance information: ▪ Performance Management - Base Monitor To link with DAMP: ▪ Disk Array Management Program 2 (for Web)
Firmware version required to use SATA expansion enclosure: For Thunder 9570V or Thunder 9530V: 0658 or later For Thunder 9580V or Thunder 9585V: 1658 or later For Thunder 9520V: 0659/M or later	To link with Storage Navigator Modular (for Web): ▪ Storage Navigator Modular (for Web) To link with Storage Navigator Modular 2: ▪ Storage Navigator Modular 2
Firmware version required to use LUN Management: For Thunder 9580V: 1655/D or later For Thunder 9585V: 1657/A or later For Thunder 9520V: 0659/M or later	
#: To use Hitachi Device Manager to configure LUN security, you must use Storage Navigator Modular (for Web), DAMP (for Web), or Storage Navigator Modular 2 to enable the mapping mode of LUN Manager. While the mapping mode is disabled, you cannot use LUN Manager.	

⚠ ***Caution:***

- Before installation, use DAMP (for Web) or Storage Navigator Modular (for Web) to verify that there are no ports with a WWN node name consisting only of zeros. If there are, you must change the name or delete the WWN, or a node-name error message will be output.
- If the Password Protection option is installed and usable, any addition of a storage subsystem to Device Manager requires a Password Protection user ID and password.
- Do not use DHCP if you use Device Manager to manage the storage subsystem. Use Storage Navigator Modular (for Web), DAMP (for Web), or Storage Navigator Modular 2 to make sure that DHCP is not selected.

System Requirements for Thunder 9200

The Device Manager server supports Thunder 9200 only when the Windows or Solaris (SPARC) version is being used. Table 1-27 describes the prerequisite firmware versions and software products.

Table 1-27 Prerequisite Firmware Versions and Software Products (Thunder 9200)

Prerequisite Firmware Versions	Prerequisite Software Products
Firmware version: 0559 or later, 355E or later	To set up security for LUNs: ▪ Fibre security control functionality To use LUSE: ▪ LU integration functionality To use a lock system for devices accessed from Device Manager: ▪ Password Protection To use the copy pair functionality: ▪ MRCF-Lite Remote Pack ▪ Hitachi Open Synchronous Remote Copy To link with DAMP: ▪ Disk Array Management Program 2 (for Web) To link with Storage Navigator Modular (for Web): ▪ Storage Navigator Modular (for Web) To link with Storage Navigator Modular 2: ▪ Storage Navigator Modular 2

Prerequisite Firmware Versions	Prerequisite Software Products

Caution:

- Make sure that the mapping mode of the storage subsystem is M-TID, M-LUN. If you attempt to perform an LUN management operation from Device Manager when the mapping mode is not M-TID, M-LUN, an error may occur.
- Make sure that fibre-channel ports are supported, because Device Manager does not support SCSI models.
- Do not use DHCP when you use Device Manager to manage the storage subsystem. Use DAMP (for Web) or Storage Navigator Modular (for Web) to make sure that DHCP is not selected.
- Do not change the default serial number of the storage subsystem. In addition, use the recognition ID that matches the serial number.

Notes:

- Thunder 9200 supports functionality to reserve LUNs for volumes that are not defined on it. If a user tries to assign such a reserved LUN to the storage unit of an applicable port, Device Manager displays an error message.
- SCSI models are not supported.

System Requirements for SUN T3

Device Manager versions 5.7 and later do not support T3. If a T3 still remains as a Device Manager management target after upgrading Device Manager, use Web Client or the CLI to remove the T3 from the targets of Device Manager management. For details on Web Client, see the Device Manager online Help. For details on the CLI, see the *Hitachi Device Manager Software Command Line Interface (CLI) User's Guide*.

System Requirements for Other Storage Subsystems

Tiered Storage Manager can use storage subsystems managed by an SMI-S provider (hereafter referred to as ***SMI-S Enabled subsystems***) as external subsystems.

To use SMI-S Enabled subsystems as external subsystems, you need to add the SMI-S Enabled subsystems by using Device Manager and, depending on the operating environment, you need to specify security settings for port numbers and communication.

Also, after creating a system, you need to use Device Manager Web Client or CLI to manage the SMI-S Enabled subsystems.

By using Device Manager, you can perform the following operations for SMI-S Enabled subsystems:

- Add or delete a storage subsystem
- Refresh a storage subsystem
- View configuration information for a storage subsystem
- Change the properties of a storage subsystem
- Start the storage subsystem management tools

The following table lists SMI-S Enabled subsystems usable as external subsystems.

Table 1-28 SMI-S Enabled Subsystems Usable as External Subsystems

Vendor	Model	Prerequisite SMI-S Providers
HP	▪ EVA 3000 ▪ EVA 4100 ▪ EVA 4400 ▪ EVA 5000 ▪ EVA 6100 ▪ EVA 6400[#] ▪ EVA 8100 ▪ EVA 8400[#1]	▪ HP Command View EVA 8.0.2 or later SMI-S: version 1.2 or later
EMC	▪ CLARiiON® CX200[#2] ▪ CLARiiON CX300[#2] ▪ CLARiiON CX400[#2] ▪ CLARiiON CX500[#2] ▪ CLARiiON CX600[#2] ▪ CLARiiON CX700[#2] ▪ CLARiiON CX3 series[#2]	▪ EMC SMI-S Provider 3.3 or later (prerequisite program: EMC Solutions Enabler 6.5 or later) SMI-S: version 1.2 or later
#1: To use this model as an external subsystem in Universal Storage Platform V/VM, the DKC microcode of Universal Storage Platform V/VM must be 60-03-10-*xx*/*xx* or later. #2: IPv6 cannot be used for communication between the Device Manager server and an SMI-S provider.		

Vendor	Model	Prerequisite SMI-S Providers

Caution:

- To add SMI-S Enabled subsystems into the Device Manager server, add them separately for each SMI-S provider from the Add Subsystem dialog box of Web Client or by using the `AddStorageArray` command. If one SMI-S provider manages multiple SMI-S Enabled subsystems, all of those SMI-S Enabled subsystems supported by Device Manager will be added to the Device Manager server at the same time.
- If multiple SMI-S providers manage one SMI-S Enabled subsystem and that subsystem has already been added to Device Manager, the subsystem will not be added (or refreshed) when another SMI-S provider that manages the subsystem is registered.
- If the number of SMI-S Enabled subsystems managed by an SMI-S provider increases or decreases, you need to re-register the same SMI-S provider into the Device Manager server from the Add Subsystem dialog box of Web Client or by using the `AddStorageArray` command (but you do not need to delete it).
- If you change the SMI-S provider that manages an SMI-S Enabled subsystem to another SMI-S provider, or if you modify the information about the SMI-S provider machine (such as IP address, port number, or protocol), you need to use Device Manager to change the properties for the SMI-S Enabled subsystem.

Host Requirements

Device Manager can manage, as hosts, computers that use volumes on managed storage subsystems. By assigning the most appropriate volume based on usage, you can centrally manage the disk resources for individual hosts by using Device Manager.

Device Manager can manage the following computers as hosts:

- Open hosts

  A computer that uses open volumes

  - If no virtualization software product is installed on the host

    In Device Manager, an environment in which no virtualization software product is installed is called a *normal host*.

  - If a virtualization software product is installed on the host

    In Device Manager, a physical host on which a virtualization software product is installed is called a *virtualization server*, and a virtual environment created by using the virtualization software product is called a *virtual machine*.

- Mainframe hosts

  A computer that uses mainframe volumes

- File servers

  A computer that is used to share the files in a storage subsystem with multiple clients in the network by using the NAS functionality.

The following sections describe system requirements for using Device Manager to manage the above types of hosts. For details on how to register hosts and assign volumes, see the Device Manager online Help.

System Requirements for Hosts on Which No Virtualization Software Product Is Installed

If you want to assign volumes to a host, register it in Device Manager as a normal host. In addition, if you want to perform the following operations, you need to install a Device Manager agent on the host:

- Automatically register and update information of the host
- Check the volume usage by using Device Manager
- Centrally manage copy pairs by using Device Manager or Replication Manager
- Centrally manage file systems and device files on the host by using Provisioning Manager

For details on how to install and operate a Device Manager agent, see the *Hitachi Device Manager Agent Installation Guide*.

System Requirements for Hosts on Which a Virtualization Software Product Is Installed

System requirements depend on whether a virtual machine or virtualization server will be managed by Device Manager.

Virtual Machine Requirements

If you want to perform the following operations, you need to install a Device Manager agent on the host:

- Automatically register and update information of the host
- Check the volume usage by using Device Manager
- Centrally manage copy pairs by using Device Manager or Replication Manager
- Centrally manage file systems and device files on the virtual machine by using Provisioning Manager

For details on how to install and operate a Device Manager agent, see the *Hitachi Device Manager Agent Installation Guide*.

In addition, the management method of Device Manager depends on the configuration of virtual machines and HBAs. The following figure shows the system configuration of virtual machines supported by Device Manager.

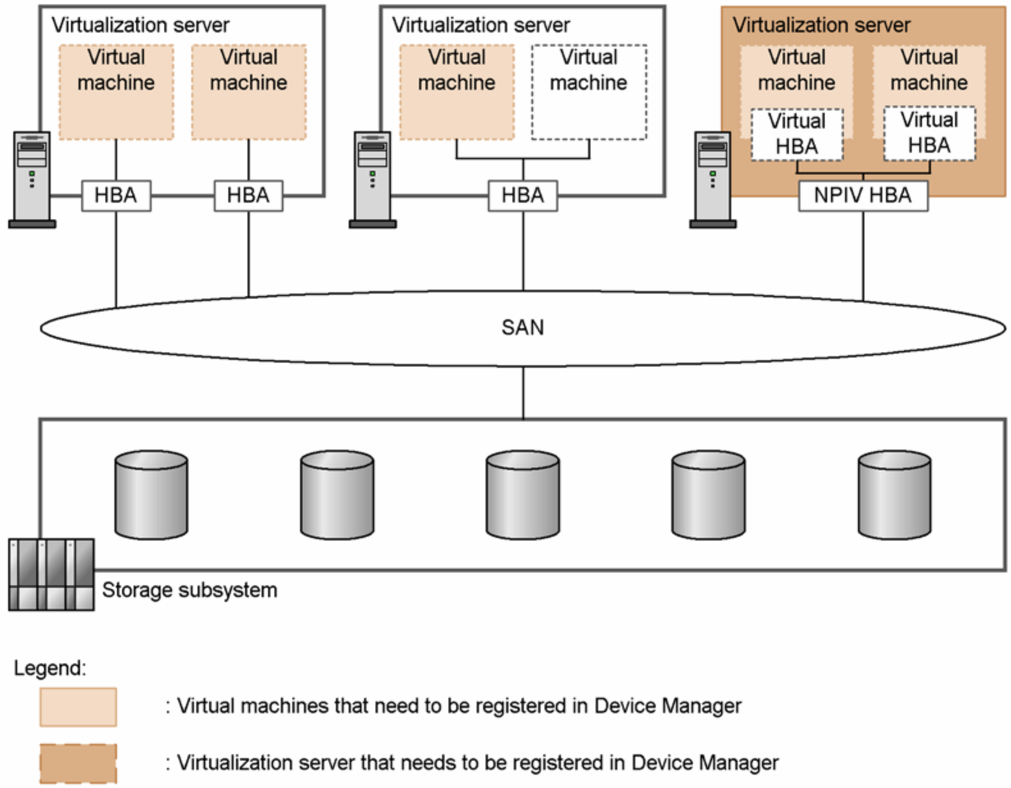


Figure 1-7 System Configuration of Virtual Machines Supported by Device Manager

The following describes the system requirements for each configuration:

- Configuration in which an HBA is assigned for each virtual machine

  Register, as a normal host, each virtual machine to which you want to assign volumes. Do not register the virtualization server that runs in the same physical environment in Device Manager.

  Assign a volume path to each virtual machine (WWN or iSCSI name). After assigning the paths, make the virtual machines recognize the volumes as RAW devices.

- Configuration in which an HBA is shared by multiple virtual machines

  If multiple virtual machines to which you want to assign volumes share an HBA, register only one of the virtual machines as a normal host. In addition, do not register the virtualization server that runs in the same physical environment in Device Manager.
  For each volume, you need to assign a path to the virtual machine (WWN or iSCSI name) that you registered in Device Manager. After assigning the paths, make the virtual machines recognize the volumes as RAW devices.

Note: If multiple virtual machines share the same HBA, regardless of which virtual machine you assign a volume to, you need to assign all paths for that HBA to the virtual machine that is managed by Device Manager. Therefore, after assigning a path, we recommend that you label each volume so that you can identify, in Device Manager, which virtual machine the volume is actually assigned to.

- Configuration in which a virtual HBA is assigned to each virtual machine (when NPIV HBA is used)

  Register, as a normal host, each virtual machine to which you want to assign volumes. In addition, register the virtualization server that runs in the same physical environment in Device Manager.

  For each volume, you must assign a path to the virtualization server (physical WWN) and a path to the virtual machine (virtual WWN). After assigning the paths, make the virtual machine recognize the volumes as a RAW device.

  For details on the system requirements for virtualization servers, see Virtualization Server Requirements.

Caution:

If you move a virtual machine from one virtualization server to another, you need to update (refresh) the information of the source and destination virtualization servers in Device Manager. After moving a virtual machine, if there are no volumes assigned to the source virtualization server, manually delete the information about the source virtualization server from Device Manager.

Virtualization Server Requirements

To use Device Manager to manage virtualization servers, the following requirements must be satisfied.

Table 1-29 System Requirements for Using Device Manager to Manage Virtualization Servers

Virtualization Software	Prerequisite Software	Connection Type Between Virtualization Servers and Storage Subsystems
VMware ESX 3.5 (Upgrade 2 or later)	None[#1]	FC
VMware ESXi 3.5	vMA[#2]	FC

Virtualization Software	Prerequisite Software	Connection Type Between Virtualization Servers and Storage Subsystems
VMware ESX 4.0	vMA[#2]	FC
VMware ESXi 4.0	vMA[#2]	FC

Note:

Before using Device Manager to manage volumes used by virtualization servers, perform the following operations:

- Set up the storage subsystem environment

  For details on the requirements for using storage subsystem volumes in a virtualization server, see the manual for each storage subsystem.
- Set up LUN security for ports

  Enable LUN security for the storage subsystem ports. For details on how to do this, see the LUN Manager manual.
- Install vMA and specify the information of the CIMOM interface

  For details on how to install vMA, see the *vSphere Management Assistant Guide*. For details on how to specify the information of the CIMOM interface, see the *CIM Storage Management API Programming Guide*.
- Configure a firewall between the management server and the virtualization server

  For details on the port numbers that need to be added to the firewall exceptions list, see Settings Required for Operation in a Firewall Environment.

#1: You can also use vMA to manage virtualization servers.

#2: IPv6 can also be used for communication between the Device Manager server and vMA. Note that, even if you use IPv6 for communication between the Device Manager server and vMA, you need to set up an environment so that the following communication uses IPv4:

- Communication between vMA and VMware ESX
- Communication between vMA and VMware vCenter Server
- Communication between vCenter Server and VMware ESX

Device Manager supports the system configurations described below. If a virtualization server is managed by Device Manager, do not make the virtual machines running on that virtualization server management targets of Device Manager, except when NPIV HBA is used in the configuration.

- Configuration in which VMware ESX is monitored by vMA

  To register a virtualization server in Device Manager, you need to specify the information (such as IP address and user account) of the CIMOM interface for vMA. When you specify the vMA information, the physical environment managed by vMA is registered as a virtualization server.

  Even if VMware ESX managed by vMA is running in a different physical environment than that in which vMA is running, you need to register the vMA information in Device Manager.

Figure 1-8 and Figure 1-9 show examples of system configurations in which VMware ESX is monitored by vMA.

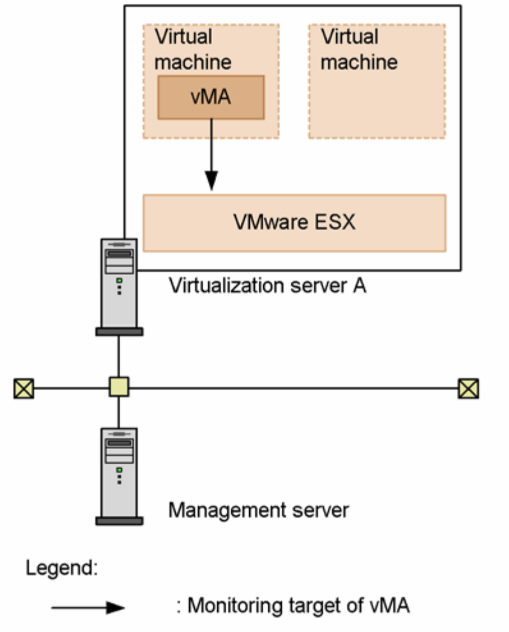


Figure 1-8 System Configuration in Which vMA Monitors VMware ESX That Is in the Same Physical Environment

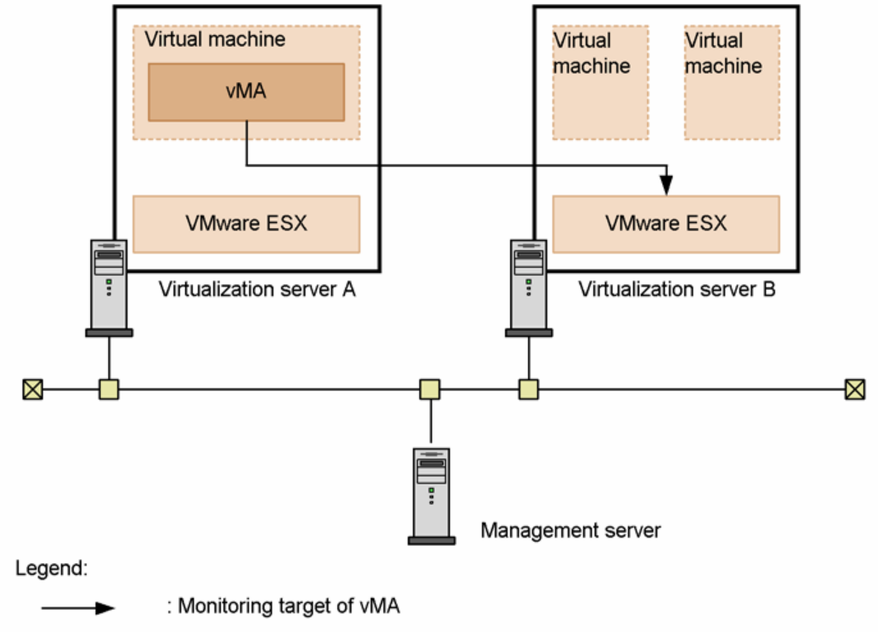


Figure 1-9 System Configuration in Which vMA Monitors VMware ESX That Is in a Different Physical Environment

In Figure 1-8, when you specify the vMA information, virtualization server A is registered in Device Manager. In Figure 1-9, when you specify the vMA information, virtualization server B is registered in Device Manager.

Caution:

- If you change the information (such as IP address and user account) of the CIMOM interface for vMA, you must re-register the vMA in Device Manager (but you do not need to delete it).
- If you change which instance of vMA manages a virtualization server, first re-register the instance of vMA that previously managed the virtualization server, and then re-register the instance of vMA that now manages the virtualization server (but you do not need to delete it).

- Configuration in which VMware vCenter Server is monitored by vMA

  To register virtualization servers in Device Manager, you need to specify the information (such as IP address and user account) about the CIMOM interface for vMA. When you specify the vMA information, the physical environments managed by VMware vCenter Server are registered as virtualization servers.

Figure 1-10 shows an example of a system configuration in which VMware vCenter Server is monitored by vMA.

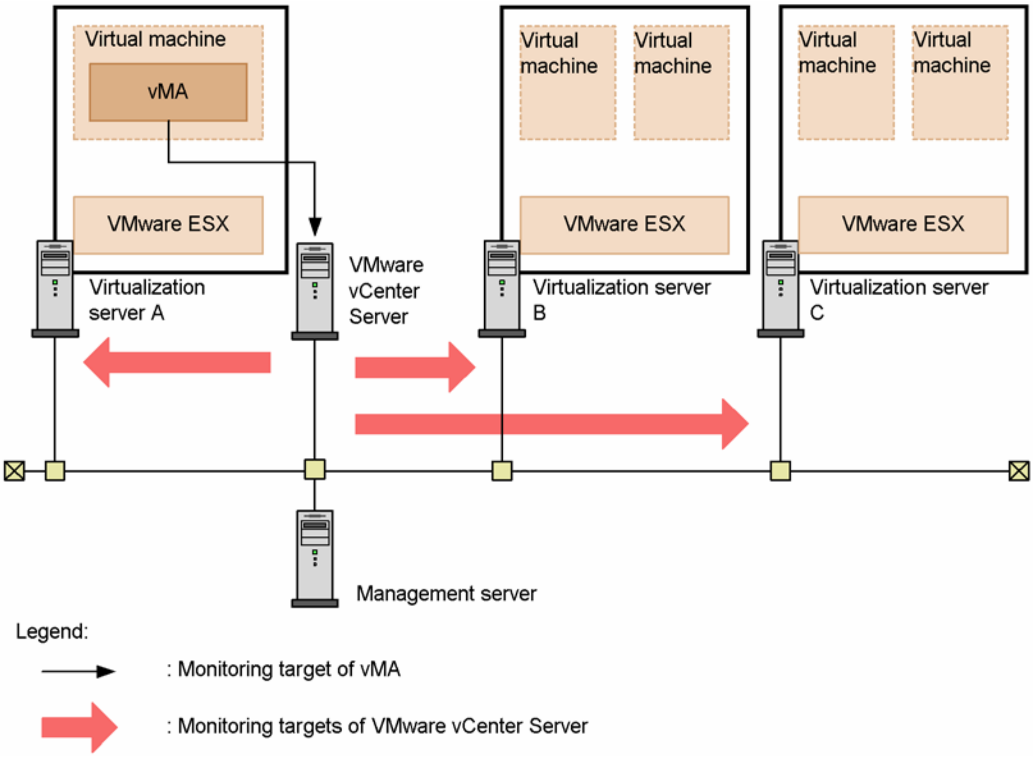


Figure 1-10 System Configuration in Which vMA Monitors VMware vCenter Server

In Figure 1-10, when you specify the information of vMA, virtualization servers A, B, and C are registered in Device Manager.

Caution:

- If you change the information (such as IP address and user account) of the CIMOM interface for vMA, you must re-register the vMA in Device Manager (but you do not need to delete it).
- If you add virtualization servers to or delete virtualization servers from VMware vCenter Server management, you must re-register, in Device Manager, the instance of vMA that monitors that instance of VMware vCenter Server (but you do not need to delete it).
- If you change which instance of VMware vCenter Server manages virtualization servers, you must perform the following operations from Device Manager:

  1. Change the communication parameter setting for the virtualization server to the information of the instance of vMA that monitors the instance of VMware vCenter Server that now manages the virtualization server.
  2. Update (refresh) the virtualization server information.

- Configuration in which vMA is not used

  In Device Manager, this configuration of virtualization server can be used only if the virtualization software is VMware ESX 3.5.

  To register a virtualization server in Device Manager, specify the information (such as IP address and user account) about the CIMOM interface for VMware ESX.

Figure 1-11 shows an example of a system configuration in which VMware ESX is operated without using vMA.

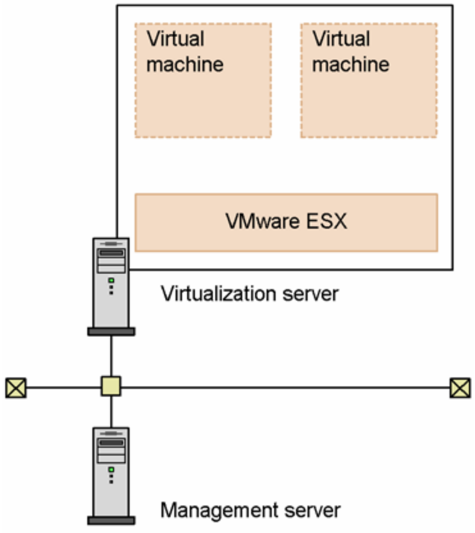


Figure 1-11 System Configuration in Which VMware ESX Is Operated Without Using vMA

In this configuration, depending on the virtualization server configuration and the number of connected volumes, it might take several hours to register and refresh the virtualization server in Device Manager.

Notes:

- To check the most recent information about virtualization server volumes, perform either of the following operations from Device Manager:
  - Manually refresh each virtualization server.
  - Re-register the vMA that manages the virtualization servers in Device Manager (but you do not need to delete it).

  Note that, if you change the hardware configuration of a virtualization server, after the configuration information of the monitored virtualization server is applied to vMA and VMware vCenter Server, you need to update (refresh) the Device Manager information. If the configuration information of virtualization servers is set to be automatically applied to vMA and VMware vCenter Server, a time lag might occur from the time the configuration is changed until the information is applied to vMA and VMware vCenter Server.

  For details on how to apply the configuration information of virtualization servers to vMA and VMware vCenter Server and how to adjust the interval for applying information, see the VMware documentation.
- You cannot use Provisioning Manager to check information about file systems and device files on a virtualization server.

Mainframe Host Requirements

To use Device Manager Web Client to check the information about volumes assigned to a mainframe host, you need to install Mainframe Agent on the mainframe host. The following table lists the versions of Mainframe Agent supported by Device Manager.

Table 1-30 Versions of Mainframe Agent Supported by Device Manager

Mainframe Host Platform	Platform Version	Mainframe Agent Version
OS/390	2.10	5.1 or later
z/OS	1.1 to 1.11	5.1 or later

For details about how to install Mainframe Agent, see the *Hitachi Device Manager Mainframe Agent User's Guide*. For details about the environment settings required for linking the Device Manager server to Mainframe Agent, see the *Hitachi Device Manager Software Command Line Interface (CLI) User's Guide*.

File Server Requirements

Device Manager can manage the following file server.

Table 1-31 File Server That Can Be Managed by Device Manager

Vendor	File Server
Hitachi	Hitachi NAS and High-performance NAS platform

Before you can allocate a volume to a Hitachi NAS and High-performance NAS platform or view its volume information, you need to specify the following environment settings.

1. Use Device Manager to register storage subsystems used by the target file server.
2. Use the management program of the Hitachi NAS and High-performance NAS platform to register the file server on the Device Manager server.
3. Use Device Manager to make sure that the file server is registered.

Caution:

- If you upgrade Device Manager from version 6.3 or earlier and you want to manage Hitachi NAS and High-performance NAS platform as a file server, we recommend that you change the value for the `server.http.entity.maxLength` property of the `server.properties` file to 1310720 or more. After changing the value, restart the Device Manager server.
- You cannot update (refresh) the file server information from Device Manager. To apply the latest file server information to the Device Manager database, re-register the file server by using the management program of the Hitachi NAS and High-performance NAS platform. (You do not need to delete the file server.)
- To re-register, as a file server, the Hitachi NAS and High-performance NAS platform that has been registered in Device Manager as a normal host, perform the following procedure:

  1. Use Web Client or CLI of Device Manager to delete the Hitachi NAS and High-performance NAS platform information.

  2. Use the management program of the Hitachi NAS and High-performance NAS platform to register the Hitachi NAS and High-performance NAS platform on the Device Manager server.

  3. Use Device Manager Web Client to add the Hitachi NAS and High-performance NAS platform registered in step 2 to the resource group.

  This step is required when you have registered, in a resource group, the Hitachi NAS and High-performance NAS platform that is managed as a normal host.

  Note that, if the host name (the file server name) of the Hitachi NAS and High-performance NAS platform matches the host name of a file server or a normal host that has already been registered in Device Manager, the Hitachi NAS and High-performance NAS platform will be registered as a file server. (The information of the database will be overwritten.)

Products Related to Device Manager

This section describes the products related to Device Manager.

Tiered Storage Manager

Tiered Storage Manager transfers data to an appropriate storage subsystem according to the characteristics (such as the importance and access frequency) of that data. Tiered Storage Manager optimizes the arrangement of data in an environment in which multiple storage subsystems have been centralized by using Universal Storage Platform V/VM and Hitachi USP. The Tiered Storage Manager GUI can be displayed from Device Manager Web Client. For details on Tiered Storage Manager, see the Tiered Storage Manager documentation.

The following table lists the versions of Tiered Storage Manager supported by Device Manager.

Table 1-32 Versions of Tiered Storage Manager Supported by Device Manager

Platform	Tiered Storage Manager Version
Windows	Same version as the Device Manager server
Solaris	Same version as the Device Manager server
Linux	Same version as the Device Manager server

Replication Manager

Replication Manager displays the copy pair configuration of a system in an easy to understand format, and allows the user to examine the configuration at the level of hosts, storage subsystems, or pair configurations. Replication Manager can also be set to automatically notify the user when errors are detected. The Replication Manager GUI can be displayed from Device Manager Web Client. For details on Replication Manager, see the documentation for Replication Manager.

The following table lists the versions of Replication Manager supported by Device Manager.

Table 1-33 Versions of Replication Manager Supported by Device Manager

Platform	Replication Manager Version
Windows	6.0 or later
Solaris	6.0 or later

Tuning Manager

Tuning Manager manages storage performance and capacity, and is installed on a management server. You can install Tuning Manager and Device Manager on different computers. The Tuning Manager GUI can be displayed from Device Manager Web Client. For details on Tuning Manager see the Tuning Manager documentation.

The following table lists the versions of Tuning Manager supported by Device Manager.

Table 1-34 Versions of Tuning Manager Supported by Device Manager

Platform	Tuning Manager Version
Windows	4.0 or later
Solaris	4.0 or later

Dynamic Link Manager

Dynamic Link Manager manages the storage access paths to and from the host on which it is installed. The Dynamic Link Manager GUI can be displayed from Device Manager Web Client only if the GUI has been set up in Dynamic Link Manager. For details on Dynamic Link Manager, see the applicable Dynamic Link Manager documentations.

Global Link Manager

Global Link Manager provides centralized management of storage access paths for multiple hosts. This product can reduce the operator’s workload in a large-scale system because path management does not have to be performed separately for each host. The Global Link Manager GUI can be displayed from Device Manager Web Client. For details on Global Link Manager, see the Global Link Manager documentation.

The following table lists the versions of Global Link Manager supported by Device Manager.

Table 1-35 Versions of Global Link Manager Supported by Device Manager

Platform	Global Link Manager Version
Windows	5.0 or later

Protection Manager

Protection Manager provides efficient and reliable data protection by simplifying complicated procedures involving data protection management. Protection Manager systematically controls storage subsystems, backup-management products, database products, and application products, reducing the workload of system administrators. The Protection Manager GUI can be displayed from Device Manager Web Client. For details on Protection Manager, see the Protection Manager documentation.

The following table lists the versions of Protection Manager supported by Device Manager.

Table 1-36 Versions of Protection Manager Supported by Device Manager

Platform	Protection Manager Version
Windows	4.0 or later

Hitachi Essential NAS Platform Manager

Hitachi Essential NAS Platform Manager operates and manages Hitachi Essential NAS Platform. The Hitachi Essential NAS Platform Manager GUI can be displayed from Web Client. For details on Hitachi Essential NAS Platform Manager, see the Hitachi Essential NAS Platform documentation.

The following table lists the versions of Hitachi Essential NAS Platform Manager supported by Device Manager.

Table 1-37 Versions of Hitachi Essential NAS Platform Manager Supported by Device Manager

Platform	Hitachi Essential NAS Platform Manager Version
Windows	5.0 or later

⚠ ***Caution:*** To plug the Hitachi Essential NAS Platform Manager GUI in to Device Manager Web Client, install a Device Manager server version of 5.6 or later, and then install Hitachi Essential NAS Platform Manager. If you install Hitachi Essential NAS Platform Manager before installing Device Manager or the installed Device Manager server is version 5.5 or earlier, you cannot plug the GUI in to Web Client. In addition, in Device Manager, you need to assign the `All Resources` resource group to the users who use Hitachi Essential NAS Platform Manager, and then add the Modify permission to the users.

Hitachi Storage Services Manager

Hitachi Storage Services Manager acts as the main console for heterogeneous storage infrastructure management software, providing SAN visualization and reporting, asset management, performance and capacity monitoring and planning, and policy-driven event management.

WARNING: Do not install HSSM on the same server as Device Manager.

Hitachi Content Archive Platform

Hitachi Content Archive Platform is an appliance product that is intended for long-term data storage, and it integrates software and hardware for a managing content archive. For details on Hitachi Content Archive Platform, see the Hitachi Content Archive Platform documentation.

System Requirements for Managing Copy Pairs

In Device Manager, you can manage copy pairs by using either of the following methods:

Local management

This method manages copy pairs for each host individually.

Central management

This method centrally manages copy pairs by using one host (the pair management server).

The following sections describe the requirements for Device Manager to manage copy pairs.

Device Manager Server Requirements for Managing Copy Pairs

This section describes the requirements necessary for the Device Manager server to manage copy pairs.

- The subsystems that are candidates for P-VOL or S-VOL must be managed by a single Device Manager server.
- The hosts that manage copy pairs must have been added to the Device Manager server.

Host Requirements for Managing Copy Pairs

This section describes the host requirements for performing copy pair operations when local management is used and when central management is used. If you have not yet created a copy pair, in the following explanation you must read *P-VOL* as *P-VOL candidate* and *S-VOL* as *S-VOL candidate*.

Caution: If you use the Remote Console for Lightning 9900, Storage Navigator (for Universal Storage Platform V/VM, Hitachi USP, and Lightning 9900V), SVP, or CCI/LIB, you can create or manage a copy pair without using CCI. However, a copy pair created by such tools cannot be controlled from Device Manager (for example, you cannot delete the copy pair or change its status), because there is no configuration definition file that is controlled by CCI to perform such copy pair operations. If you have an existing copy pair that was not created using CCI, first release the copy pair (using the same tool that created it), and then use Device Manager to recreate the volume pairs. You can also manually create a configuration definition file to control the existing copy pairs.

Managing Copy Pairs by Using Local Management

Figure 1-12 shows an example of a configuration in which copy pairs are locally managed.

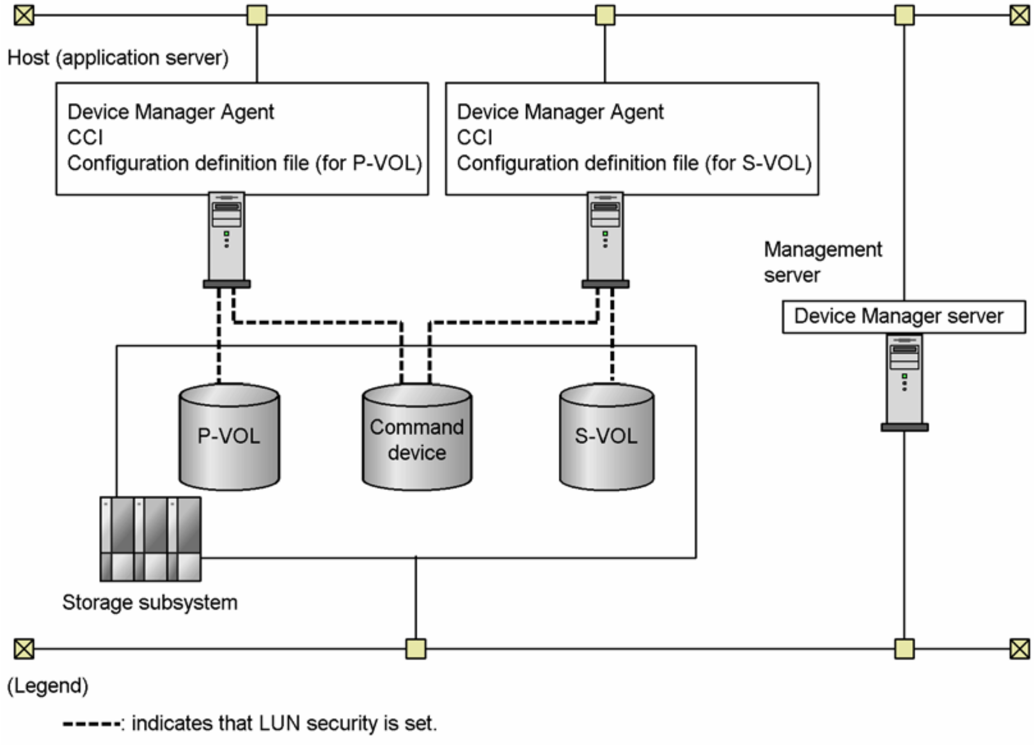

Host (application server)
Device Manager Agent
CCI
Configuration definition file (for P-VOL)
Device Manager Agent
CCI
Configuration definition file (for S-VOL)
Management server
Device Manager server
P-VOL
Command device
S-VOL
Storage subsystem
(Legend)
-----: indicates that LUN security is set.

Figure 1-12 Example of Pair Operations When Local Management is Used

- From the P-VOL or S-VOL, LUN security must be set for the host.

  LUN security from the P-VOL and S-VOL must be set for at least one host, although the host to which LUN security from the P-VOL is assigned and the host to which LUN security from the S-VOL is assigned do not need to be the same.

- The host must recognize the P-VOL or S-VOL.

  The P-VOL and S-VOL must be recognized by at least one host, although the host that recognizes the P-VOL and the host that recognizes the S-VOL do not need to be the same.

- From a command device, LUN security must be set for the hosts that recognize the P-VOL or S-VOL.

  For a host that recognizes the P-VOL, LUN security must be set from the command device on the P-VOL side. For a host that recognizes the S-VOL, LUN security must be set from the command device on the S-VOL side.

- The host that recognizes the P-VOL or S-VOL must recognize a command device.

- Device Manager agent must be installed on hosts as follows:

  If there is one host that recognizes the P-VOL and one host that recognizes the S-VOL:

  > Install a Device Manager agent on each of the hosts.

  If there are multiple hosts that recognize the P-VOL and multiple hosts that recognize the S-VOL:

  > Install a Device Manager agent on one of the hosts that recognize the P-VOL and one of the hosts that recognize the S-VOL.

  For details on the correspondence between copy pair operations and required Device Manager agent versions, see Device Manager Agent Requirements for Managing Copy Pairs.

⚠ ***Caution:*** To create a configuration definition file by using Web Client, you need to install the Device Manager agent version 3.1 or later on each host.

- CCI must be installed on hosts as follows:

  If there are multiple hosts that recognize the P-VOL and multiple hosts that recognize the S-VOL, install CCI on one of the hosts that recognize the P-VOL and one of the hosts that recognize the S-VOL.

  For details on how to install CCI, see the relevant manual for CCI.

- If there are multiple NICs on the host, the Device Manager agent and CCI must use the same IP address.
- There must be fewer than 32 running instances of CCI.

Managing Copy Pairs by Using Central Management

Figure 1-13 shows an example of a configuration in which copy pairs are centrally managed.

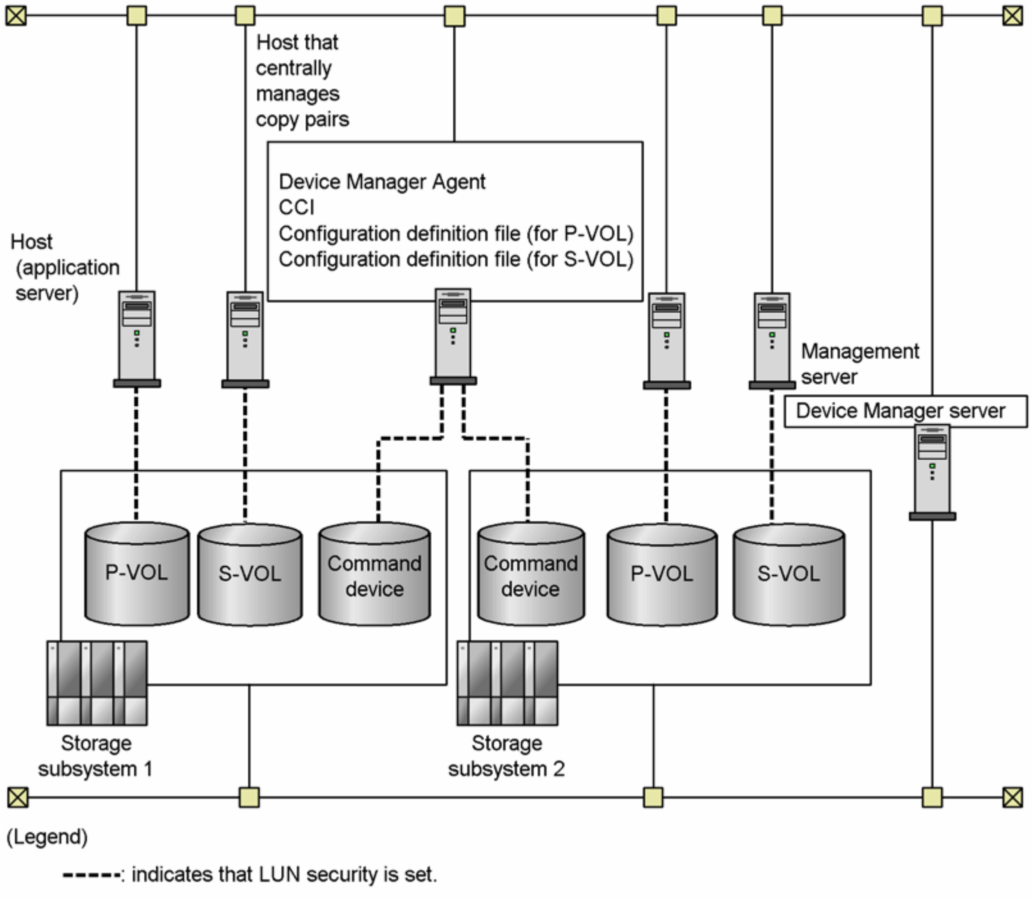


Figure 1-13 Example of Pair Operations When Central Management is Used

- From the P-VOL or S-VOL, LUN security must be set for the host.

  The host does not need to recognize the P-VOL or S-VOL.
- From a command device, LUN security must be set for the host that centrally manages copy pairs.

  To manage copy pairs for TrueCopy or Universal Replicator, LUN security must be set for the host, from the command devices of the storage subsystems of both the P-VOL and S-VOL.
- The host that centrally manages copy pairs must recognize a command device.

  The command device security must not be used for a command device.

- Device Manager agent version 3.0 or later must be installed on the host that centrally manages copy pairs.

  For details on the correspondence between copy pair operations and required Device Manager agent versions, see Device Manager Agent Requirements for Managing Copy Pairs.

⚠ ***Caution:*** To create a configuration definition file by using Web Client, you need to install the Device Manager agent version 3.1 or later on the host (pair management server) that centrally manages copy pairs.

- The `server.agent.rm.centralizePairConfiguration` property for the Device Manager agent must be set to `enable`.
- CCI must be installed on the host that centrally manages copy pairs. For details on how to install CCI, see the relevant manual for CCI.
- If there are multiple NICs on the host that centrally manages copy pairs, the Device Manager agent and CCI must use the same IP address.
- There must be fewer than 32 running instances of CCI.

⚠ ***Note:*** When central management is used, copy pairs of a host that uses a platform on which the Device Manager agent cannot be installed can be recognized.

Device Manager Agent Requirements for Managing Copy Pairs

Table 1-38 lists the copy pair operations and the versions of the Device Manager agent required for each operation.

Table 1-38 Device Manager Agent Requirements for Managing Copy Pairs

Program	Operation from Device Manager	Device Manager Agent Version
Universal Replication	Display the status	4.0 or later
	Display the status (3DR)	5.5 or later
	Change the status	5.6 or later
	Change the status (3DR)	5.5 or later
TrueCopy	Display the status	2.3 or later
	Display the status (TrueCopy Extended Distance)	5.1 or later
	Change the status	2.4 or later
	Change the status (TrueCopy Extended Distance)	5.1 or later
Simple Data Recovery	Display the status	6.0 or later

Program	Operation from Device Manager	Device Manager Agent Version
ShadowImage	Display the status	2.3 or later
	Display the status (maximum 1:3)	5.5 or later
	Change the status	2.4 or later
	Change the status (maximum 1:3)	5.5 or later
Copy-on-Write Snapshot	Display the status	4.1 or later
	Change the status	4.1 or later#2
QuickShadow	Display the status	3.0 or later
	Display the status (maximum 1:15)	5.5 or later
	Change the status	3.0 or later
	Change the status (maximum 1:15)	5.5 or later

#1: The required Device Manager agent version varies depending on the model of the target storage subsystem.

When managing Hitachi AMS 2000 copy pairs:

For Hitachi AMS 2000 (H/W Rev. 0100): Device Manager agent version 5.9 or later is required.

For Hitachi AMS 2000 (H/W Rev. 0200): Device Manager agent version 6.4 or later is required.

When managing Hitachi SMS 100 copy pairs:

Device Manager agent version 6.0 or later is required.

When managing Hitachi AMS/WMS copy pairs:

Device Manager agent version 4.1 or later is required.

#2: The version must be 4.2 or later when Universal Storage Platform V/VM or Hitachi USP is used.

Storage Subsystem Requirements for Managing Copy Pairs

This section describes the storage subsystem requirements for changing the copy pair configuration by using Device Manager. Use a storage management tool launched from Web Client to prepare the storage subsystem environment (for Lightning 9900, use the SVP or Remote Console).

To launch a storage management tool from Web Client, you need to specify the settings in the Device Manager server. For details on how to specify the settings, see Settings for Linking with Storage Navigator Modular 2, Settings for Linking with Storage Navigator Modular (for Web), or Settings for Linking with DAMP (for Web).

Caution:

- After the subsystem has been configured as required, the subsystem must be refreshed.
- The subsystem serial numbers managed by Device Manager must all be unique. In the case of TrueCopy, remote subsystems that are not managed by Device Manager must also have unique serial numbers.

The following table describes the storage subsystem requirements for managing copy pairs by using Device Manager.

Table 1-39 Storage Subsystem Requirements for Managing Copy Pairs

Subsystem	Function	Requirements
Universal Storage Platform V/VM Hitachi USP Lightning 9900V Lightning 9900	Universal Replicator[#1]	▪ Prerequisite software for Universal Replicator must be installed and the license must be enabled. ▪ There must be a fibre-channel connection between the two ports used for an MCU-RCU path.[#2] ▪ The MCU port for an MCU-RCU path must be an Initiator port, and the RCU port must be an RCU Target port.[#2] ▪ The RCU and the MCU-RCU path must be registered in the MCU.[#2] ▪ The storage subsystem cache or non-volatile memory must be sufficient. ▪ Journal volumes must be registered in the journal group. ***Note:*** After configuring the ports, you need to refresh the storage subsystem. If you need to increase the cache, contact maintenance personnel.
	TrueCopy[#1]	▪ Prerequisite software for TrueCopy must be installed and the license must be enabled. ▪ There must be a fibre-channel connection between the two ports used for an MCU-RCU path. ▪ The MCU port for an MCU-RCU path must be an Initiator port, and the RCU port must be an RCU Target port. ▪ The RCU and the MCU-RCU path must be registered in the MCU. ▪ The storage subsystem cache or non-volatile memory must be sufficient. ***Note:*** After configuring the ports, you need to refresh the storage subsystem. If you need to increase the cache, contact maintenance personnel.
	ShadowImage[#1]	Prerequisite software for ShadowImage must be installed and the license must be enabled.

Subsystem	Function	Requirements
Hitachi AMS 2000 Hitachi AMS/WMS Thunder 9500V	TrueCopy	▪ Prerequisite software for TrueCopy must be installed and the license must be enabled. ▪ There must be a fibre-channel connection between the two ports used for a path. ▪ The TrueCopy path must be configured. For Hitachi AMS 2000, paths can be set from a storage subsystem to multiple storage subsystems. ▪ The system start attribute must be dual active mode. ▪ For Thunder 9500V, the data share mode must be ON. ▪ For Thunder 9500V, the SCSI ID/Port ID inheritance mode must be set to **Unused**. ▪ For Hitachi AMS 2000, Hitachi SMS or Hitachi AMS/WMS, a DM-LU must be set up. ▪ To use TrueCopy Extended Distance in Hitachi AMS 2000 or Hitachi AMS/WMS, a pool must be set. The pool can be shared with Copy-on-Write-Snapshot.
	ShadowImage	▪ Prerequisite software for ShadowImage must be installed and the license must be enabled. ▪ The system start attribute must be dual active mode. ▪ For Thunder 9500V, the data share mode must be ON. ▪ For Thunder 9500V, the SCSI ID/Port ID inheritance mode must be set to **Unused**. ▪ For Hitachi AMS 2000, Hitachi SMS or Hitachi AMS/WMS, a DM-LU must be set up.
	Copy-on-Write-Snapshot QuickShadow[#3]	▪ Prerequisite software for Copy-on-Write-Snapshot or QuickShadow must be installed and the license must be enabled. You need to restart the storage subsystem after installing the software. ▪ To be used as an S-VOL, a V-VOL (a special LU) must be prepared in advance. Perform the preparations in the following order: - Create a pool. - Create a virtual V-VOL (for QuickShadow, set up the V-VOL). ▪ For Hitachi AMS 2000, or Hitachi AMS/WMS, a DM-LU must be set up.
Hitachi SMS	ShadowImage	▪ Prerequisite software for ShadowImage must be installed and the license must be enabled. ▪ The system start attribute must be the dual active mode. ▪ A DM-LU must be set up.
	Copy-on-Write-Snapshot	▪ Prerequisite software for Copy-on-write-Snapshot must be installed and the license must be enabled. You need to restart the storage subsystem after installing the software. ▪ To be used as an S-VOL, a V-VOL (a special LU) must be prepared in advance. Perform the preparations in the following order: - Create a pool. - Create a virtual V-VOL. ▪ A DM-LU must be set up.

Subsystem	Function	Requirements
Thunder 9200	TrueCopy	▪ Prerequisite software for TrueCopy (Synchronous Remote Copy) must be installed and the license must be enabled. ▪ There must be a fibre-channel connection between the two ports used for a path. ▪ The Remote Copy path must be configured. ▪ The data share mode must be **ON**. ▪ The system start attribute must be dual active mode. ▪ The SCSI ID/Port ID inheritance mode must be set to **Unused**. ▪ Specify the INQUIRY data extended mode in the host mode 2 to all the ports.
	ShadowImage	▪ Prerequisite software for ShadowImage (MRCF-Lite control function) must be installed and the license must be enabled. ▪ The stripe size must be set to 64 KB. ▪ The data share mode must be enabled. ▪ The system start attribute must be dual active mode. ▪ The SCSI ID/Port ID inheritance mode must be set to **Unused**. ▪ Specify the INQUIRY data extended mode in host mode 2 to all ports.
#1: For mainframe volume copy pairs, the only operation you can perform with Device Manager is to check the configuration. To check the copy pair configuration by using Device Manager, there are no storage subsystem requirements. #2: The settings specified in TrueCopy can be shared with Universal Replicator. However, in Universal Replicator, the settings must be specified for both storage subsystems used for the P-VOL and the S-VOL.		

Notes on Using Device Manager When CCI or Protection Manager Is Already Managing Copy Pairs

If a copy pair is already managed by CCI or Protection Manager, the copy pair can be managed by Device Manager once Device Manager is installed.

Note the following if you are using CCI or Protection Manager to manage existing copy pairs:

- To use Device Manager to control copy pairs managed by CCI or Protection Manager, the configuration definition file on the host that manages the P-VOL of the copy pair and the configuration definition file on the host that manages the S-VOL of the copy pair must have the same group name and the same pair name. If different names are specified, Device Manager cannot control that copy pair. In addition, if you want to use a single host to manage multiple copy pairs, make sure that these copy pairs satisfy the conditions written below. If there are copy pairs that do not satisfy the conditions, modify the configuration definition file.

  - If the version of the Device Manager agent installed on the host is 05-60 or earlier:

    Each copy pair on the host must have a unique combination of the following items:

    - Group name
    - Pair name

  - If the version of the Device Manager agent installed on the host is 05-70 or later:

    Each copy pair on the host must have a unique combination of the following items:

    - Port number
    - Group name
    - Pair name

- If you want to use CCI to create a copy pair or are already using CCI to manage copy pairs, you can create a configuration definition file by using the Create Pair wizard of Device Manager Web Client. To create a configuration definition file by using Web Client, you need to stop HBase Storage Mgmt Common Service, and then change the value of the `client.outputhorcmfunction.enabled` property in the `client.properties` file to `true`. For details about this property, see client.outputhorcmfunction.enabled.

  - You cannot create a copy pair from the Device Manager server by using a configuration definition file created using Web Client.
  - If you create an invalid configuration definition file by using Web Client, you need to delete or edit the file on the host that manages copy pairs because the Device Manager server cannot be used to delete configuration definition files. An invalid configuration file or a configuration file that is not used for performing copy pair operations might affect system performance (for example, when adding or refreshing a storage subsystem). Delete such configuration files from the host that manages copy pairs.

Note:

- In the step performed in the Define Pair(s) dialog box, you do not need to specify the fence level and copy pace. Even if you specify these items, they are not applied to the configuration definition file.
- In the View Pair Information dialog box, you can view the HORCM instance number, pair group name, and pair name of the created configuration definition file.
- For a Shadow Image copy pair and a QuickShadow or Copy-on-Write Snapshot copy pair, the Device Manager server sets `0` as the MU number in the configuration definition file. For TrueCopy, the MU number is not set because this number is not necessary. The Device Manager server also sets `1` as the MU number in the configuration definition file for Universal Replicator copy pairs. When you use a configuration definition file, created by the Device Manager server, to create a copy pair, make sure that you change these values into appropriate values.

- When you install the Device Manager agent, the Device Manager agent properties must be configured if the installation drive of CCI in Windows is different from the installation drive of the Device Manager agent. For details about the Device Manager agent properties to be configured, see the *Hitachi Device Manager Agent Installation Guide*.

  To avoid malfunctions and to shorten the processing time of Device Manager, exclude (from Device Manager operations) copy pairs that you do not plan to control from Device Manager. To do this:

  1. Check the number of the CCI HORCM instance that is managing the copy pair.
  2. In the following property in the Device Manager agent property file, enter the HORCM instances that you want to exclude from Device Manager operations. If you enter multiple HORCM instances, separate them by a comma:

     Property file name: `server.properties`

     Property name: `server.agent.rm.exclusion.instance`

     `Example: server.agent.rm.exclusion.instance=0,1,2`
  3. Restart the Device Manager agent service (daemon).

2

Settings for Various Network Configurations

This chapter describes the settings required on a Device Manager server for various network configurations.

Port Settings

This section describes the port numbers and firewall settings used by Device Manager.

Ports Used by Device Manager

If you use Device Manager with other programs on a computer, be sure to avoid duplicating port numbers.

Ports Used by Common Component

Table 2-1 describes the ports used by Common Component.

Table 2-1 Ports Used by Common Component

Port Number	Description
23015/tcp[#1]	Used for accessing the HBase Storage Mgmt Web Service when communicating with management clients (Web Client). If a product other than Common Component is using this port number, change the settings of that product or of Common Component. For details about how to change the Common Component settings, see Changing Ports Used by Common Component
23016/tcp	Used for accessing the HBase Storage Mgmt Web Service when performing SSL communication with management clients (Web Client). If a product other than Common Component is using this port number, change the settings of that product or of Common Component. For details about how to change the Common Component settings, see Changing Ports Used by Common Component
23017/tcp	Used internally for Common Component communication (accessing HBase Storage Mgmt Common Service through an AJP connection from HBase Storage Mgmt Web Service). If a product other than Common Component is using this port number, change the settings of that product or of Common Component. For details about how to change the Common Component settings, see Changing Ports Used by Common Component.
23018/tcp	Used internally for Common Component communication (receiving a stop request from HBase Storage Mgmt Common Service). If a product other than Common Component is using this port number, change the settings of that product or of Common Component. For details about how to change the Common Component settings, see Changing Ports Used by Common Component.
23019/tcp to 23031/tcp	Reserved ports

Port Number	Description
23032/tcp	Used internally for Common Component communication (HiRDB). If a product other than Common Component is using this port number, change the settings of that product or of Common Component. For details about how to change the Common Component settings, see Changing Ports Used by Common Component.
23033/tcp 23034/tcp	Reserved ports
45001/tcp to 49000/tcp	Used internally for Common Component communication (HiRDB). You cannot change the settings by using Device Manager. If products using these ports are installed on the same computer, change the settings of those products.
#: This port is also used when SSL is enabled. If you want to permit only SSL communication, set up a firewall as described in Settings Required for Operation in a Firewall Environment.	

Ports Used by Device Manager Server

Table 2-2 describes the ports used by the Device Manager server.

Table 2-2 Ports Used by the Device Manager Server

Port Number	Description
162/udp	Used for receiving SNMP traps from Universal Storage Platform V/VM, Hitachi USP, Lightning 9900V, and Lightning 9900.
427/tcp	Used for communication with a CIM client.
1099/tcp	Used for launching Storage Navigator Modular 2, Storage Navigator Modular (for Web), or DAMP (for Web) from Web Client during non-SSL communication. We recommend that you change this port number because it is used as the temporary port assigned by default in Windows. You will need to change the settings for Hitachi AMS/WMS or Thunder 9500V if operated using Storage Navigator Modular 2. For details about how to change the Device Manager settings, see Settings for Linking with Storage Navigator Modular 2 or Settings for Linking with Storage Navigator Modular (for Web). ***Caution:*** When launching DAMP (for Web), this port number cannot be changed to another port number. If another product is using this port number, perform either of the following operations: ▪ If the product using port number 1099 is almost always running: Use different computers for running Device Manager and that product. ▪ If the product using port number 1099 is only running temporarily: Restart DAMP (for Web).

Port Number	Description
2001/tcp[#]	Used for communication with management clients (Web Client and CLI) and hosts (Device Manager agents and file servers). This port number is used as the temporary port assigned by default in Windows. Therefore, we recommend that you change this port number setting for the Device Manager server by modifying the `server.http.port` property in the `server.properties` file. Note that you cannot start the Device Manager server if this port is being used by another product. After changing the port number, execute the hdvmagt_account command to change the setting for the Device Manager agent. For details about the hdvmagt_account command, see the *Hitachi Device Manager Agent Installation Guide*.
2443/tcp	Used for SSL communication with management clients (Web Client and CLI). This port number is used as the temporary port assigned by default in Windows. Therefore, we recommend that you change this port number setting for the Device Manager server by modifying the `server.https.port` property in the `server.properties` file. ***Note:*** You can also change Windows OS settings by editing the registry. For details about how to do this, see the Microsoft web site.
5983/tcp	Used for receiving event indications from SMI-S providers.You can change this port number by modifying the `server.smisclient.indication.port` property in the `server.properties` file.
5988/tcp	Used for non-SSL communication with the SMI-S provider or CIM client. You can change the port used for communication with a CIM client by modifying the `server.cim.http.port` property in the `server.properties` file.
5989/tcp	Used for SSL communication with the SMI-S provider or CIM client. You can change the port used for communication with a CIM client by modifying the `server.cim.https.port` property in the `server.properties` file.
24220/tcp	Used by HiRDB.
51099/tcp	Used for launching Storage Navigator Modular 2 or Storage Navigator Modular (for Web) from Web Client during SSL communication.

#: This port is also used when SSL is enabled. If you want to permit only SSL communication, set up a firewall as described in Settings Required for Operation in a Firewall Environment.

Ports Used by Device Manager Agent

Table 2-3 describes the ports used by a Device Manager agent.

Table 2-3 Ports Used by Device Manager Agent

Port Number	Description
24041/tcp	Used for communication with the Device Manager server. You can change the port by using the `server.agent.port`

Port Number	Description
	property in the server.properties file of the Device Manager agent. Mainframe Agent can also use this port.
24042/tcp	Used for communication with the Device Manager server. You can change the port by using the server.http.port property in the server.properties file of the Device Manager agent. Mainframe Agent can also use this port.
24043/tcp	Used internally for Device Manager agent communication. You can change the port by using the server.http.localPort property in the server.properties file of the Device Manager agent.

Ports Used by Storage Subsystems

If you change the port number used by a storage subsystem, you need to specify the new port number in the services file of the management server OS. If you operate the storage subsystem without doing so, an error (code: DMEA000006) occurs and operations might fail.

For communication between storage subsystems and the Device Manager server, use the same port number for SSL and non-SSL communication. If communication is between storage subsystems that have different port numbers, an error might occur if a storage subsystem uses a port number that is different from the one specified in the services file of the management server. In addition, even if the storage subsystems use the same port numbers as the ones specified in the services file, an error will not occur but the operation might take a long time.

For details about how to check the port numbers and how to specify entries in the services file, see the documentation for each storage subsystem.

Changing Ports Used by Common Component

After installing Device Manager, if you want to change the ports used by Common Component, perform the following procedure:

1. If HiCommand Suite products whose versions are earlier than 5.7 are running, stop their services. For details, see the manual for your product version.
2. Stop the services of Hitachi Storage Command Suite products and Common Component.
   – In Windows:

     Select **Start**, **All Program**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server with Common Services**.

   – In Solaris or Linux:

     *installation-directory-for-Common-Component/*bin/hcmdssrv -stop

3. Edit the Common Component settings files and change the port number.

   For details about each port's setup file, see 23015/tcp (Used for Accessing HBase Storage Mgmt Web Service) to 23032/tcp (Used for HiRDB).

4. Start the services of the Device Manager server, other Hitachi Storage Command Suite products, and Common Component.

   – In Windows:

     Select **Start**, **All Program**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server with Common Services**.

   – In Solaris or Linux:

     installation-directory-for-Common-Component **/bin/hcmdssrv -start**

5. If HiCommand Suite products whose versions are earlier than 5.7 have been installed, start their services as required. For details, see the manual for your product version.

6. If you change the following port numbers, you need to change the URLs used for accessing Hitachi Storage Command Suite products:

   – 23015/tcp (used for accessing HBase Storage Mgmt Web Service)

     You need to change the URLs if you use non-SSL for communication between the management server and management clients.

   – 23016/tcp (used for accessing SSL HBase Storage Mgmt Web Service)

     You need to change the URLs if you use SSL for communication between the management server and management clients.

   For details about how to change the URLs, see Settings Required When Disconnecting the Management Server Network.

   Note that you might not need to change the URLs depending on the network environment between the management server and management clients, such as an environment that has a firewall configured.

⚠ ***Note:*** If storage management tools are configured to be launched from Web Client, you need to use `launchapptool` to change the launch settings for the storage management tools (Storage Navigator Modular 2, Storage Navigator Modular, or DAMP (for Web)). For details on how to do this, see Launch Settings for Storage Navigator Modular 2, Launch Settings for Storage Navigator Modular (for Web), or Launch Settings for DAMP (for Web).

23015/tcp (Used for Accessing HBase Storage Mgmt Web Service)

To change the port used for accessing the HBase Storage Mgmt Web Service, change the port number written in the following files:

In Windows:

– The `Listen` directive in

installation-folder-for-Common-Component\httpsd\conf\httpsd.conf

- hsso.hostport in

  installation-folder-for-Common-Component\conf\hsso.conf

In Solaris or Linux:

- The Listen directive in

  installation-directory-for-Common-Component/httpsd/conf/httpsd.conf

- hsso.hostport in

  installation-directory-for-Common-Component/conf/hsso.conf

23016/tcp (Used for Accessing SSL HBase Storage Mgmt Web Service)

To change the port used for accessing SSL HBase Storage Mgmt Web Service, you must change the port numbers written in the following file:

In Windows:

- <VirtualHost *host-name*:*port-number*> and also the Listen directive in

  installation-folder-for-Common-Component\httpsd\conf\httpsd.conf

In Solaris or Linux:

- <VirtualHost *host-name*:*port-number*> and also the Listen directive in

  installation-directory-for-Common-Component/httpsd/conf/httpsd.conf

23017/tcp (Used for HBase Storage Mgmt Common Service through an AJP Connection)

To change the port used for the HBase Storage Mgmt Common Service through an AJP connection, change the port number written in the following files:

In Windows:

- worker.worker1.port in

  installation-folder-for-Common-Component\CC\web\redirector\workers.properties

- webserver.connector.ajp13.port in

  installation-folder-for-Common-Component\CC\web\containers\HiCommand\usrconf\usrconf.properties

In Solaris or Linux:

- worker.worker1.port in

  installation-directory-for-Common-Component/CC/web/redirector/workers.properties

- `webserver.connector.ajp13.port` in

  `installation-directory-for-Common-Component``/CC/web/containers/HiCommand/usrconf/usrconf.properties`

23018/tcp (Used for Stop Requests to HBase Storage Mgmt Common Service)

To change the port through which the HBase Storage Mgmt Common Service Service receives a stop request, change the port number written in the following file:

In Windows:

- `webserver.shutdown.port` in

  `installation-folder-for-Common-Component``\CC\web\containers\HiCommand\usrconf\usrconf.properties`

In Solaris or Linux:

- `webserver.shutdown.port` in

  `installation-directory-for-Common-Component``/CC/web/containers/HiCommand/usrconf/usrconf.properties`

23032/tcp (Used for HiRDB)

To change the port used by HiRDB, you must change the port number written in the following files:

In Windows:

- `PDNAMEPORT` in

  `installation-folder-for-Common-Component``\HDB\CONF\emb\HiRDB.ini`

- `pd_name_port` in

  `installation-folder-for-Common-Component``\HDB\CONF\pdsys`

- `pd_name_port` in

  `installation-folder-for-Common-Component``\database\work\def_pdsys`

In Solaris or Linux:

- `PDNAMEPORT` in

  `installation-directory-for-Common-Component``/HDB/conf/emb/HiRDB.ini`

- `pd_name_port` in

  `installation-directory-for-Common-Component``/HDB/conf/pdsys`

- `pd_name_port` in

  `installation-directory-for-Common-Component``/database/work/def_pdsys`

Settings Required for Operation in a Firewall Environment

In an environment where firewalls are set up in the following locations, you need to register port numbers as firewall exceptions to permit communication between ports:

- Between the management server and management clients
- Between the management server and storage subsystems
- Between the management client and storage subsystems
- Between the management server and a normal host
- Between the management server and a virtualization server
- Between the management server and a mainframe host
- Between the management server and a file serer
- Between the management server of Device Manager and the management server of Tuning Manager
- Between the management server and an SMI-S provider
- Between the management server and a CIM client
- Between the management server and a mail server
- Between the management server and an external authentication server

Table 2-4 describes the port numbers that must be registered as exceptions to a firewall between the management server and a management client.

Table 2-4 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and Management Clients

Port Number	Originator	Destination	Remarks
1099/tcp[#1]	Management client (Web Client)	Management server	This setting is required in the following cases: ▪ When operating Hitachi AMS/WMS or Thunder 9500V by linking with Storage Navigator Modular 2. ▪ When linking with Storage Navigator Modular (for Web), or with DAMP (for Web).
2001/tcp[#2]	Management client (Web Client or CLI)	Management server	This setting is required when non-SSL communication is used.
2443/tcp[#2]	Management client (Web Client or CLI)	Management server	This setting is required when SSL communication is used.
23015/tcp[#2]	Management client (Web Client)	Management server	This setting is required when non-SSL communication is used.
23016/tcp[#2]	Management client (Web Client)	Management server	This setting is required when SSL communication is used.
51099/tcp[#2]	Management client (Web Client)	Management server	This setting is required in the following cases: ▪ When operating a Hitachi AMS/WMS or Thunder 9500V linked through Storage Navigator Modular 2. ▪ When linking with Storage Navigator Modular (for Web) or DAMP (for Web).

#1: This port number can be changed when linking with Storage Navigator Modular 2 or Storage Navigator Modular (for Web).

#2: This port number can be changed.

Table 2-5 describes the port numbers that must be registered as exceptions to a firewall between the management server and storage subsystems.

Table 2-5 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and Storage Subsystems

Port Number	Originator	Destination	Remarks
20/tcp	▪ Lightning 9900 ▪ Lightning 9900V ▪ Hitachi USP ▪ Universal Storage Platform V/VM	Management server	Set up the firewall so that communication can be established from the 20/tcp port of the storage subsystem to any port of the management server.
21/tcp	Management server	▪ Lightning 9900 ▪ Lightning 9900V ▪ Hitachi USP ▪ Universal Storage Platform V/VM	-
161/udp	Management server	Lightning 9900	-
162/udp	▪ Lightning 9900 ▪ Lightning 9900V ▪ Hitachi USP ▪ Universal Storage Platform V/VM	Management server	-
1099/tcp	Management server	▪ Lightning 9900V ▪ Hitachi USP ▪ Universal Storage Platform V/VM	-
2000/tcp#	Management server	▪ Thunder 9200 ▪ Thunder 9500V ▪ Hitachi AMS/WMS	-
2000/tcp#	Management server	▪ Hitachi SMS ▪ Hitachi AMS 2000	This setting is required when non-SSL communication is used.
2001/tcp#	▪ Hitachi USP ▪ Universal Storage Platform V/VM	Management server	Set up the firewall so that communication can be established from any port of the storage subsystem to the 2001/tcp port of the management server.
28355/tcp#	Management server	▪ Hitachi SMS ▪ Hitachi AMS 2000	This setting is required when SSL communication is used.
51099/tcp	Management server	▪ Lightning 9900V ▪ Hitachi USP ▪ Universal Storage Platform V/VM	-
51100/tcp	Management server	▪ Universal Storage Platform V/VM	This setting is required when you perform an upgrade installation to a Device

Port Number	Originator	Destination	Remarks
			Manager server version 6.0.0-00 or later.
Legend -: Not supported. #: This port number can be changed.			

Table 2-6 describes the port numbers that must be registered as exceptions to a firewall between the management client and storage subsystems.

Table 2-6 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Client and Storage Subsystems

Port Number	Originator	Destination	Remarks
80/tcp	Management client (Web Client)	▪ Lightning 9900V ▪ Hitachi USP ▪ Universal Storage Platform V/VM	-
443/tcp	Management client (Web Client)	▪ Hitachi USP ▪ Universal Storage Platform V/VM	This setting is required when using SSL to start Physical View.
1099/tcp	Management client (Web Client)	▪ Lightning 9900V ▪ Hitachi USP ▪ Universal Storage Platform V/VM	-
2000/tcp#	Management client (Web Client)	▪ Thunder 9200 ▪ Thunder 9500V ▪ Hitachi AMS/WMS	-
51099/tcp	Management client (Web Client)	▪ Lightning 9900V ▪ Hitachi USP ▪ Universal Storage Platform V/VM	-
Legend -: Not supported. #: This port number can be changed.			

Table 2-7 describes the port numbers that must be registered as exceptions to a firewall between the management server and a normal host.

Table 2-7 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and a Normal Host

Port Number	Originator	Destination	Remarks
2001/tcp#	Normal host	Management server	-
24041/tcp#	Management server	Normal host	-

Port Number	Originator	Destination	Remarks
24042/tcp#	Management server	Normal host	-
Legend -: Not supported. #: This port number can be changed.			

Table 2-8 describes the port numbers that must be registered as exceptions to a firewall between the management server and a virtualization server.

Table 2-8 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and a Virtualization Server

Port Number	Originator	Destination	Remarks
5988/tcp	Management server	vMA	This setting is required for non-SSL communication if the configuration uses vMA.
5988/tcp	Management server	VMware ESX	This setting is required for non-SSL communication if the configuration does not use vMA.
5989/tcp	Management server	vMA	This setting is required for SSL communication if the configuration uses vMA.
5989/tcp	Management server	VMware ESX	This setting is required for SSL communication if the configuration does not use vMA.

Table 2-9 describes the port numbers that must be registered as exceptions to a firewall between the management server and a mainframe host.

Table 2-9 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and a Mainframe Host

Port Number	Originator	Destination	Remarks
24042/tcp#	Management server	Mainframe host	-
Legend: -: Not applicable #: This port number can be changed.			

Table 2-10 describes the port numbers that must be registered as exceptions to a firewall between the management server and a file server.

Table 2-10 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and a File Server

Port Number	Originator	Destination	Remarks
2001/tcp#	Management server	File server	-
Legend: -: Not applicable #: This port number can be changed.			

Table 2-11 describes the port number that must be registered as exceptions to a firewall between the management server of Device Manager and the management server of Tuning Manager.

Table 2-11 Port Number That Must Be Registered as Exceptions to a Firewall Between the Management Server of Device Manager and the Management Server of Tuning Manager

Port Number	Originator	Destination	Remarks
22900/tcp to 22999/tcp	Management server of Device Manager	Management server of Tuning Manager	This setting is required for remotely connecting to Tuning Manager.
23015/tcp#1	Management server of Tuning Manager	Management server of Device Manager	This setting is required for remotely connecting to Tuning Manager.
24220/tcp#2	Management server of Tuning Manager	Management server of Device Manager #2	This setting is required for remotely connecting to Tuning Manager.
#1: This port number can be changed. #2: This port number can be changed to one in the range from 5001 to 65535.			

Table 2-12 describes the port numbers that must be registered as exceptions to a firewall between the management server and an SMI-S provider.

Table 2-12 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and an SMI-S Provider

Port Number	Originator	Destination	Remarks
5983/tcp#	SMI-S provider	Management server	-
5988/tcp#	Management server	SMI-S provider	This setting is required when non-SSL communication is used.
5989/tcp#	Management server	SMI-S provide	This setting is required when SSL communication is used.
Legend			

Port Number	Originator	Destination	Remarks

-: Not supported.

#: This port number can be changed.

Table 2-13 describes the port numbers that must be registered as exceptions to a firewall between the management server and a CIM client.

Table 2-13 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and a CIM Client

Port Number	Originator	Destination	Remarks
427/tcp	CIM client	Management server	-
5988/tcp[#]	CIM client	Management server	This setting is required when non-SSL communication is used.
5989/tcp[#]	CIM client	Management server	This setting is required when SSL communication is used.

Legend

-: Not supported.

#: This port number can be changed.

Table 2-14 describes the port numbers that must be registered as exceptions to a firewall between the management server and a mail server.

Table 2-14 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and a Mail Server

Port Number	Originator	Destination	Remarks
25/tcp[#1]	Management server (Storage Navigator Modular 2, Storage Navigator Modular (for Web), or DAMP (for Web))	Mail server[#2]	This setting is required for using the function used to report email errors while Device Manager is linked with Storage Navigator Modular 2, Storage Navigator Modular (for Web), or DAMP (for Web).
25/tcp[#3]	Management server (Device Manager server)	Mail server[#4]	This setting is required when the email notification function of the Device Manager server is used.

#1: To link with Storage Navigator Modular 2, this setting is required if the target storage subsystem is a member of Hitachi AMS/WMS or Thunder 9500V.

#2: This is a mail server configured to send error information for the storage subsystems by using Storage Navigator 2, Storage Navigator Modular (for Web), or DAMP (for Web).

#3: This port number can be changed.

#4: This is the mail server used for the email notification function of the Device Manager server.

Table 2-15 describes the port numbers that must be registered as exceptions to a firewall between the management server and an external authentication server.

Table 2-15 Port Numbers That Must Be Registered as Exceptions to a Firewall Between the Management Server and an External Authentication Server

Port Number	Originator	Destination	Remarks
88/tcp#	Management server	Kerberos server	-
88/udp#	Management server	Kerberos server	-
359/tcp#	Management server	LDAP directory server	-
1812/udp#	Management server	RADIUS server	-
*/udp	RADIUS server Kerberos server	Management server	-

Legend

-: Not supported.

#: This port number is generally used. However, a different port number might be used for an external authentication server.

Registering Firewall Exceptions in a Linux Environment

In Linux environments, the user must register firewall exceptions manually.

For details on ports to be registered, see Settings Required for Operation in a Firewall Environment.

In Red Hat Enterprise Linux

To register a firewall exception by using the text mode setup utility:

1. In a terminal window, execute the `setup` command.

   The Choose a Tool window of the text mode setup utility is displayed.

2. Select **Firewall configuration**, use the tab key to move to the **Run Tool** button, and then press **Enter**.

   The Firewall Configuration window is displayed.

3. Set **Security Level** to **Enabled** by pressing the space key to select **Enabled**, use the tab key to move to the **Customize** button, and then press **Enter**.

   The Firewall Configuration - Customize window is displayed.

4. In **Other ports** specify the port to be registered as an exception, use the tab key to move to the **OK** button, and then press **Enter**.

   Example: **Other ports** `162:udp 2001:tcp 23015:tcp`

Note: If a port is already specified, use a space to separate it from the newly added entry.

5. After returning to the Firewall Configuration window, check that **Security Level** is **Enabled**, use the tab key to move to the **OK** button, and then press **Enter**.

In SUSE Linux Enterprise Server

To register a firewall exception by using `SuSEFirewall2`:

1. Edit the `/etc/sysconfig/SuSEfirewall2` file to specify the port to be registered as an exception.

   Specify the port numbers to be registered as exceptions, in the following format:

   – FW_SERVICES_EXT_TCP="*TCP-port-number*"

   – FW_SERVICES_EXT_UDP="*UDP-port-number*"

   Example: In this example, `2001`, `23015`, `23016`, `23017`, `23018`, `161`, and `162` are registered as exceptions.

```
FW_SERVICES_EXT_TCP="2001 23015:23018"
FW_SERVICES_EXT_UDP="161 162"
```

2. Execute `/sbin/SuSEfirewall2`.

Settings Required to Use a Management Server That Has Multiple NICs

If the server computer on which Device Manager server has been installed has multiple NICs and uses the bridge function, when you specify an IP address in the Device Manager settings, specify the IP address of the NIC that belongs to the network to which Web Client is connected. Do not specify the host name.

The following describes the network settings required for the configuration example in the figure below.

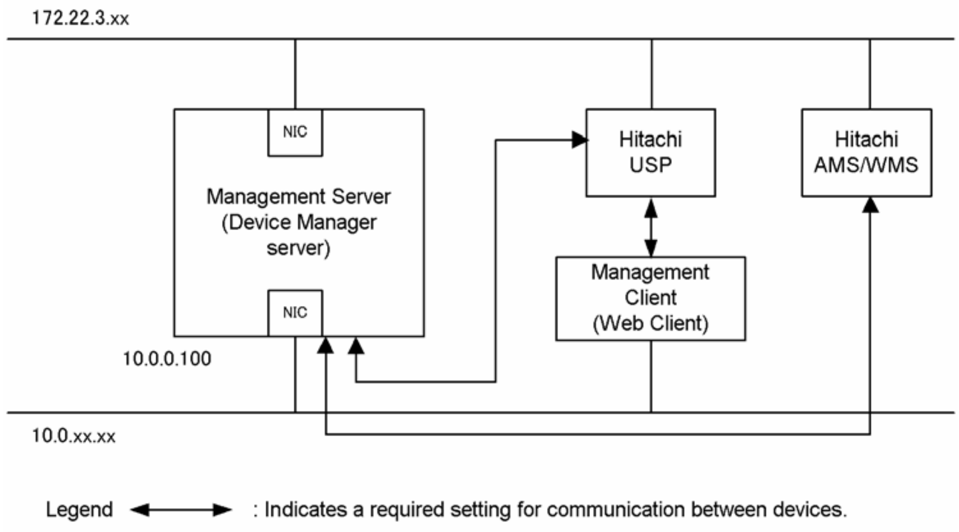

172.22.3.xx
NIC
Management Server (Device Manager server)
NIC
Hitachi USP
Hitachi AMS/WMS
Management Client (Web Client)
10.0.0.100
10.0.xx.xx
Legend
: Indicates a required setting for communication between devices.

Figure 2-1 Configuration Example Using a Server Computer that Has Two NICs

Network Settings

If you set up the configuration shown in Figure 2-1, set up routers, the management client, and the management server so that the following devices can communicate with each other as shown by the arrows in the figure:

- Hitachi USP and the computer used for Web Client
- Hitachi USP, Hitachi AMS/WMS, and the server computer on which Device Manager has been installed (the server computer whose IP address is `10.0.0.100` in the figure)

You do not have to set up communication between a management client and a member of Hitachi AMS/WMS because Storage Navigator Modular 2 or Storage Navigator Modular manages this communication.

Settings for the Device Manager Server

When you use a Device Manager property to specify an IP address, specify the IP address of the NIC that belongs to the network to which the management client connects.

The settings required for the configuration in Figure 2-1 are as follows:

- Specifying the property for the Device Manager server:

  For the `server.http.host` property, specify the IP address of the computer on which the web server function of Device Manager is used.

  ```
  server.http.host=10.0.0.100
  ```

- Specifying the property for launchable applications:

  As shown in Figure 2-1, if the management target is a member of Hitachi AMS/WMS, necessary settings vary depending on the application to be executed.

  – If the application to be executed is DAMP or Storage Navigator Modular (for Web):

    For the `launchapp.damp.url` property, specify the URL of the web server for Storage Navigator Modular (for Web) to be launched from the web browser of a management client.

  ```
  launchapp.damp.url=http://10.0.0.100:23015/program/DeviceManager/snm
  ```

  – If the application to be executed is Storage Navigator Modular 2:

    For the `launchapp.snm2.url` property, specify the URL of the web server for Storage Navigator Modular 2 to be executed from a management client web browser.

  ```
  launchapp.snm2.url=http://10.0.0.100:23015/program/StorageNavigatorModular/applet
  ```

⚠ ***Note:*** If the storage subsystem to be managed is a member of Hitachi AMS 2000 and Hitachi SMS, settings for Storage Navigator Modular 2 are not required.

For details about the Device Manager properties, see Specifying Properties.

Settings for Storage Navigator Modular 2 or Storage Navigator Modular (for Web)

In the configuration example in Figure 2-1, if you use the simple setup tool (`launchapptool`) to set the IP address to be specified for the web server's URL, specify `10.0.0.100` for the IP address.

For details on how to set up the environment when Storage Navigator Modular 2 or Storage Navigator Modular (for Web) is to be launched and executed, see Settings for Linking with Storage Navigator Modular 2 or Settings for Linking with Storage Navigator Modular (for Web).

Note: If the storage subsystem to be managed is a member of Hitachi AMS 2000 and Hitachi SMS, settings for Storage Navigator Modular 2 are not required.

For details on Storage Navigator Modular 2 and Storage Navigator Modular (for Web), see the manual for Storage Navigator Modular 2 or the Storage Navigator Modular (for Web) User's Guide.

Settings Required to Operate in an IPv6 Environment

This section describes the settings required to use Device Manager in an IPv6 environment. For details about the OSs that support Device Manager server operations in IPv6 environments, see Management Server Requirements.

Limitations on Operations in an IPv6 Environment

Note the following limitations when you use Device Manager in an IPv6 environment:

- Set up the OS so that both IPv6 and IPv4 can be used because, even if IPv6 is being used, IPv4 is also required for processing in the product.
- You can only use global addresses as IPv6 addresses. Global-unique local addresses, (site-local addresses,)and link-local addresses cannot be used.
- When specifying the IP address or host name of the Device Manager server, we recommend that you use the host name. If you specify an IPv6 address, in Internet Explorer® 6 you might not be able to connect to the Device Manager server or move among windows.
- If you specify a URL when setting up Storage Navigator Modular 2, Storage Navigator Modular (for Web), or DAMP (for Web), you cannot use IPv6 addresses. Use a host name for these settings.

Settings for Linking with Storage Subsystems That Support IPv6

If you use Physical View of Universal Storage Platform V/VM managed by using IPv6 addresses, set either of the following values for the `server.http.host` property in the `server.properties` file:

- The IPv6 address of the computer on which the Device Manager server is installed
- The host name of the computer on which the Device Manager server is installed[#]

  #:

  The host name must be resolvable to the IPv6 address.

For details on how to set the `server.http.host` property, see server.http.host.

Caution: If a storage subsystem that supports IPv6 is used with a Universal Storage Platform V/VM or Hitachi USP that is managed by using IPv4 addresses, in the `server.http.host` property you need to set an IPv4 address for any NIC for which an IPv6 address is specified.

Settings Required to Migrate Device Manager to an IPv6 Environment

If Device Manager is used in an IPv4 environment and you then wish to use it in an IPv6 environment, edit the `httpsd.conf` file. The `httpsd.conf` file is stored in the following locations:

- In Windows:
  `installation-folder-for-Common-Component``\httpsd\conf\httpsd.conf`
- In Solaris or Linux:
  `installation-directory-for-Common-Component``/httpsd/conf/httpsd.conf`

Caution: Stop Device Manager and Common Component, and then edit the `httpsd.conf` file. After editing the file, start Device Manager and Common Component to apply the changes.

Note: If you perform a new installation of Device Manager in an environment where IPv6 is enabled, the installer automatically sets the following settings.

Settings for IPv6

Remove the hash mark (#) from the line that includes `Listen [::]:23015` (the default setting). By default, all IP addresses are set to allow communication.

Specify the same port number as specified in the `Listen` line for IPv4. The default value for the port number is 23015.

The following shows an example of how to specify these settings:

```
ServerName example.com
:
Listen 23015
Listen [::]:23015
SSLDisable
:
SSLSessionCacheSize 0
Listen 23016
#Listen [::]:23016
<VirtualHost *:23016>
  ServerName example.com
  SSLEnable
:
```

Caution: Do not delete or edit the default setting, `Listen 23015`. If you do, communication using IPv4 will no longer be available.

Settings When Establishing SSL Communication

Remove the hash mark (#) from the line that includes `Listen [::]:23016` (the default setting). By default, all IP addresses are set to allow communication.

Specify the same port number as specified in the Listen line for IPv4. The default value for the port number for SSL communication is 23016. For details on the settings for SSL communication, see Security Settings Related to Communication.

The following shows an example of how to specify these settings:

```
ServerName example.com
:
Listen 23015
Listen [::]:23015
SSLDisable
:
SSLSessionCacheSize 0
Listen 23016
Listen [::]:23016
<VirtualHost *:23016>
  ServerName example.com
  SSLEnable
:
```

Caution: Do not delete or edit the default setting, `Listen 23016`. If you do this, communication using IPv4 will no longer be available.

Changing the IP Address or Host Name of the Management Server

If you change the IP address or host name of the management server, you also need to change the settings files of Hitachi Storage Command Suite products.

Changing the IP Address of the Management Server

This section describes how to change the IP address of the management server.

> ***Caution:***
>
> - If you have changed the IP address of the management server before changing the settings files of Hitachi Storage Command Suite products, write down the new IP address.
> - Do not change the settings in the cluster configuration file (the `cluster.conf` file).

To change the IP address of the management server:

1. If HiCommand Suite products whose versions are earlier than 5.7 are running, stop their services.

   For details about how to stop these services, see the manual for your product version.

2. Stop the services of Hitachi Storage Command Suite products and Common Component.

   – In Windows:

     Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server with Common Services**.

   – In Solaris or Linux:

     Execute the following command:

     ```
     installation-directory-for-Common-Component/bin/hcmdssrv -stop
     ```

3. Edit the `httpsd.conf` file.

   If the old IP address is specified in the `httpsd.conf` file, change the IP address to the host name or the new IP address.

   The `httpsd.conf` file is stored in the following locations:

   – In Windows:

     ```
     installation-folder-for-Common-Component\httpsd\conf\httpsd.conf
     ```

   – In Solaris or Linux:

installation-directory-for-Common-Component/httpsd/conf/httpsd.conf

⚠ **Note:** We recommend that you specify the host name in the `httpsd.conf` file.

4. Edit the `pdsys` file and the `def_pdsys` file.

   If the old IP address is specified in the `pdsys` file and the `def_pdsys` file, change the IP address to the loopback address `127.0.0.1`.

   The `pdsys` and `def_pdsys` files are stored in the following locations:

   – In Windows:

     installation-folder-for-Common-Component\HDB\CONF\pdsys

     installation-folder-for-Common-Component\database\work\def_pdsys

   – In Solaris or Linux:

     installation-directory-for-Common-Component/HDB/conf/pdsys

     installation-directory-for-Common-Component/database/work/def_pdsys

5. Edit the `pdutsys` file and the `def_pdutsys` file.

   If the old IP address is specified in the `pdutsys` file and the `def_pdutsys` file, change the IP address to the loopback address `127.0.0.1`.

   The `pdutsys` and `def_pdutsys` files are stored in the following locations:

   – In Windows:

     installation-folder-for-Common-Component\HDB\CONF\pdutsys

     installation-folder-for-Common-Component\database\work\def_pdutsys

   – In Solaris or Linux:

     installation-directory-for-Common-Component/HDB/conf/pdutsys

     installation-directory-for-Common-Component/database/work/def_pdutsys

⚠ **Note:** If the management server is running in a cluster configuration, you also need to change the IP address specified in the `pdutsys` file and the `def_pdutsys` file to the loopback address `127.0.0.1` on the standby node .

6. Edit the `HiRDB.ini` file.

   If the old IP address is specified in the `HiRDB.ini` file, change the IP address to the loopback address `127.0.0.1`.

   The `HiRDB.ini` file is stored in the following locations:

   – In Windows:

     installation-folder-for-Common-Component\HDB\CONF\emb\HiRDB.ini

   – In Solaris or Linux:

```
installation-directory-for-Common-
Component/HDB/conf/emb/HiRDB.ini
```

7. Change the IP address of the management server, and then restart the computer.

   If the IP address of the management server has already been changed before you change the Common Component settings files, just restart the computer.

8. Make sure that the Common Component services are running.

   – In Windows:

     Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Server and Common Services Status**.

   – In Solaris or Linux:

     Execute the following command:

     ```
     installation-directory-for-Common-Component/bin/hcmdssrv -status
     ```

   – If the IP address is used in the URLs for accessing Hitachi Storage Command Suite products, change the setting.

     For details on how to change the URLs, see Changing the URLs for Accessing Hitachi Storage Command Suite Products.

   Note that, if you change the IP address of the management server, you need to check and, if necessary, revise the settings for each Hitachi Storage Command Suite product. For details about the settings that need to be changed, see Settings Required After Changing the IP Address or Host Name of the Management Server.

Changing the Host Name of the Management Server

This section describes how to change the host name of the management server.

Caution:

- The host name must be no more than 32 bytes. You can use the following characters:

  `A` to `Z` `a` to `z` `0` to `9` and `-`

  Note that the host name cannot start or end with a hyphen (-).
- If you have changed the host name of the management server before changing the settings files of Hitachi Storage Command Suite products, use the `hostname` command to display the new host name and write it down (for Windows, the `ipconfig /ALL` command can also be used to display host names). For the host name in the Device Manager settings file, specify the name you recorded earlier. Note that this name is case-sensitive.

To change the host name of the management server:

1. If HiCommand Suite products whose versions are earlier than 5.7 are running, stop their services. For details, see the manual for your product version.
2. Stop the services of Hitachi Storage Command Suite products and Common Component.
   - In Windows:

     Choose **Start, All Program, Hitachi Storage Command Suite, Device Manager**, and then **Stop Server with Common Services**
   - In Solaris or Linux:

     Execute the following command:

     installation-directory-for-Common-Component/bin/hcmdssrv -stop
3. If TLS/SSL is used for communication between the management server and management clients or an SMI-S provider, re-create a server certificate of the management server by using the new host name. For details on how to configure SSL settings, see Security Settings Related to Communication.
4. If the OS is Solaris or Linux, edit the /etc/hosts file.

   Change the host name of the management server to the new host name. For Linux, write the new host name into the line above the localhost line.
5. Edit the httpsd.conf file.

   Change the value for the ServerName parameter to the new host name.

   The httpsd.conf file is stored in the following locations:
   - In Windows:

     installation-folder-for-Common-Component\httpsd\conf\httpsd.conf
   - In Solaris or Linux:

     installation-directory-for-Common-Component/httpsd/conf/httpsd.conf

   If TLS/SSL is used for communication between the management server and management clients, you also need to change the following settings:
   - If a host name has been specified for the <VirtualHost> tag, change the host name to an asterisk (*).
   - Change the value for the ServerName parameter in the <VirtualHost> tag to the new host name.
6. Edit the pdsys file and def_pdsys file. Change the value for the -x option for the pdunit parameter to the loopback address 127.0.0.1.

   The pdsys and def_pdsys files are stored in the following locations:
   - In Windows:

     installation-folder-for-Common-Component\HDB\CONF\pdsys

     installation-folder-for-Common-Component\database\work\def_pdsys
   - In Solaris or Linux:

     installation-directory-for-Common-Component/HDB/conf/pdsys *installation-directory-for-Common-Component*/database/work/def_pdsys

7. Edit the pdutsys file and the def_pdutsys file.

   Change the value for the pd_hostname parameter to the loopback address 127.0.0.1. If the pd_hostname parameter does not exist, add the pd_hostname parameter, specifying the loopback address.

   The pdutsys and def_pdutsys files are stored in the following locations:

   – In Windows:

     installation-folder-for-Common-Component\HDB\CONF\pdutsys

     installation-folder-for-Common-Component\database\work\def_pdutsys

   – In Solaris or Linux:

     installation-directory-for-Common-Component/HDB/conf/pdutsys

     installation-directory-for-Common-Component/database/work/def_pdutsys

Note: If the management server is running in a cluster configuration, you also need to change the settings in the pdutsys file and the def_pdutsys file on the standby node. For the pd_hostname parameter on the standby node, specify the loopback address 127.0.0.1 or the host name of the executing node.

8. Edit the HiRDB.ini file. Change the value for the PDHOST parameter to the loopback address 127.0.0.1.

   The HiRDB.ini file is stored in the following locations:

   – In Windows:

     installation-folder-for-Common-Component\HDB\CONF\emb\HiRDB.ini

   – In Solaris or Linux:

     installation-directory-for-Common-Component/HDB/conf/emb/HiRDB.ini

9. Edit the cluster.conf file (applicable only for a cluster configuration). Change the corresponding logical host name, executing node's host name, and standby node's host name to the new host names.

   The cluster.conf file is stored in the following location:

   – In Windows:

     installation-folder-for-Common-Component\conf\cluster.conf

   – In Solaris:

     installation-directory-for-Common-Component/conf/cluster.conf

10. Change the host name for the management server, and then restart the computer.

If you have changed the host name for the management server before changing the Common Component settings files, just restart the computer.

11. Make sure that the Common Component services are running.

   – In Windows:

     Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Server and Common Services Status**.

   – In Solaris or Linux:

     Execute the following command:

     ```
     installation-directory-for-Common-Component/bin/hcmdssrv -status
     ```

12. If the host name is used in the URLs for accessing Hitachi Storage Command Suite products, change the setting.

    For details on how to change the URLs, see Changing the URLs for Accessing Hitachi Storage Command Suite Products.

Note that, if you change the host name of the management server, you need to check and, if necessary, revise the settings for each Hitachi Storage Command Suite product. For details about the settings that need to be changed, see Settings Required After Changing the IP Address or Host Name of the Management Server.

Settings Required After Changing the IP Address or Host Name of the Management Server

This section describes the settings required in Device Manager after you change the IP address or host name of the management server. For details about the settings for other Hitachi Storage Command Suite products, see the manual for each product.

In Device Manager, check and revise the following settings:

- Settings in the Device Manager server property files

  If the old host name or IP address is specified for the `server.http.host` property in the `server.properties` file, you need to specify the new host name or IP address, and then restart the Device Manager server.

- Settings in the Device Manager agent property files

  You need to execute the `hdvmagt_account` command to change the settings for the Device Manager server information (the `server.server.authorization` property). For details on how to do this, see the *Hitachi Device Manager Agent Installation Guide*.

Also, depending on the operating environment, you might need to check and revise the following settings:

- If storage management tools are configured to be launched from Web Client, you need to use `launchapptool` to change the launch settings for the storage management tools (Storage Navigator Modular 2, Storage Navigator Modular, or DAMP (for Web)). For details on how to do this, see Launch Settings for Storage Navigator Modular 2, Launch Settings for Storage Navigator Modular (for Web), or Launch Settings for DAMP (for Web).
- If a RADIUS server is used to authenticate accounts

  Check the settings in the `exauth.properties` file. For details on how to specify settings in the exauth.properties file, see Setting the exauth.properties File (When the Authentication Method Is RADIUS).
- If the Device Manager server and the Tuning Manager server are remotely connected

  If all the following conditions are satisfied, change the registration of repository location.
  - The IP address of the computer on which the Device Manager server is installed was changed.
  - The IP address of the computer on which the Device Manager server is installed is set in the `hsso.conf` file of the computer on which the Tuning Manager server is installed.

  For details on how to change the registration of repository location, see the *Hitachi Tuning Manager Server Administration Guide*.
- If VDS Provider is used to manage network resources

  Use the `hdvmconfig` command to change the IP address of the Device Manager server specified for the `server.ipaddress` property in the `vds.properties` file. For details on how to do this, see Specifying Information in the vds.properties File.

Changing the URLs for Accessing Hitachi Storage Command Suite Products

If any of the following configuration changes are made after you begin using Device Manager, you must also change the URLs for accessing Hitachi Storage Command Suite products:

- Changing the IP address or host name of a computer on which the Device Manager server is installed
- Changing to a port used by HBase Storage Mgmt Web Service
- Changing to the settings of the Device Manager system in order to use or stop using SSL
- Migrating to a cluster environment

Use the `hcmdschgurl` command to change the URLs for accessing Hitachi Storage Command Suite products.

Format:

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdschgurl {/print |
/list | /change old-URL new-URL | /change new-URL /type Hitachi-
Storage-Command-Suite-product-name}
```

In Solaris or Linux:

```
installation-folder-for-Common-Component\bin\hcmdschgurl {-print |
-list | -change old-URL new-URL | -change new-URL -type Hitachi-
Storage-Command-Suite-product-name}
```

Options:

`print`: Specify this option to display a list of URLs and programs that are currently registered.

`list`: Specify this option to display the same information as the `print` option in a different format.

`change`: Specify this option to change a currently registered URL.

Caution:

- The specified URL must be a complete URL that contains protocols and a port number. You cannot use an IPv6 address. You must use a host name to specify the URL in an IPv6 environment, as shown in the following example:

  `http://127.0.0.1:23015`

  `http://hostname:23015`
- When changing the URL during migration to a cluster environment, use the following format to specify *`new-URL`*:

  `http://`*`logical-host-name:port-number`*

`type`: If you want to change the URL for a specific Hitachi Storage Command Suite product only, use this option to specify the name of that product. If you omit the `type` option, the URLs for all Hitachi Storage Command Suite products that are installed in the same management server will be changed. To change only the Device Manager URL, specify `DeviceManager`. To change only the Provisioning Manager URL, specify `ProvisioningManager`. For details on the names of other Hitachi Storage Command Suite products, see the documentation for each product.

Return values:

0: Normal

1: Argument error

2: URL does not exist

253: Restoration failure

254: Backup failure

255: Abnormal termination

For details about the errors, check a following log file:

- In Windows:

  `installation-folder-for-Common-Component``\log\hcmdsChangeURL`*`n`*`.log`
- In Solaris or Linux:

  `/var/`*`installation-directory-for-Common-Component`*`/log/hcmdsChangeURL`*`n`*`.log`

To change the URLs for accessing Hitachi Storage Command Suite products:

1. Make sure that the Common Component services are running.
   - In Windows:

     Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Server and Common Services Status**.
   - In Solaris or Linux:

     Execute the following command:

     `installation-directory-for-Common-Component``/bin/hcmdssrv -status`

2. Execute the command with the `list` option to check the current URL registered in the database.

   - In Windows:

     ```
     C:\Program Files\HiCommand\Base\bin\hcmdschgurl /list
     http://192.168.11.33:23015
     Hitachi DeviceManager
     Hitachi Provisioning Manager
     ```

   - In Solaris or Linux:

     ```
     # /opt/HiCommand/Base/bin/hcmdschgurl -list
     http://192.168.11.33:23015
     Hitachi DeviceManager
     Hitachi Provisioning Manager
     ```

3. Execute the command with the `change` option to change the URL information.

   In the following example, the URL is changed from `http://192.168.11.33:23015` to `http://192.168.11.55:23015`.

   - In Windows:

     ```
     C:\Program Files\HiCommand\Base\bin\hcmdschgurl /change
     “http://192.168.11.33:23015”  “http://192.168.11.55:23015”
     The URL was changed from “http://192.168.11.33:23015” to
     “http://192.168.11.55:23015”.
     ```

   - In Solaris or Linux:

     ```
     # /opt/HiCommand/Base/bin/hcmdschgurl -change
     “http://192.168.11.33:23015”  “http://192.168.11.55:23015”
     The URL was changed from “http://192.168.11.33:23015” to
     “http://192.168.11.55:23015”.
     ```

4. To confirm the results, execute the command with the `list` option specified.

   - In Windows:

     ```
     C:\Program Files\HiCommand\Base\bin\hcmdschgurl /list
     http://192.168.11.55:23015
     Hitachi DeviceManager
     Hitachi Provisioning Manager
     ```

   - In Solaris or Linux:

     ```
     # /opt/HiCommand/Base/bin/hcmdschgurl -list
     http://192.168.11.55:23015
     Hitachi DeviceManager
     Hitachi Provisioning Manager
     ```

Settings Required When Disconnecting the Management Server Network

To change the settings or perform maintenance, you might have to disconnect the management server from the network. Before disconnecting, first change the Common Component settings files. If you disconnect the management server from the network without changing the settings files, you will not be able to perform operations on Web Client and CLI because the Device Manager server stops running. To return to the status in which you can perform operations on Web Client and CLI, you need to restart the computer where Device Manager is installed.

The procedure to change the settings file is described in steps 1 through 7 below. After you perform these steps once, you no longer have to do so when disconnecting the network.

To disconnect the network:

1. If HiCommand Suite products whose versions are earlier than 5.7 are running, stop their services. For details, see the manual for your product version.
2. Stop the services of Hitachi Storage Command Suite products and Common Component.
   - In Windows:

     Select **Start**, **All Program**, **Hitachi Storage Command**, **Device Manager**, and then **Stop Server with Common Services**.
   - In Solaris or Linux:

     Execute the following command:

     installation-directory-for-Common-Component/bin/hcmdssrv -stop
3. Edit the pdsys file and the def_pdsys file. Change the value for the pdunit parameter's -x option to the loopback address 127.0.0.1.

   In a default installation, the pdsys and def_pdsys files are stored in the following locations:
   - In Windows:

     installation-folder-for-Common-Component\HDB\CONF\pdsys

     installation-folder-for-Common-Component\database\work\def_pdsys
   - In Solaris or Linux:

     installation-directory-for-Common-Component/HDB/conf/pdsys

     installation-directory-for-Common-Component/database/work/def_pdsys
4. Edit the pdutsys file and the def_pdutsys file. Change the value for the pd_hostname parameter to the loopback address 127.0.0.1.

If the `pd_hostname` parameter does not exist, add the `pd_hostname` parameter to set a loopback address.

In a default installation, the `pdutsys` and `def_pdutsys` files are stored in the following locations:

- In Windows:

  installation-folder-for-Common-Component`\HDB\CONF\pdutsys`

  installation-folder-for-Common-Component`\database\work\def_pdutsys`

- In Solaris or Linux:

  installation-directory-for-Common-Component`/HDB/conf/pdutsys`

  installation-directory-for-Common-Component`/database/work/def_pdutsys`

5. Edit the `HiRDB.ini` file. Change the value for the `PDHOST` parameter to the loopback address `127.0.0.1`.

   In a default installation, the `HiRDB.ini` file is stored in the following location:

   - In Windows:

     installation-folder-for-Common-Component`\HDB\CONF\emb\HiRDB.ini`

   - In Solaris or Linux:

     installation-directory-for-Common-Component`/HDB/conf/emb/HiRDB.ini`

6. Restart the computer.
7. Make sure that the Common Component services are running.

   - In Windows:

     Select **Start**, **All Program**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Server and Common Services Status**.

   - In Solaris or Linux:

     Execute the following command:

     installation-directory-for-Common-Component`/bin/hcmdssrv -status`

8. Disconnect the network, and then change the settings or perform maintenance.
9. After the network becomes available, start the service of the Device Manager server, the services of other Hitachi Storage Command Suite products, and Hitachi Storage Command Suite Common Component.

   - In Windows:

     Select **Start**, **All Program**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server with Common Services**.

   - In Solaris or Linux, execute the following command:

     installation-directory-for-Common-Component`/bin/hcmdssrv -start`

10. If Hitachi Storage Command Suite products have been installed, start their services as required. For details, see the manual for your product.

3

Settings Required for Managing User Accounts

This chapter describes the settings required for Device Manager to manage user accounts.

Setting Password Conditions for User Accounts

To prevent users' passwords from being guessed by a third party, Device Manager allows you to specify password conditions. For example, you can specify a minimum number of characters and a required combination of character types.

The password conditions are set in the `security.conf` file, which is stored in the following locations:

- In Windows:
  `*installation-folder-for-Common-Component*\conf\sec\security.conf`
- In Solaris or Linux:
  `*installation-directory-for-Common-Component*/conf/sec/security.conf`

Table 3-1 describes the password conditions set in the `security.conf` file:

Table 3-1 Password Conditions Set in the security.conf File

Item	Description
`password.min.length`	Specifies the minimum number of characters that can be set as a password. Specify a value from 1 to 256. Default: 4
`password.min.uppercase`	Specifies the minimum number of uppercase letters the password must contain. Specify a value from 0 to 256. If you specify 0, no restriction applies. Default: 0
`password.min.lowercase`	Specifies the minimum number of lowercase letters the password must contain. Specify a value from 0 to 256. If you specify 0, no restriction applies. Default: 0
`password.min.numeric`	Specifies the minimum number of numeric characters the password must contain. Specify a value from 0 to 256. If you specify 0, no restriction applies. Default: 0
`password.min.symbol`	Specifies the minimum number of symbols the password must contain. Specify a value from 0 to 256. If you specify 0, no restriction applies. Default: 0
`password.check.userID`	Specifies whether the password can be the same as the user ID. Specify `true` or `false`. If `true` is specified, passwords cannot be the same as the corresponding user ID. If `false` is specified, passwords can be the same as the corresponding user ID. Default: `false`

When you change a setting in the `security.conf` file, the change takes effect immediately. The password conditions that you set in the `security.conf` file are applied when a user account is created or when a password is changed, and are not applied to passwords of existing user accounts. As a result, even if an existing password does not satisfy the password conditions, a user can continue to use the password to log in to the system.

Caution:

- Password conditions can also be set from Web Client. However, if the system is in a cluster configuration, the settings from Web Client are only applied to the executing node. To apply the settings to the standby node, switch the nodes, and then specify the same settings. For details on how to use Web Client, see the Device Manager online Help.
- If Hitachi Storage Command Suite product versions 5.1 or later are installed, password conditions can be set. The password conditions are applied to all users registered in Hitachi Storage Command Suite products. Therefore, if you are unable to change a password or add a user account while using HiCommand Suite product versions 5.0 or earlier, the reason might be that the specified character string does not satisfy the password conditions. Follow the output message and specify an appropriate password.
- If an external authentication server is used to authenticate users, passwords are checked by using a combination of character types specified on the external authentication server. However, if you register a password for a Hitachi Storage Command Suite product user, you need to use character types specified in the Hitachi Storage Command Suite products.

Settings for Locking User Accounts

This section describes the settings related to locking user accounts.

Settings for Automatic Locking

Device Manager provides settings by which a user account is automatically locked after repeated unsuccessful login attempts to Web Client. Such automatic locking reduces the risk of unauthorized access to Web Client.

The settings related to automatic locking are set using the `account.lock.num` property in the `security.conf` file, which is stored in the following locations:

- In Windows:
  `installation-folder-for-Common-Component``\conf\sec\security.conf`
- In Solaris or Linux:
  `installation-directory-for-Common-Component``/conf/sec/security.conf`

Specify a value from 0 to 10 (default: 0). If a user makes the specified number of unsuccessful logon attempts, his or her user account will be locked. If you specify 0, any number of unsuccessful logon attempts is allowed. When you change a setting in the `security.conf` file, the change takes effect immediately.

Unsuccessful attempts to log on to other products in the Hitachi Storage Command Suite that use the Single Sign-On feature count towards the number of unsuccessful logon attempts. For example, if the number of unsuccessful attempts is set to 3, and a user fails to log on to Device Manager once, fails to log on to Provisioning Manager once, and then fails to log on to Tiered Storage Manager once, his or her user account will be automatically locked.

If the number of unsuccessful logon attempts is changed, the new number will be applied the next time an attempt to log on fails. If a user is currently logged on and you attempt to log on using his or her account, but you fail the specified number of times, his or her user account will be locked. However, the user can continue to perform operations while still logged on.

You can unlock user accounts from Web Client. You must have the User Management permission to unlock a user account. For details about unlocking user accounts, see the Device Manager online Help.

⚠ ***Caution:***

- Settings related to locking can also be specified from Web Client. However, if the system is in a cluster configuration, the settings from Web Client are only applied to the executing node. To apply the settings to the standby node, switch the nodes, and then specify the same settings. For details on how to use Web Client, see the Device Manager online Help.
- You can specify settings for automatic locking if Hitachi Storage Command Suite product versions 5.1 or later are installed.

  These settings are applied to all Hitachi Storage Command Suite product versions, so there is a risk of login failure if versions 5.0 or earlier (which do not support automatic locking) are being used. If login fails despite a correctly specified user ID and password, take appropriate action, such as unlocking the relevant user account and registering a new user account.
- If an external authentication server is used to authenticate users, the settings on the external authentication server are used to control automatic locking.

Settings for Automatic Locking of the System Account

The `System` account is not subject to automatic or manual locking during the initial installation of Device Manager. If you want to also make the `System` account subject to locking, specify this setting in the `account.lock.system` property in the `user.conf` file, which is stored in the following locations:

- In Windows:

  `installation-folder-for-Common-Component``\conf\user.conf`
- In Solaris or Linux:

  `installation-directory-for-Common-Component``/conf/user.conf`

If the `user.conf` file does not exist, create it.

Specify the `account.lock.system` property in the following format:

```
account.lock.system=value
```

For *`value`*, specify `true` or `false`. If you specify `true`, the `System` account is subject to automatic and manual locking. If you specify `false`, the `System` account is not subject to automatic or manual locking.

Note that you need to restart Common Component for the value set in the `user.conf` file to take effect. For details about how to restart Common Component, see Stopping the Device Manager Server and Common Component and Starting the Device Manager Server and Common Component.

Caution:

- If Hitachi Storage Command Suite product versions 6.2 or later are installed and `true` is set in the `user.conf` file, the `System` account is subject to automatic and manual locking for all Hitachi Storage Command Suite products.
- For what to do when all accounts with Admin (user management) permission (including the `System` account) are locked, see Common Problems and Solutions.

Settings Required to Authenticate Users by Using an External Authentication Server

Hitachi Storage Command Suite products can authenticate users by linking to an external authentication server. If you register the user IDs that are registered on the external authentication server into Hitachi Storage Command Suite products, you can use those user IDs to log in to Hitachi Storage Command Suite products. This saves you from having to managing login passwords and controlling accounts in Hitachi Storage Command Suite products.

In addition, if you use both an external authentication server and an external authorization server, you can control users' access permissions for Hitachi Storage Command Suite products by using the external authorization server. When an external authorization server is also linked to, you do not need to manage accounts and set permissions for individual users because Hitachi Storage Command Suite products manage users by using the *authorization groups* external authorization server.

Requirements for an external authentication server and an external authorization server depend on whether only an external authentication server is linked to or an external authorization server is also linked to. Table 3-2 and Table 3-3 describe requirements for each case.

Table 3-2 Requirements When Linking to Only an External Authentication Server

Authentication Method	Requirements
LDAP	The software in use must comply with LDAP v3.
RADIUS	The software must comply with RFC2865 and must be able to use either of the following authentication methods: ▪ PAP authentication ▪ CHAP authentication
Kerberos	The following requirements must be satisfied Supported OSs Window Server 2003 Window Server 2003 R2 Window Server 2008 Window Server 2008 R2 Software Active Directory Protocol Kerberos v5

Table 3-3 Requirements When Also Linking to an External Authorization Server

Authentication Method	Requirements
LDAP	The external authentication server and the external authorization server must be running on the same computer and must satisfy the following requirements: Supported OSs Window Server 2003 Window Server 2003 R2 Window Server 2008 Window Server 2008 R2 Software Active Directory Protocol For an external authentication server: LDAP v3 For an external authorization server: LDAP v3
RADIUS	The external authentication server and the external authorization server can be running on the same computer or on different computers. The following describes requirements for each server: **External authentication server** The software must comply with RFC2865 and must be able to use either of the following authentication methods: ▪ PAP authentication ▪ CHAP authentication **External authorization server** The following requirements must be satisfied: ▪ Supported OSs Window Server 2003 Window Server 2003 R2 Window Server 2008 Window Server 2008 R2 ▪ Software Active Directory ▪ Protocol LDAP v3

Authentication Method	Requirements
Kerberos	The external authentication server and the external authorization server must be running on the same computer and must satisfy the following requirements: Supported OSs Window Server 2003 Window Server 2003 R2 Window Server 2008 Window Server 2008 R2 Software Active Directory Protocol For an external authentication server: Kerberos v5 For an external authorization server: LDAP v3

Settings required to link to an external authentication server or an external authorization server depend on the authentication method used in the external authentication server. Settings required for each authentication method are described in the sections below.

Caution: If command line control characters are included in the arguments of commands that will be executed when specifying the settings to link to an external authentication server, escape the characters correctly according to the specifications of the command line.

Also, you need to pay attention to backslashes (\) included in the arguments because they are treated specially in the command line.

– In Windows:

  If the following characters are included in an argument, enclose the argument in double quotation marks (") or use a caret (^) to escape each character:

  Spaces `& | ^ < > ( )`

  A backslash might be treated as an escape character depending on the character that follows it. Therefore, if a backslash and any of the above characters are included in an argument, use a caret to escape each character rather than enclose the argument in double quotation marks.

  Also, if there is a backslash at the end of an argument, escape it by using another backslash.

– In Solaris or Linux:

  If the following characters are included in an argument, enclose the argument in double quotation marks or use a backslash to escape each character:

  Spaces `# & ' ( ) ~ \ ` < > ; |`

  Note that a backslash in an argument is treated as an escape character even if the argument is enclosed in double quotation marks. If a backslash is included in an argument, escape it by using another backslash.

For example, if a shared secret to be registered by the `hcmdsradiussecret` command is `secret01\`, escape it as follows:

– In Windows:

```
hcmdsradiussecret /set secret01\\ /name ServerName
```

– In Solaris or Linux:

  Use either of the following formats:

```
hcmdsradiussecret -set secret01\\ -name ServerName
hcmdsradiussecret -set "secret01\\" -name ServerName
```

Settings Required When Using an LDAP Directory Server for Authentication

To authenticate users by using an LDAP directory server, specify the following settings in Hitachi Storage Command Suite products.

1. Check the data structure of the LDAP directory server to determine the method for linking with Hitachi Storage Command Suite products and for authentication.

2. In the exauth.properties file on the management server, specify necessary information.

   Necessary settings depend on whether only an external authentication server is linked to or an external authorization server is also linked to.

   You can use either of the following methods to define the LDAP directory server:

   – In the exauth.properties file, directly specify information about the LDAP directory server to connect to.

     Specify information such as IP address and port number in the exauth.properties file for each LDAP directory server.

   – Use the DNS server to look up the LDAP directory server to connect to.

     Before using this method, you need to set up the DNS server environment on the OS of the LDAP directory server. In addition, you need to register the host name, port number, and domain name of the LDAP directory server in the SRV records of the DNS server.

Note: To use StartTLS for communication between the management server and the LDAP directory server, you need to directly specify information about the LDAP directory server to connect to in the exauth.properties file.

If you use the DNS server to look up the LDAP directory server to connect to, it might take longer for users to log in.

3. In the following cases, on the management server, register a user account used to search for user information on the LDAP directory server.

   – When the data structure is the hierarchical structure model

   – When the data structure is the flat model and an external authorization server is also linked to#

   #:

     When registering an authorization group in Hitachi Storage Command Suite products by using Web Client (For details on the procedure, see step 5), if you want to check whether the distinguished name of the authorization group is registered on the external authorization server by using a user ID such as the System account registered in Hitachi Storage Command Suite products, you need to register a user account used to search for LDAP user information on the management server.

4. On the LDAP directory server, register the accounts of users that will use Hitachi Storage Command Suite products.

   User IDs and passwords must consist of characters that can be used in Hitachi Storage Command Suite products. Specify 1 to 256 bytes of the following characters:

   0 to 9 A to Z a to z ! # $ % & ' ( ) * + - . = @ \ ^ _ |

In Hitachi Storage Command Suite products, user IDs are not case-sensitive. The combination of character types for passwords must follow the settings in the external authentication server.

5. Register accounts and set permissions by using Web Client.

   When linking to only an external authentication server

   - Register users.
   - Change the authentication method of users.#
   - Set permissions for users.
   - Assign resource groups to users.

   #: This operation is required if you want to change the authentication method of existing users.

   When also linking to an external authorization server

   - Register authorization groups.
   - Set permissions for authorization groups.

   You do not need to assign resource groups to authorization groups. `All Resources` will be automatically assigned to users who belong to authorization groups.

6. Use the `hcmdscheckauth` command to make sure that the external authentication server and the external authorization server can be properly connected to.

The following sections describe operations you need to perform on the management server. For details on how to use Web Client, see the Device Manager online Help.

Checking the Data Structure and Authentication Method

The LDAP directory server has the following two data structure models.

- Hierarchical structure model
- Flat model

You must first determine which data structure model is being used, because the information you need to set in the `exauth.properties` file and the operations you need to perform on the management server depend on the data structure.

In addition, check BaseDN, which is the entry that will be the start point for searching for LDAP user information during authentication. BaseDN must be specified in the `exauth.properties` file. Only the user entries that are in the hierarchy below BaseDN can be authenticated. Make sure that all users you want to authenticate for Hitachi Storage Command Suite products are in this hierarchy.

Hierarchical structure model

A data structure in which the hierarchies below BaseDN branch off and in which user entries are registered in another hierarchy. If the hierarchical structure model is used, the entries in the hierarchy below BaseDN are searched for an entry that has the same login ID and user attribute value.

The following figure shows an example of the hierarchical structure model. The user entries enclosed by the dotted line can be authenticated. In this example, BaseDN is `cn=group,dc=example,dc=com`, because the target user entries extend across two departments (`cn=sales and cn=development`).

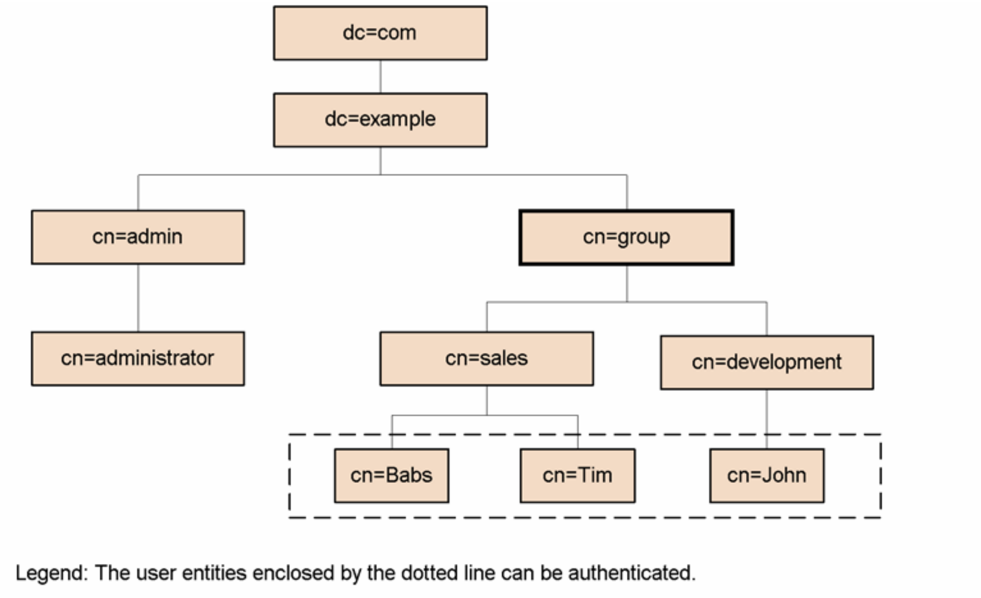


Figure 3-1 Example of the Hierarchical Structure Model

Flat model

A data structure in which there are no branches in the hierarchy below BaseDN and in which user entries are registered in the hierarchy located just below BaseDN. If the flat model is used, the entries in the hierarchy below BaseDN are searched for an entry that has the DN that consists of a combination of the login ID and BaseDN. If such a value is found, the user is authenticated.

The following figure shows an example of the flat model. The user entities enclosed by the dotted line can be authenticated. In this example, BaseDN is `ou=people,dc=example,dc=com`, because all of the user entries are located just below `ou=people`.

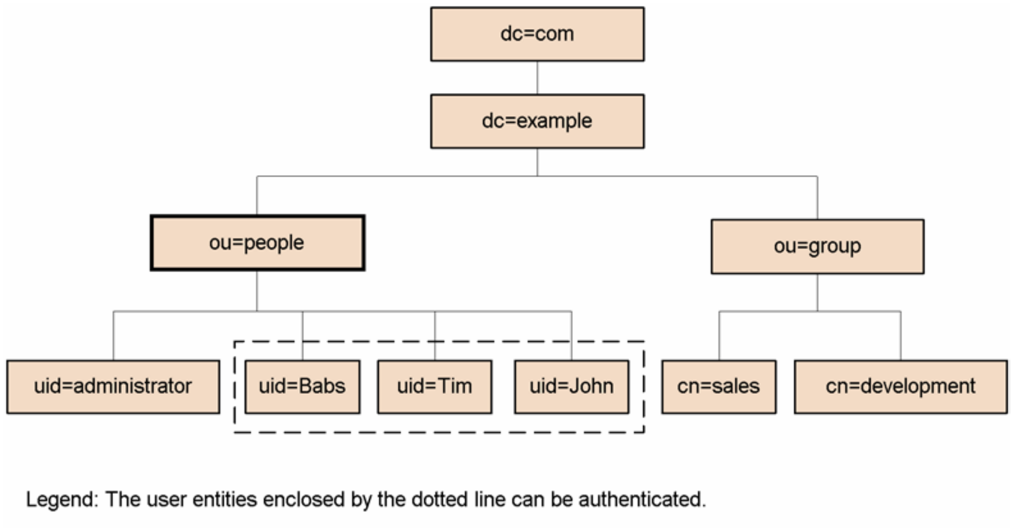


Figure 3-2 Example of the Flat Model

Note, however, that even if the flat model is being used, if either of the following conditions is satisfied, specify the settings by following the explanation for the hierarchical structure model:

– If a user attribute value other than the RDN attribute value is used as the user ID of a Hitachi Storage Command Suite product:

  If a user attribute value other than the RDN attribute value (for example, the Windows logon ID) of a user entry is used as the user ID of a Hitachi Storage Command Suite product, you must use the authentication method for the hierarchical structure model.

– If the RDN attribute value of a user entry includes an invalid character that cannot be used in a user ID for a Hitachi Storage Command Suite product:

  When using the authentication method for the flat model, the RDN attribute value of a user entry functions as the user ID for Hitachi Storage Command Suite products. Therefore, if the RDN attribute value of a user entry includes an invalid character that cannot be used in a user ID of a Hitachi Storage Command Suite product, you cannot use the authentication method for the flat model.

  Example of a valid RDN:

  `uid=John123S`

  `cn=John_Smith`

  Example of an invalid RDN:

  `uid=John:123S` (A colon is used.)

  `cn=John Smith` (A space is used between `John` and `Smith`.)

Setting the exauth.properties File (When the Authentication Method Is LDAP)

This section describes the settings required for the `exauth.properties` file in order to use an LDAP directory server to authenticate users.

1. Specify values for the following properties in the `exauth.properties` file:

   – Common properties (Table 3-4)

   – Properties for an external authentication server and an external authorization server

     Specify these property values for each LDAP directory server.

     The items you need to specify differ depending on whether you directly specify information about the LDAP directory server (Table 3-5) or you use the DNS server to look up the LDAP directory server (Table 3-6).

   The template of the `exauth.properties` file is stored in the following location:

   In Windows:

   installation-folder-for-Common-Component\sample\conf\exauth.properties

   In Solaris or Linux:

   installation-directory-for-Common-Component/sample/conf/exauth.properties

Caution: Do not enter a space at the beginning or end of a setting value. Also, do not enclose a setting value in double quotation marks ("). If you do, the value is ignored, and the default value is used instead.

2. Save the `exauth.properties` file in the following location:

   In Windows:

   installation-folder-for-Common-Component\conf\exauth.properties

   In Solaris or Linux:

   installation-directory-for-Common-Component/conf/exauth.properties

   If you change a setting value in the `exauth.properties` file, the changed value immediately takes effect.

Table 3-4 through Table 3-6 describe the items to specify in the `exauth.properties` file.

Table 3-4 Items to Specify in the exauth.properties File When Using an LDAP Directory Server for Authentication (Common Items)

Property	Details
`auth.server.type`	Specify an external authentication server type. Specify `ldap`. Default value: `internal` (used when not linking to an external authentication server)

Property	Details
auth.server.name	Specify the server identification names of LDAP directory servers. You can specify any name for this property in order to identify which LDAP directory servers the settings such as the port number and the protocol for connecting to the LDAP directory server (see Table 3-5 or Table 3-6) are applied to. ServerName has been set as the initial value. You must specify at least one name. When specifying multiple LDAP directory server identification names, separate the names with commas (,). Do not register the same server identification name more than once. Specifiable values: No more than 64 bytes of the following characters: 0 to 9 A to Z a to z ! # ( ) + - . = @ [ ] ^ _ { } ~ Default value: none
auth.group.mapping	Specify whether to also link to an external authorization server. Specify true to link to an external authorization server. Specify false to not to link to an external authorization server. Default value: false

Table 3-5 Items to Specify in the exauth.properties File When Using an LDAP Directory Server for Authentication (When Directly Specifying Information About the External Authentication Server)

Attributes	Details
protocol#1	Specify the protocol for connecting to the LDAP directory server. This attribute is required. When communicating in plain text format, specify ldap. When using StartTLS communication, specify tls. Before specifying tls, make sure that one of the following encryption methods can be used on the LDAP directory server. ▪ TLS_RSA_WITH_AES_256_CBC_SHA ▪ TLS_RSA_WITH_AES_128_CBC_SHA ▪ SSL_RSA_WITH_3DES_EDE_CBC_SHA Specifiable values: ldap or tls Default value: none
host#2	Specify the host name or IP address of the LDAP directory server. If you specify the host name, make sure beforehand that the host name can be resolved to an IP address. If you specify the IP address, you can use either an IPv4 or IPv6 address. When specifying an IPv6 address, enclose it in square brackets ([]). This attribute is required. Default value: none
port	Specify the port number of the LDAP directory server. Make sure beforehand that the port you specify is set as the listen port number on the LDAP directory server. Specifiable values: 1 to 65535 Default value: 389
timeout	Specify the amount of time to wait before timing out when connecting to the LDAP directory server. If you specify 0, the system waits until a communication error occurs without timing out. Specifiable values: 0 to 120 (seconds) Default value: 15

Attributes	Details
attr	Specify the attribute (Attribute Type) to use as the user ID during authentication. ▪ For the hierarchical structure model Specify the name of the attribute containing the unique value to be used for identifying the user. The value stored in this attribute will be used as the user ID for Hitachi Storage Command Suite products.[#3] For example, if you are using Active Directory and you want to use the Windows logon ID for the user ID of a Hitachi Storage Command Suite product, specify the attribute name sAMAccountName in which the Windows logon ID has been defined. ▪ For the flat model Specify the RDN attribute name of the user entry. For example, if the user's DN is uid=John,ou=People,dc=example,dc=com, specify the uid that is the attribute name of the RDN uid=John. sAMAccountName has been set as the initial value. This attribute is required. Default value: none
basedn	Specify the BaseDN, which is the DN of the entry that will be used as the start point when searching for LDAP user information on the LDAP directory server. The user entries that are located in the hierarchy below this DN will be checked during authentication. If characters that need to be escaped are included in the specified BaseDN, escape all of those characters correctly because the specified value will be passed to the LDAP directory server without change. ▪ For the hierarchical structure model Specify the DN of the hierarchy that includes all of the user entries to be searched. For example, for Figure 3-1, specify cn=group,dc=example,dc=com. ▪ For the flat model Specify the DN of the hierarchy just above the user entries to be searched. For example, for Figure 3-2, specify ou=people,dc=example,dc=com. This attribute is required. Specify the DN by following the rules defined in RFC4514. For example, if any of the following characters are included in a DN, you need to use a backslash (\) to escape each character. Spaces # + ; , < = > \ Default value: none
retry.interval	Specify the retry interval (in seconds) for when an attempt to connect to the LDAP directory server fails. Specifiable values: 1 to 60 (seconds) Default value: 1
retry.times	Specify the number of retries to attempt when an attempt to connect to the LDAP directory server fails. If you specify 0, no retries are attempted. Specifiable values: 0 to 50 Default value: 20

Attributes	Details
domain.name	Specify the name of a domain managed by the LDAP directory server. This item is required when an external authorization server is also linked to. Default value: none
dns_lookup	Specify false. Default value: false

Note: To specify the attributes, use the following syntax:

auth.ldap.*auth.server.name-property-value.attribute*=*value*

#1: When communicating by using StartTLS as the protocol for connecting to the LDAP directory server, you need to specify the security settings of Common Component. For details about specifying security settings in order to communicate by using StartTLS, see Security Settings for the Common Component (Communication with an LDAP Directory Server).

#2: When using StartTLS as the protocol for connecting to the LDAP directory server, in the host attribute specify the same host name as the value of CN in the LDAP directory server certificate. You cannot use an IP address.

#3: The specified attribute must not include characters that cannot be used in a user ID of the Hitachi Storage Command Suite product.

Table 3-6 Items to Specify in the exauth.properties File When Using an LDAP Directory Server for Authentication (When Using the DNS Server to Look Up Information About the External Authentication Server)

Attributes	Details
protocol	Specify the protocol for connecting to the LDAP directory server. This attribute is required. Specifiable values: ldap Default value: none
port	Specify the port number of the LDAP directory server. Make sure beforehand that the port you specify is set as the listen port number on the LDAP directory server. Specifiable values: 1 to 65535 Default value: 389
timeout	Specify the amount of time to wait before timing out when connecting to the LDAP directory server. If you specify 0, the system waits until a communication error occurs without timing out. Specifiable values: 0 to 120 (seconds) Default value: 15

Attributes	Details
attr	Specify the attribute (Attribute Type) to use as the user ID during authentication. ▪ For the hierarchical structure model Specify the name of the attribute containing the unique value to be used for identifying the user. The value stored in this attribute will be used as the user ID for Hitachi Storage Command Suite products.# For example, if you are using Active Directory and you want to use the Windows logon ID for the user ID of a Hitachi Storage Command Suite product, specify the attribute name sAMAccountName in which the Windows logon ID has been defined. ▪ For the flat model Specify the RDN attribute name of the user entry. For example, if the user's DN is uid=John,ou=People,dc=example,dc=com, specify the uid that is the attribute name of the RDN uid=John. sAMAccountName has been set as the initial value. This attribute is required. Default value: none
basedn	Specify the BaseDN, which is the DN of the entry that will be used as the start point when searching for LDAP user information on the LDAP directory server. The user entries that are located in the hierarchy below this DN will be checked during authentication. If characters that need to be escaped are included in the specified BaseDN, escape all of those characters correctly because the specified value will be passed to the LDAP directory server without change. ▪ For the hierarchical structure model Specify the DN of the hierarchy that includes all of the user entries to be searched. For example, for Figure 3-1, specify cn=group,dc=example,dc=com. ▪ For the flat model Specify the DN of the hierarchy just above the user entries to be searched. For example, for Figure 3-2, specify ou=people,dc=example,dc=com. This attribute is required. Specify the DN by following the rules defined in RFC4514. For example, if any of the following characters are included in a DN, you need to use a backslash (\) to escape each character. Spaces # + ; , < = > \ Default value: none
retry.interval	Specify the retry interval (in seconds) for when an attempt to connect to the LDAP directory server fails. Specifiable values: 1 to 60 (seconds) Default value: 1
retry.times	Specify the number of retries to attempt when an attempt to connect to the LDAP directory server fails. If you specify 0, no retries are attempted. Specifiable values: 0 to 50 Default value: 20
domain.name	Specify the domain name managed by the LDAP directory server. Default value: none

Attributes	Details
dns_lookup	Specify true. However, if the following attribute values are already set, the LDAP directory server will be connected to by using the user-specified values instead of by using the DNS server to look up the information. ▪ auth.ldap.*auth.server.name-property-value*.host ▪ auth.ldap.*auth.server.name-property-value*.port Default value: false

Note: To specify the attributes, use the following syntax:

auth.ldap.*auth.server.name-property-value.attribute*=*value*

#: The specified attribute must not include invalid characters that cannot be used in a user ID of the Hitachi Storage Command Suite product.

The following examples show how to specify the properties:

- When directly specifying information about an LDAP directory server (when linking to only an external authentication server)

```
auth.server.type=ldap
auth.server.name=ServerName
auth.group.mapping=false
auth.ldap.ServerName.protocol=ldap
auth.ldap.ServerName.host=ldap.example.com
auth.ldap.ServerName.port=389
auth.ldap.ServerName.timeout=15
auth.ldap.ServerName.attr=sAMAccountName
auth.ldap.ServerName.basedn=dc=Example,dc=com
auth.ldap.ServerName.retry.interval=1
auth.ldap.ServerName.retry.times=20
auth.ldap.ServerName.dns_lookup=false
```

- When Using the DNS server to look up an LDAP directory server (when linking to only an external authentication server)

```
auth.server.type=ldap
auth.server.name=ServerName
auth.group.mapping=false
auth.ldap.ServerName.protocol=ldap
auth.ldap.ServerName.timeout=15
auth.ldap.ServerName.attr=sAMAccountName
auth.ldap.ServerName.basedn=dc=Example,dc=com
auth.ldap.ServerName.retry.interval=1
auth.ldap.ServerName.retry.times=20
auth.ldap.ServerName.domain.name=EXAMPLE.COM
auth.ldap.ServerName.dns_lookup=true
```

- When directly specifying about the LDAP directory server (when also linking to an authorization server)

```
auth.server.type=ldap
auth.server.name=ServerName
auth.group.mapping=true
auth.ldap.ServerName.protocol=ldap
auth.ldap.ServerName.host=ldap.example.com
auth.ldap.ServerName.port=389
auth.ldap.ServerName.timeout=15
auth.ldap.ServerName.attr=sAMAccountName
auth.ldap.ServerName.basedn=dc=Example,dc=com
auth.ldap.ServerName.retry.interval=1
auth.ldap.ServerName.retry.times=20
auth.ldap.ServerName.domain.name=EXAMPLE.COM
auth.ldap.ServerName.dns_lookup=false
```

- When using the DNS server to look up the LDAP directory server (when also linking to an authorization server)

```
auth.server.type=ldap
auth.server.name=ServerName
auth.group.mapping=true
auth.ldap.ServerName.protocol=ldap
auth.ldap.ServerName.timeout=15
auth.ldap.ServerName.attr=sAMAccountName
auth.ldap.ServerName.basedn=dc=Example,dc=com
auth.ldap.ServerName.retry.interval=1
auth.ldap.ServerName.retry.times=20
auth.ldap.ServerName.domain.name=EXAMPLE.COM
auth.ldap.ServerName.dns_lookup=true
```

Registering a User Account Used to Search for LDAP User Information (When the Authentication Method Is LDAP)

By using the `hcmdsldapuser` command, you can register, on the management server, a user account used to search for LDAP user information. After registering a user account, you can use this command to delete such an account or check LDAP directory servers for which user accounts used to search for LDAP user information have been registered on the management server.

This step is necessary in the following cases:

- When the data structure is the hierarchical model
- When the data structure is the flat model and an external authorization server is also linked to#

  #:

  When registering an authorization group in Hitachi Storage Command Suite products by using Web Client, if you want to check whether the distinguished name of the authorization group is registered on the external authorization server by using a user ID such as the System account registered in Hitachi Storage Command Suite products, you need to register a user account used to search for LDAP user information on the management server.

In cases other than above, this step is not necessary, because LDAP user information is not searched during authentication and authorization. If a user account used to search for LDAP user information has been already registered, delete it.

Registering a user account used to search for LDAP user information

Use the `hcmdsldapuser` command to register a user account used to search for LDAP user information.

For a user account used to search for LDAP user information, register a user account that satisfies the following conditions:

– The user account is already registered in the LDAP directory server.

- The user account can bind to the DN specified for `auth.ldap.`*`auth.server.name-property-value`*`.basedn` in the `exauth.properties` file
- The user account can search the attributes for all entries below the DN specified for `auth.ldap.`*`auth.server.name-property-value`*`.basedn` in the `exauth.properties` file
- The user account can reference the DN specified for `auth.ldap.`*`auth.server.name-property-value`*`.basedn` in the `exauth.properties` file

The format of the `hcmdsldapuser` command is as follows:

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsldapuser /set
/dn DN-of-user-account-used-to-search-for-LDAP-user-info /pass
password-of-user-account-used-to-search-for-LDAP-user-info /name
server-identification-name
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsldapuser -
set -dn DN-of-user-account-used-to-search-for-LDAP-user-info -
pass password-of-user-account-used-to-search-for-LDAP-user-info
-name server-identification-name
```

- *`DN-of-user-account-used-to-search-for-LDAP-user-info`*

  Specify a DN by following the rules defined in RFC4514. For example, if the following characters are included in a DN, you need to use a backslash (\) to escape each character.

  Spaces `# + , ; < = > \`

- *`password-of-user-account-used-to-search-for-LDAP-user-info`*

  This is case-sensitive and must exactly match the password registered in the LDAP directory server.

- *`server-identification-name`*

  Specify the server identification name that was specified for the `auth.server.name` property in the `exauth.properties` file.

Caution: In the LDAP directory server, you can use double quotation marks (") for the DN and password. In the management server, however, you need to register a user account whose DN and password do not include double quotation marks.

The following describes an example of execution using the data structure shown in Figure 3-1. In this data structure, the DN of the entry used as the start point for searching is specified as `cn=group,dc=example,dc=com`. If a user searching the attribute values of all users (`Babs`, `Tim`, and `John`) below the DN has the `administrator` privilege, specify the `dn` option as the DN of `administrator` (`cn=administrator,cn=admin,dc=example,dc=com`). The following is an example of executing the command. The password of `administrator` is `administrator_pass`:

– In Windows:

```
hcmdsldapuser /set /dn
"cn=administrator,cn=admin,dc=example,dc=com" /pass
administrator_pass /name ServerName
```

– In Solaris or Linux:

```
hcmdsldapuser -set -dn
"cn=administrator,cn=admin,dc=example,dc=com" -pass
administrator_pass -name ServerName
```

Note:

- If you are using Active Directory, you can use the dsquery command provided by Active Directory to check the DN of a user. The following example shows how to use the dsquery command to check the DN of the user administrator, and also shows the execution results:

  ```
  dsquery user -name administrator
  "CN=administrator,CN=admin,DC=example,DC=com"
  ```

- If the DN includes commas such as cn=administrator,cn=admin,dc=example,com, specify as follows:

  In Windows:

  ```
  hcmdsldapuser /set /dn
  "cn=administrator,cn=admin,dc=example\,com" /pass
  administrator_pass /name ServerName
  ```

  In Solaris or Linux:

  ```
  hcmdsldapuser -set -dn
  "cn=administrator,cn=admin,dc=example\\,com" -pass
  administrator_pass -name ServerName
  ```

Deleting a user account used to search for LDAP user information

To delete a user account used to search for LDAP user information, execute the following command.

– In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsldapuser
/delete /name server-identification-name
```

– In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsldapuser -
delete -name server-identification-name
```

Checking LDAP directory servers for which a user account used to search for LDAP user information has been registered

To check the names of LDAP directory servers for which a user account used to search for LDAP user information has been registered on the management server, execute the following command.

– In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsldapuser /list
```

– In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsldapuser –
list
```

Checking the Connection Status of the External Authentication Server and the External Authorization Server (When the Authentication Method Is LDAP)

By using the hcmdscheckauth command, you can make sure that the external authentication server and the external authorization server can properly be connected to.

If Tuning Manager is remotely connected, perform this operation on the computer on which the Device Manager server is installed.

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdscheckauth /user
user-ID /pass password [/summary]
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdscheckauth -
user user-ID -pass password [-summary]
```

If you execute the command with the summary option specified, the confirmation message is displayed in summary format.

user-ID and *password* must match those of the user account that has been registered in the LDAP directory server. *user-ID* must be the same value as the one specified for the attribute auth.ldap.*auth.server.name-property-value*.attr in the exauth.properties file. However, you cannot specify a user account whose *user-ID* or *password* begins with a forward slash (/) in Windows or a hyphen (-) in Solaris or Linux.

If you execute the hcmdscheckauth command, the settings in the exauth.properties file, and the connection status of the external authentication server and the external authorization server are checked in the four phases described below. Check results are displayed for each phase.

Phase 1

The command verifies that common properties (Table 3-4) have been correctly specified in the exauth.properties file.

Phase 2

The command verifies that the properties for the external authentication server and the external authorization server (Table 3-5 or Table 3-6) have been correctly specified in the exauth.properties file.

Phase 3

The command verifies that the external authentication server can be connected to.

Phase 4

If an external authorization server is also linked to, the command verifies that the external authorization server can be connected to and authorization groups can be searched.

When a phase finishes normally, the following message is displayed:

```
KAPM15004-I The result of the configuration check of Phase X was normal.
```

Note: *X* is the phase number.

If an error occurs, find the output message ID in the *Hitachi Device Manager Error Codes*, and check the cause and action to take for the error.

- Example of executing the hcmdscheckauth command when the hierarchical structure model is used:

  The following example shows how to execute the hcmdscheckauth command, using the user account John shown in Figure 3-1.

  This example assumes that sAMAccountName has been specified in auth.ldap.*auth.server.name-property-value*.attr in the exauth.properties file. If the sAMAccountName attribute value of John is John_Smith, specify John_Smith in *user-ID*. If the password of John to be used on the LDAP directory server is John_pass, specify John_pass in *password*.

  – In Windows:

  ```
  hcmdscheckauth /user John_Smith /pass John_pass
  ```

  – In Solaris or Linux:

  ```
  hcmdscheckauth -user John_Smith -pass John_pass
  ```

- Example of executing the hcmdscheckauth command when the flat model is used:

  The following example shows how to execute the hcmdscheckauth command, using the user account John shown in Figure 3-2.

  This example assumes that uid has been specified in auth.ldap.*auth.server.name-property-value*.attr in the exauth.properties file. As the RDN of John is given by uid=John, specify the RDN attribute value John in *user-ID*. If the password of John to be used on the LDAP directory server is John_pass, specify John_pass in *password*.

  – In Windows:

  ```
  hcmdscheckauth /user John /pass John_pass
  ```

  – In Solaris or Linux:

  ```
  hcmdscheckauth -user John -pass John_pass
  ```

Settings Required When Using a RADIUS Server for Authentication

To authenticate users by using a RADIUS server, specify the following settings in Hitachi Storage Command Suite products.

1. In the `exauth.properties` file on the management server, specify necessary information.

   Necessary settings depend on whether only an external authentication server is linked to or an external authorization server is also linked to.

   You can use either of the following methods to define the LDAP directory server to be used as an external authorization server:

   – In the `exauth.properties` file, directly specify information about the LDAP directory server to connect to.

     Specify information such as IP address and port number in the `exauth.properties` file for each LDAP directory server.

   – Use the DNS server to look up the LDAP directory server to connect to.

     Before using this method, you need to set up the DNS server environment on the OS of the LDAP directory server. In addition, you need to register the host name, port number, and domain name of the LDAP directory server in the SRV records of the DNS server.

> ***Note:*** To use StartTLS for communication between the management server and the LDAP directory server, you need to directly specify information about the LDAP directory server to connect to in the `exauth.properties` file.
>
> When using the DNS server to look up the LDAP directory server to connect to, it might take longer for users to log in.

2. When also linking to an external authorization server, on the management server, register a user account used to search for user information on the LDAP directory server.

3. On the RADIUS server, register the accounts of user that will use Hitachi Storage Command Suite products.

   User IDs and passwords must consist of characters that can be used in Hitachi Storage Command Suite products. Specify 1 to 256 bytes of the following characters:

   `0` to `9` `A` to `Z` `a` to `z` `! # $ % & ' ( ) * + - . = @ \ ^ _ |`

   In Hitachi Storage Command Suite products, user IDs are not case-sensitive. The combination of character types for passwords must follow the settings in the external authentication server.

4. Specify a shared secret on the management server for communicating with the RADIUS server.

5. Register accounts and set permissions by using Web Client.

   When linking to only an external authentication server

   - Register users.
   - Change the authentication method of users.#
   - Set permissions for users.
   - Assign resource groups to users.

   #: This operation is required if you want to change the authentication method of existing users.

   When also linking to an external authorization server

   - Register authorization groups.
   - Set permissions for authorization groups.

   You do not need to assign resource groups to authorization groups. All Resources will be automatically assigned to users who belong to authorization groups.

6. Use the hcmdscheckauth command to make sure that the external authentication server and the external authorization server can be properly connected to.

The following sections describe operations you need to perform on the management server. For details on how to use Web Client, see the Device Manager online Help.

Setting the exauth.properties File (When the Authentication Method Is RADIUS)

This section describes the settings required for the `exauth.properties` file in order to use a RADIUS server to authenticate users.

1. Specify values for the following properties in the `exauth.properties` file:

   – Common properties (Table 3-7)

   – Properties for an external authentication server (Table 3-8)

   Specify these property values for each RADIUS server.

   – Properties for an external authorization server

   These properties need to be set when an external authorization server is also linked to. Specify information about the LDAP directory server for each domain.

   The items you need to specify differ depending on whether you directly specify information about the LDAP directory server (Table 3-9 and Table 3-10) or you use the DNS server to look up the LDAP directory server (Table 3-9 and Table 3-11).

   The template of the `exauth.properties` file is stored in the following location:

In Windows:

installation-folder-for-Common-Component\sample\conf\exauth.properties

In Solaris or Linux:

installation-directory-for-Common-Component/sample/conf/exauth.properties

⚠ ***Caution:*** Do not enter a space at the beginning or end of a setting value. Also, do not enclose a setting value in double quotation marks ("). If you do, the value is ignored, and the default value is used instead.

2. Save the `exauth.properties` file in the following location:

   In Windows:

   installation-folder-for-Common-Component\conf\exauth.properties

   In Solaris or Linux:

   installation-directory-for-Common-Component/conf/exauth.properties

   If you change a setting value in the `exauth.properties` file, the changed value immediately takes effect.

Table 3-7 through Table 3-11 list and describe the properties to specify in the `exauth.properties` file.

Table 3-7 Items to Specify in the exauth.properties File When Using a RADIUS Server for Authentication (Common Items)

Property Names	Details
auth.server.type	Specify an external authentication server type. Specify `radius`. Default value: `internal` (used when not linking to an external authentication server)
auth.server.name	Specify the server identification names of RADIUS servers. You can specify any name for this property in order to identify which RADIUS servers the settings such as the port number and the protocol for connecting to the RADIUS server (see Table 3-8) are applied to. `ServerName` has been set as the initial value. You must specify at least one name. When specifying multiple RADIUS server identification names, separate the names with commas (,). Do not register the same server identification name more than once. Specifiable values: No more than 64 bytes of the following characters: 0 to 9 A to Z a to z ! # ( ) + - . = @ [ ] ^ _ { } ~ Default value: none
auth.group.mapping	Specify whether to also link to an external authorization server. Specify `true` to link to an external authorization server. Specify `false` to not to link to an external authorization server. Default value: `false`

Table 3-8 Items to Specify in the exauth.properties File When Using a RADIUS Server for Authentication (Settings for the External Authentication Server)

Attributes	Details
protocol	Specify the protocol for RADIUS server authentication. This attribute is required. Specifiable values: PAP or CHAP Default value: none
host[#1]	Specify the host name or IP address of the RADIUS server. If you specify the host name, make sure beforehand that the host name can be resolved to an IP address. If you specify the IP address, you can use either an IPv4 or IPv6 address. When specifying an IPv6 address, enclose it in square brackets ([]). This attribute is required. Default value: none
port	Specify the port number for RADIUS server authentication. Make sure beforehand that the port you specify is set as the listen port number on the RADIUS server. Specifiable values: 1 to 65535 Default value: 1812
timeout	Specify the amount of time to wait before timing out when connecting to the RADIUS server. Specifiable values: 1 to 65535 (seconds) Default value: 1
retry.times	Specify the number of retries to attempt when an attempt to connect to the RADIUS server fails. If you specify 0, no retries are attempted. Specifiable values: 0 to 50 Default value: 3
attr.NAS-Identifier[#2]	Specify the host name of the Device Manager management server. The RADIUS server uses this attribute value to identify the management server. The host name of the management server has been set as the initial value. Specifiable values: Specify no more than 253 bytes of the following characters: 0 to 9 A to Z a to z ! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [\ ] ^ _ ` { | } ~ Default value: none
attr.NAS-IP-Address[#2]	Specify the IPv4 address of the Device Manager management server. The RADIUS server uses this attribute value to identify the management server. If the format of the address is invalid, this property is disabled. Default value: none

Attributes	Details
attr.NAS-IPv6-Address[#2]	Specify the IPv6 address of the Device Manager management server. The RADIUS server uses this attribute value to identify the management server. Enclose the IPv6 address in square brackets ([]). If the format of the address is invalid, this property is disabled. Default value: none
Note: To specify the attributes, use the following syntax: auth.radius.*auth.server.name-property-value*.*attribute*=*value* #1: When linking to an external authorization server that is running on the same computer and using StartTLS as the protocol for connecting to the LDAP directory server, in the host attribute specify the same host name as the value of CN in the LDAP directory server certificate. You cannot use an IP address. #2: You must specify exactly one of the following: attr.NAS-Identifier, attr.NAS-IP-Address, or attr.NAS-IPv6-Address.	

Table 3-9 Items to Specify in the exauth.properties File When Using a RADIUS Server for Authentication (Common Settings for the External Authorization Server)

Attributes	Details
domain.name	Specify the name of a domain managed by the LDAP directory server. This item is required when an external authorization server is also linked to. Default value: none
dns_lookup	Specify whether to use the DNS server to look up the information about the LDAP directory server. If you want to directly specify information about the LDAP directory server in the exauth.properties file, specify false. If you want to use the DNS server to look up the information, specify true. However, if the following attribute values are already set, the LDAP directory server will be connected to by using the user-specified values instead of by using the DNS server to look up the information. ▪ auth.group.*domain-name*.host ▪ auth.group.*domain-name*.port Default value: false
Note: To specify the attributes, use the following syntax: auth.radius.*auth.server.name-property-value.attribute*=*value*	

Table 3-10 Items to Specify in the exauth.properties File When Using a RADIUS Server for Authentication (When Directly Specifying Information about the External Authentication Server)

Attributes	Details
protocol[#1]	Specify the protocol for connecting to the LDAP directory server. When communicating in plain text format, specify ldap. When using StartTLS communication, specify tls. Before specifying tls, make sure that one of the following encryption methods can be used on the LDAP directory server. ▪ TLS_RSA_WITH_AES_256_CBC_SHA ▪ TLS_RSA_WITH_AES_128_CBC_SHA ▪ SSL_RSA_WITH_3DES_EDE_CBC_SHA Specifiable values: ldap or tls Default value: ldap
host[#2]	If the external authentication server and the external authorization server are running on different computers, specify the host name or IP address of the LDAP directory server. If you specify the host name, make sure beforehand that the host name can be resolved to an IP address. If you specify the IP address, you can use either an IPv4 or IPv6 address. When specifying an IPv6 address, enclose it in square brackets ([]). If you omit this attribute, the external authentication server and the external authorization server are assumed to be running on the same computer. Default value: none
port	Specify the port number of the LDAP directory server. Make sure beforehand that the port you specify is set as the listen port number on the LDAP directory server. Specifiable values: 1 to 65535 Default value: 389
basedn	Specify the BaseDN, which is the DN of the entry that will be used as the start point when searching for LDAP user information on the LDAP directory server. The user entries that are located in the hierarchy below this DN will be checked during authorization. Specify the DN of the hierarchy that includes all of the user entries to be searched. Specify the DN by following the rules defined in RFC4514. For example, if any of the following characters are included in a DN, you need to use a backslash (\) to escape each character. Spaces # + ; , < = > \ If characters that need to be escaped are included in the specified BaseDN, escape all of those characters correctly because the specified value will be passed to the LDAP directory server without change. If you omit this attribute, the value specified in the defaultNamingContext property of Active Directory is assumed as the BaseDN. Default value: none
timeout	Specify the amount of time to wait before timing out when connecting to the LDAP directory server. If you specify 0, the system waits until a communication error occurs without timing out. Specifiable values: 0 to 120 (seconds) Default value: 15

Attributes	Details
`retry.interval`	Specify the retry interval (in seconds) for when an attempt to connect to the LDAP directory server fails. Specifiable values: 1 to 60 (seconds) Default value: 1
`retry.times`	Specify the number of retries to attempt when an attempt to connect to the LDAP directory server fails. If you specify 0, no retries are attempted. Specifiable values: 0 to 50 Default value: 20
Note: To specify the attributes, use the following syntax: `auth.group.`*`domain-name`*`.`*`attribute`*`=`*`value`* For *domain-name*, specify the value specified for `auth.radius.`*`auth.server.name-property-value`*`.domain.name`. #1: When communicating by using StartTLS as the protocol for connecting to the LDAP directory server, you need to specify the security settings of Common Component. For details about specifying security settings in order to communicate by using StartTLS, see Security Settings for the Common Component (Communication with an LDAP Directory Server). #2: When the external authentication server and the external authorization server are running on different computers and when using StartTLS as the protocol for connecting to the LDAP directory server, in the host attribute specify the same host name as the value of CN in the LDAP directory server certificate. You cannot use an IP address.	

Table 3-11 Items to Specify in the exauth.properties File When Using a RADIUS Server for Authentication (When Using the DNS Server to Look Up Information About the External Authentication Server)

Attributes	Details
`protocol`	Specify the protocol for connecting to the LDAP directory server. Specifiable values: `ldap` Default value: `ldap`
`port`	Specify the port number of the LDAP directory server. Make sure beforehand that the port you specify is set as the listen port number on the LDAP directory server. Specifiable values: 1 to 65535 Default value: 389

Attributes	Details
basedn	Specify the BaseDN, which is the DN of the entry that will be used as the start point when searching for LDAP user information on the LDAP directory server. The user entries that are located in the hierarchy below this DN will be checked during authorization. Specify the DN of the hierarchy that includes all of the user entries to be searched. Specify the DN by following the rules defined in RFC4514. For example, if any of the following characters are included in a DN, you need to use a backslash (\) to escape each character. Spaces `# + ; , < = > \` If characters that need to be escaped are included in the specified BaseDN, escape all of those characters correctly because the specified value will be passed to the LDAP directory server without change. If you omit this attribute, the value specified in the `defaultNamingContext` property of Active Directory is assumed as the BaseDN. Default value: none
`timeout`	Specify the amount of time to wait before timing out when connecting to the LDAP directory server. If you specify 0, the system waits until a communication error occurs without timing out. Specifiable values: 0 to 120 (seconds) Default value: 15
`retry.interval`	Specify the retry interval (in seconds) for when an attempt to connect to the LDAP directory server fails. Specifiable values: 1 to 60 (seconds) Default value: 1
`retry.times`	Specify the number of retries to attempt when an attempt to connect to the LDAP directory server fails. If you specify 0, no retries are attempted. Specifiable values: 0 to 50 Default value: 20

Note: To specify the attributes, use the following syntax:

`auth.group.`*`domain-name`*`.`*`attribute`*`=`*`value`*

For *domain-name*, specify the value specified for `auth.radius.`*`auth.server.name-property-value`*`.domain.name`.

The following examples show how to specify the properties:

- When linking to only an external authentication server

```
auth.server.type=radius
auth.server.name=ServerName
auth.group.mapping=false
auth.radius.ServerName.protocol=PAP
auth.radius.ServerName.host=radius.example.com
auth.radius.ServerName.port=1812
auth.radius.ServerName.timeout=1
auth.radius.ServerName.retry.times=3
auth.radius.ServerName.attr.NAS-Identifier=host_A
```

- When directly specifying information about an external authentication server

```
auth.server.type=radius
auth.server.name=ServerName
auth.group.mapping=true
auth.radius.ServerName.protocol=PAP
auth.radius.ServerName.host=radius.example.com
auth.radius.ServerName.port=1812
auth.radius.ServerName.timeout=1
auth.radius.ServerName.retry.times=3
auth.radius.ServerName.attr.NAS-Identifier=host_A
auth.radius.ServerName.domain.name=EXAMPLE.COM
auth.radius.ServerName.dns_lookup=false
auth.group.EXAMPLE.COM.protocol=ldap
auth.group.EXAMPLE.COM.host=ldap.example.com
auth.group.EXAMPLE.COM.port=389
auth.group.EXAMPLE.COM.basedn=dc=Example,dc=com
auth.group.EXAMPLE.COM.timeout=15
auth.group.EXAMPLE.COM.retry.interval=1
auth.group.EXAMPLE.COM.retry.times=20
```

- When using the DNS server to look up an external authorization server

```
auth.server.type=radius
auth.server.name=ServerName
auth.group.mapping=true
auth.radius.ServerName.protocol=PAP
auth.radius.ServerName.host=radius.example.com
auth.radius.ServerName.port=1812
auth.radius.ServerName.timeout=1
auth.radius.ServerName.retry.times=3
auth.radius.ServerName.attr.NAS-Identifier=host_A
auth.radius.ServerName.domain.name=EXAMPLE.COM
auth.radius.ServerName.dns_lookup=true
auth.group.EXAMPLE.COM.protocol=ldap
auth.group.EXAMPLE.COM.basedn=dc=Example,dc=com
auth.group.EXAMPLE.COM.timeout=15
auth.group.EXAMPLE.COM.retry.interval=1
auth.group.EXAMPLE.COM.retry.times=20
```

Registering a User Account Used to Search for LDAP User Information (When the Authentication Method Is RADIUS)

When using an LDAP directory server as an external authorization server, by using the `hcmdsldapuser` command, you can register, on the management server, a user account used to search for LDAP user information. After registering a user account, you can use this command to delete such an account or check LDAP directory servers for which user accounts used to search for LDAP user information have been registered on the management server.

Registering a user account used to search for LDAP user information

Use the `hcmdsldapuser` command to register a user account used to search for LDAP user information.

For a user account used to search for LDAP user information, register a user account that satisfies the following conditions:

- The user account is already registered in the LDAP directory server.
- The user account can bind to the DN specified for `auth.group.`*`domain-name`*`.basedn` in the `exauth.properties` file
- The user account can search the attributes for all entries below the DN specified for `auth.group.`*`domain-name`*`.basedn` in the `exauth.properties` file
- The user account can reference the DN specified for `auth.group.`*`domain-name`*`.basedn` in the `exauth.properties` file

The format of the `hcmdsldapuser` command is as follows:

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsldapuser /set /dn
DN-of-user-account-used-to-search-for-LDAP-user-info /pass
password-of-user-account-used-to-search-for-LDAP-user-info /name
domain-name
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsldapuser -set
-dn DN-of-user-account-used-to-search-for-LDAP-user-info -pass
password-of-user-account-used-to-search-for-LDAP-user-info -name
domain-name
```

- *DN-of-user-account-used-to-search-for-LDAP-user-info*

  Specify a DN by following the rules defined in RFC4514. For example, if the following characters are included in a DN, you need to use a backslash (\) to escape each character.

  Spaces `# + , ; < = > \`

- *password-of-user-account-used-to-search-for-LDAP-user-info*

  This is case-sensitive and must exactly match the password registered in the LDAP directory server.

- *domain-name*

  Specify the domain name specified for `auth.radius.`*`auth.server.name-property-value`*`.domain.name` in the `exauth.properties` file.

⚠ ***Caution:*** In the LDAP directory server, you can use double quotation marks (") for the DN and password. In the management server, however, you need to register a user account whose DN and password do not include double quotation marks.

Note:

- You can use the dsquery command provided by Active Directory to check the DN of a user. The following example shows how to use the dsquery command to check the DN of the user administrator, and also shows the execution results:

  ```
  dsquery user -name administrator
  "CN=administrator,CN=admin,DC=example,DC=com"
  ```

- If the DN includes commas such as cn=administrator,cn=admin,dc=example,com, specify as follows:

  In Windows:

  ```
  hcmdsldapuser /set /dn
  "cn=administrator,cn=admin,dc=example\,com" /pass
  administrator_pass /name ServerName
  ```

  In Solaris or Linux:

  ```
  hcmdsldapuser -set -dn
  "cn=administrator,cn=admin,dc=example\\,com" -pass
  administrator_pass -name ServerName
  ```

Deleting a user account used to search for LDAP user information

To delete a user account used to search for LDAP user information, execute the following command.

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsldapuser /delete
/name domain-name
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsldapuser -
delete -name domain-name
```

Checking LDAP directory servers for which a user account used to search for LDAP user information has been registered

To check the names of LDAP directory servers for which a user account used to search for LDAP user information has been registered on the management server, execute the following command:

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsldapuser /list
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsldapuser -list
```

Setting a Shared Secret

By using the `hcmdsradiussecret` command, you can specify a shared secret on the management server to communicate with the RADIUS server. After specifying a shared secret, you can use this command to delete a shared secret or to list the server identification names of external authentication servers in which a shared secret has been registered.

Specifying a shared secret

To specify a shared secret by using the `hcmdsradiussecret` command, execute the following command.

– In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsradiussecret
/set shared-secret /name RADIUS-server-indication-name
```

– In Solaris or Linux:

```
installation-directory-for-Common-
Component/bin/hcmdsradiussecret -set shared-secret -name RADIUS-
server-indication-name
```

RADIUS-server-indication-name must match a server indication name specified for the `auth.server.name` property in the `exauth.properties` file.

The following example shows how to execute the `hcmdsradiussecret` command when the shared secret is `secret01` and the server identification name of the RADIUS server is `ServerName`.

– In Windows:

```
hcmdsradiussecret /set secret01 /name ServerName
```

– In Solaris or Linux:

```
hcmdsradiussecret -set secret01\\ -name ServerName
```

Deleting a shared secret

To delete a shared secret, execute the following command.

– In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsradiussecret
/delete /name RADIUS-server-indication-name
```

– In Solaris or Linux:

```
installation-directory-for-Common-
Component/bin/hcmdsradiussecret -delete -name RADIUS-server-
indication-name
```

Listing the server identification names of RADIUS servers in which a shared secret has been registered

To list the server identification names of RADIUS servers in which a shared secret has been registered, execute the following command:

– In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsradiussecret
/list
```

- In Solaris or Linux:

  ```
  installation-directory-for-Common-
  Component/bin/hcmdsradiussecret -list
  ```

Checking the Connection Status of then External Authentication Server and the External Authorization Server (When the Authentication Method Is RADIUS)

By using the hcmdscheckauth command, you can make sure that the external authentication server and the external authorization server can be properly connected to.

If Tuning Manager is remotely connected, perform this operation on the computer on which the Device Manager server is installed.

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdscheckauth /user
user-ID /pass password [/summary]
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdscheckauth -
user user-ID -pass password [-summary]
```

If you specify a user who belongs to a realm different from the realm name specified for default_realm in the exauth.properties file, specify a character string that contains the realm name for user-ID. If you specify a user who belongs to the realm specified for default_realm in the exauth.properties file, you can omit the realm name. However, you cannot specify a user account whose *user-ID* or *password* begins with a forward slash (/) in Windows, or a hyphen (-) in Solaris or Linux.

If you execute the command with the summary option specified, the confirmation message is displayed in summary format.

If you execute the hcmdscheckauth command, the settings in the exauth.properties file, and the connection status of the external authentication server and the external authorization server are checked in the four phases described below. Check results are displayed for each phase.

Phase 1

The command verifies that common properties (Table 3-7) have been correctly specified in the exauth.properties file.

Phase 2

The command verifies that the properties for the external authentication server (Table 3-8) and properties for the external authorization server (Table 3-9 through Table 3-11) have been correctly specified in the exauth.properties file.

Phase 3

The command verifies that the external authentication server can be connected to.

Phase 4

If an external authorization server is also linked to, the command verifies that the external authorization server can be connected to and authorization groups can be searched.

When a phase finishes normally, the following message is displayed:

```
KAPM15004-I The result of the configuration check of Phase X was normal.
```

Note: *X* is the phase number.

If an error occurs, find the output message ID in the *Hitachi Device Manager Error Codes*, and check the cause and action to take for the error.

Settings Required When Using a Kerberos Server for Authentication

To authenticate users by using a Kerberos server, specify the following settings in Hitachi Storage Command Suite products.

1. In the `exauth.properties` file on the management server, specify necessary information.

   Necessary settings depend on whether only an external authentication server is linked to or an external authorization server is also linked to.

   You can use either of the following methods to define the Kerberos server to be used as an external authorization server:

   – In the `exauth.properties` file, directly specify information about the Kerberos server to connect to.

     Specify information about the Kerberos server, such as the IP address and port number, in the `exauth.properties` file for each realm.

   – Use the DNS server to look up the Kerberos server to connect to.

     Specify information about the DNS server that manages Kerberos servers in the `exauth.properties` file.

     In addition, before using this method, you need to register the host name, port number, and realm name of the Kerberos server in the SRV records of the DNS server.

Note: To use StartTLS for communication between the management server and the LDAP directory server, you need to directly specify information about the Kerberos server to connect to in the `exauth.properties` file.

When using the DNS server to look up the Kerberos server to connect to, it might take longer for users to log in.

2. When also linking to an external authorization server, on the management server, register a user account used to search for user information on the LDAP directory server.
3. On the Kerberos server, register accounts of users that will use Hitachi Storage Command Suite products.

   User IDs and passwords must consist of characters that can be used in Hitachi Storage Command Suite products. Specify 1 to 256 bytes of the following characters:

   0 to 9 A to Z a to z ! # $ % & ' ( ) * + - . = @ \ ^ _ |

   In Hitachi Storage Command Suite products, user IDs are not case-sensitive. The combination of character types for passwords must follow the settings in the external authentication server.
4. Register accounts and set permissions by using Web Client.

   When linking to only an external authentication server

   - Register users.
   - Change the authentication method of users.#
   - Set permissions for users.
   - Assign resource groups to users.

   #: This operation is required if you want to change the authentication method of existing users.

   When also linking to an external authorization server

   - Register authorization groups.
   - Set permissions for authorization groups.

   You do not need to assign resource groups to authorization groups. All Resources will be automatically assigned to users who belong to authorization groups.
5. On the management server, use the `hcmdscheckauth` command to make sure that the external authentication server and the external authorization server can be properly connected to.

The following sections describe operations you need to perform on the management server. For details on how to use Web Client, see the Device Manager online Help.

Setting the exauth.properties File (When the Authentication Method Is Kerberos)

This section describes the settings required for the `exauth.properties` file in order to use a Kerberos server to authenticate users.

1. Specify values for the necessary properties in the `exauth.properties` file:
   - Common properties (Table 3-12)
   - Properties for an external authentication server

     Specify these property values for each Kerberos server.

     The items you need to specify differ depending on whether you directly specify information about the Kerberos server (Table 3-13) or you use the DNS server to look up the Kerberos server (Table 3-14).
   - Properties for an external authorization server (Table 3-15)

     These properties need to be set if you directly specify information about the Kerberos server and an external authorization server is also linked. Specify the properties for each realm.

   The template of the `exauth.properties` file is stored in the following location:

   In Windows:

   `installation-folder-for-Common-Component``\sample\conf\exauth.properties`

   In Solaris or Linux:

   `installation-directory-for-Common-Component``/sample/conf/exauth.properties`

Caution: Do not enter a space at the beginning or end of a setting value. Also, do not enclose a setting value in double quotation marks ("). If you do, the value is ignored, and the default value is used instead.

2. Save the `exauth.properties` file in the following location:

   In Windows:

   `installation-folder-for-Common-Component``\conf\exauth.properties`

   In Solaris or Linux:

   `installation-directory-for-Common-Component``/conf/exauth.properties`

   If you change a setting value in the `exauth.properties` file, the changed value immediately takes effect.

Table 3-12 through Table 3-15 list and describe the properties to specify in the `exauth.properties` file.

Table 3-12 Items to Specify in the exauth.properties File When Using a Kerberos Server for Authentication (Common Items)

Property Names	Details
auth.server.type	Specify an external authentication server type. Specify kerberos. Default value: internal (used when not linking to an external authentication server)
auth.group.mapping	Specify whether to also link to an external authorization server. Specify true to link to an external authorization server. Specify false to not to link to an external authorization server. Default value: false

Table 3-13 Items to Specify in the exauth.properties File When Using a Kerberos Server for Authentication (When Directly Specifying Information About the External Authentication Server)

Attributes	Details
default_realm	Specify the default realm name. If you specify a user ID but not a realm name in the Web Client login window, the user is authenticated as a user that belongs to the realm specified for this attribute. This attribute is required. Default value: none
dns_lookup_kdc	Specify false. Default value: false
clockskew	Specify the acceptable range of difference between the management server time and Kerberos server time. If the difference exceeds this value, an authentication error occurs. Specifiable values: 0 to 300 (seconds) Default value: 300
timeout	Specify the amount of time to wait before timing out when connecting to the Kerberos server. If you specify 0, the system waits until a communication error occurs without timing out. Specifiable values: 0 to 120 (seconds) Default value: 3
realm_name	Specify the realm identification names. You can specify any name for this attribute in order to identify which realms the property attribute settings are applied to. You must specify at least one name. When specifying multiple realm identification names, separate the names with commas (,). Do not register the same realm identification name more than once. Default value: none
*value-specified-for-realm*_name.realm	Specify the name of the realm set in the Kerberos server. This attribute is required. Default value: none

Attributes	Details
*value-specified-for-realm*_name.kdc	Specify the information about the Kerberos server in the following format: *host-name-or-IP-address*[:*port-number*] This attribute is required. *host-name-or-IP-address* If you specify the host name, make sure beforehand that the name can be resolved to an IP address. If you specify the IP address, use an IPv4 address. In an IPv6 environment, you must specify the host name. Note that you cannot specify the loopback address (localhost or 127.0.0.1). *port-number* Make sure beforehand that the port you specify is set as the listen port number on the Kerberos server. If you do not specify a port number or the specified port number cannot be used in a Kerberos server, 88 is assumed. When specifying multiple Kerberos servers, separate them with commas as follows: *host-name-or-IP-address*[:*port-number*],*host-name-or-IP-address*[:*port-number*],...
Note: To specify the attributes, use the following syntax: auth.kerberos.*attribute*=*value*	

Table 3-14 Items to Specify in the exauth.properties File When Using a Kerberos Server for Authentication (When Using the DNS Server to Look UP Information About the External Authentication Server)

Attributes	Details
default_realm	Specify the default realm name. If you specify a user ID but not a realm name in the Web Client login window, the user is authenticated as a user that belongs to the realm specified for this attribute. This attribute is required. Default value: none
dns_lookup_kdc	Specify true. This attribute is required. However, if all the following attributes values are already set, the Kerberos server will not be looked up by using the DNS server. ▪ realm_name ▪ *value-specified-for-realm_name*.realm ▪ *value-specified-for-realm_name*.kdc
clockskew	Specify the acceptable range of difference between the management server time and Kerberos server time. If the difference exceeds this value, an authentication error occurs. Specifiable values: 0 to 300 (seconds) Default value: 300
timeout	Specify the amount of time to wait before timing out when connecting to the Kerberos server. If you specify 0, the system waits until a communication error occurs without timing out. Specifiable values: 0 to 120 (seconds) Default value: 3
Note: To specify the attributes, use the following syntax: auth.kerberos.*attribute*=*value*	

Table 3-15 Items to Specify in the exauth.properties File When Using a Kerberos Server for Authentication (Settings for the External Authorization Server)

Attributes	Details
protocol#	Specify the protocol for connecting to the LDAP directory server. When communicating in plain text format, specify ldap. When using StartTLS communication, specify tls. StartTLS communication can be used only when directly specifying information about the Kerberos server. Before specifying tls, make sure that one of the following encryption methods can be used on the LDAP directory server. ▪ TLS_RSA_WITH_AES_256_CBC_SHA ▪ TLS_RSA_WITH_AES_128_CBC_SHA ▪ SSL_RSA_WITH_3DES_EDE_CBC_SHA Specifiable values: ldap or tls Default value: ldap
port	Specify the port number of the LDAP directory server. Make sure beforehand that the port you specify is set as the listen port number on the LDAP directory server. Specifiable values: 1 to 65535 Default value: 389
basedn	Specify the BaseDN, which is the DN of the entry that will be used as the start point when searching for LDAP user information on the LDAP directory server. The user entries that are located in the hierarchy below this DN will be checked during authorization. Specify the DN of the hierarchy that includes all of the user entries to be searched. Specify the DN by following the rules defined in RFC4514. For example, if any of the following characters are included in a DN, you need to use a backslash (\) to escape each character. Spaces # + ; , < = > \ If characters that need to be escaped are included in the specified BaseDN, escape all of those characters correctly because the specified value will be passed to the LDAP directory server without change. If you omit this attribute, the value specified in the defaultNamingContext property of Active Directory is assumed as the BaseDN. Default value: none
timeout	Specify the amount of time to wait before timing out when connecting to the LDAP directory server. If you specify 0, the system waits until a communication error occurs without timing out. Specifiable values: 0 to 120 (seconds) Default value: 15
retry.interval	Specify the retry interval (in seconds) for when an attempt to connect to the LDAP directory server fails. Specifiable values: 1 to 60 (seconds) Default value: 1

Attributes	Details
retry.times	Specify the number of retries to attempt when an attempt to connect to the LDAP directory server fails. If you specify 0, no retries are attempted. Specifiable values: 0 to 50 Default value: 20
Note: To specify the attributes, use the following syntax: auth.group.*realm-name*.*attribute*=*value* For *realm-name*, specify the value specified for auth.kerberos.*realm_name-property-value*.realm. #: When communicating by using StartTLS as the protocol for connecting to the LDAP directory server, you need to specify the security settings of Common Component. For details about specifying security settings in order to communicate by using StartTLS, see Security Settings for the Common Component (Communication with an LDAP Directory Server).	

The following examples show how to specify the properties:

- When directly specifying information about a Kerberos server (when not linking to an external authorization server):

```
auth.server.type=kerberos
auth.group.mapping=false
auth.kerberos.default_realm=EXAMPLE.COM
auth.kerberos.dns_lookup_kdc=false
auth.kerberos.clockskew=300
auth.kerberos.timeout=3
auth.kerberos.realm_name=RealmName
auth.kerberos.RealmName.realm=EXAMPLE.COM
auth.kerberos.RealmName.kdc=kerberos.example.com:88
```

- When using the DNS server to look up a Kerberos server (when not linking to an external authorization server):

```
auth.server.type=kerberos
auth.group.mapping=false
auth.kerberos.default_realm=EXAMPLE.COM
auth.kerberos.dns_lookup_kdc=true
auth.kerberos.clockskew=300
auth.kerberos.timeout=3
```

- When directly specifying information about a Kerberos server (when also linking to an external authorization server):

```
auth.server.type=kerberos
auth.group.mapping=true
auth.kerberos.default_realm=EXAMPLE.COM
auth.kerberos.dns_lookup_kdc=false
auth.kerberos.clockskew=300
auth.kerberos.timeout=3
auth.kerberos.realm_name=RealmName
auth.kerberos.RealmName.realm=EXAMPLE.COM
auth.kerberos.RealmName.kdc=kerberos.example.com:88
auth.group.EXAMPLE.COM.protocol=ldap
auth.group.EXAMPLE.COM.port=389
auth.group.EXAMPLE.COM.basedn=dc=Example,dc=com
auth.group.EXAMPLE.COM.timeout=15
auth.group.EXAMPLE.COM.retry.interval=1
auth.group.EXAMPLE.COM.retry.times=20
```

- When using the DNS server to look up a Kerberos server (when also linking to an external authorization server):

```
auth.server.type=kerberos
auth.group.mapping=true
auth.kerberos.default_realm=EXAMPLE.COM
auth.kerberos.dns_lookup_kdc=true
auth.kerberos.clockskew=300
auth.kerberos.timeout=3
```

Registering a User Account Used to Search for LDAP User Information (When the Authentication Method Is Kerberos)

When using an LDAP directory server as an external authorization server, by using the hcmdsldapuser command, you can register, on the management server, a user account used to search for LDAP user information. After registering a user account, you can use this command to delete such an account or check LDAP directory servers for which user accounts used to search for LDAP user information have been registered on the management server.

Registering a user account used to search for LDAP user information

Use the hcmdsldapuser command to register a user account used to search for LDAP user information.

For a user account used to search for LDAP user information, register a user account that satisfies the following conditions:

- The user account is already registered in the LDAP directory server.
- The user account can bind to the DN specified for auth.group.*realm-name*.basedn in the exauth.properties file
- The user account can search the attributes for all entries below the DN specified for auth.group.*realm-name*.basedn in the exauth.properties file
- The user account can reference the DN specified for auth.group.*realm-name*.basedn in the exauth.properties file

The format of the hcmdsldapuser command is as follows:

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsldapuser /set /dn
DN-of-user-account-used-to-search-for-LDAP-user-info /pass
password-of-user-account-used-to-search-for-LDAP-user-info /name
realm-name
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsldapuser -set
-dn DN-of-user-account-used-to-search-for-LDAP-user-info -pass
password-of-user-account-used-to-search-for-LDAP-user-info -name
realm-name
```

- *DN-of-user-account-used-to-search-for-LDAP-user-info*

Specify a DN by following the rules defined in RFC4514. For example, if the following characters are included in a DN, you need to use a backslash (\) to escape each character.

Spaces `# + , ; < = > \`

- *password-of-user-account-used-to-search-for-LDAP-user-info*

  This is case-sensitive and must exactly match the password registered in the LDAP directory server.

- *realm-name*

  If you directly specify information about a Kerberos server in the `exauth.properties` file, specify the value specified for `auth.kerberos.default_realm` or `auth.kerberos.`*`auth.kerberos.realm_name-property-value`*`.realm`.

  If you specify the settings in the `exauth.properties` file to use the DNS server to look up information about a Kerberos server, specify the realm name registered in the DNS server.

Caution: In the LDAP directory server, you can use double quotation marks (") for the DN and password. In the management server, however, you need to register a user account whose DN and password do not include double quotation marks.

Note:

- You can use the `dsquery` command provided by Active Directory to check the DN of a user. The following example shows how to use the `dsquery` command to check the DN of the user `administrator`, and also shows the execution results:

  ```
  dsquery user -name administrator
  "CN=administrator,CN=admin,DC=example,DC=com"
  ```

- If the DN includes commas such as `cn=administrator,cn=admin,dc=example,com`, specify as follows:

  In Windows:

  ```
  hcmdsldapuser /set /dn
  "cn=administrator,cn=admin,dc=example\,com" /pass
  administrator_pass /name ServerName
  ```

  In Solaris or Linux:

  ```
  hcmdsldapuser -set -dn
  "cn=administrator,cn=admin,dc=example\\,com" -pass
  administrator_pass -name ServerName
  ```

Deleting a user account used to search for LDAP user information

To delete a user account used to search for LDAP user information, execute the following command.

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsldapuser /delete
/name realm-name
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsldapuser -
delete -name realm-name
```

Checking LDAP directory servers for which a user account used to search for LDAP user information has been registered

To check the names of LDAP directory servers for which a user account used to search for LDAP user information has been registered on the management server, execute the following command.

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsldapuser /list
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsldapuser -list
```

Checking the Connection Status of then External Authentication Server and the External Authorization Server (When the Authentication Method Is Kerberos)

By using the `hcmdscheckauth` command, you can make sure that the external authentication server and the external authorization server can properly be connected to. If you have specified multiple realm names in the `exauth.properties` file, perform this operation for each realm.

If Tuning Manager is remotely connected, perform this operation on the computer on which the Device Manager server is installed.

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdscheckauth /user
user-ID /pass password [/summary]
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdscheckauth -
user user-ID -pass password [-summary]
```

The user account to be specified for user-ID and password depends on whether only an external authentication server is linked or an external authorization server is also linked to.

When linking to only an external authentication server:

> Specify a user account that is registered in Hitachi Storage Command Suite products and whose authentication method has been set to Kerberos authentication.

When also linking to an external authorization server:

Specify a user account that is not registered in Hitachi Storage Command Suite products.

If you specify a user who belongs to the realm specified for `default_realm` in the `exauth.properties` file, you can omit the realm name. In addition, note that you cannot specify a user account whose *`user-ID`* or *password* begins with a forward slash (`/`) in Windows, or hyphen (`-`) in Solaris or Linux.

If you execute the command with the `summary` option specified, the confirmation message is displayed in summary format.

If you execute the `hcmdscheckauth` command, the settings in the `exauth.properties` file, and the connection status of the external authentication server and the external authorization server are checked in the four phases described below. Check results are displayed for each phase.

Phase 1

The command verifies that common properties (Table 3-12) have been correctly specified in the `exauth.properties` file.

Phase 2

The command verifies that the properties for the external authentication server (Table 3-13 and Table 3-14) and properties for the external authorization server (Table 3-15) have been correctly specified in the `exauth.properties` file.

Phase 3

The command verifies that the external authentication server can be connected to.

Phase 4

If an external authorization server is also linked to, the command verifies that the external authorization server can be connected to and authorization groups can be searched.

When a phase finishes normally, the following message is displayed:

```
KAPM15004-I The result of the configuration check of Phase X was normal.
```

Note: *X* is the phase number.

If an error occurs, find the output message ID in the *Hitachi Device Manager Error Codes*, and check the cause and action to take for the error.

Encryption Types That Can Be Used For Kerberos Authentication

In Hitachi Storage Command Suite products, the encryption types listed below can be used for Kerberos authentication. Configure the Kerberos server so that one of the following encryption types can be used.

If the management server OS is Windows:

AES128-CTS-HMAC-SHA1-96

RC4-HMAC

DES3-CBC-SHA1

DES-CBC-CRC

DES-CBC-MD5

If the management server OS is Solaris or Linux:

DES-CBC-MD5

For example, if the management server OS is Solaris or Linux and you use Windows Server 2008 R2 Active Directory for the Kerberos server, you need to enable DES-CBC-MD5 in the Windows security policy settings.

4

Security Settings for Device Manager

This chapter describes the security settings required to operate Device Manager.

Warning Banner Settings

In version 5.1 or later of Hitachi Storage Command Suite products, an optional message (warning banner) can be displayed as a security risk measure at login. Issuing a warning beforehand to third parties that might attempt invalid access can help reduce the risk of problems such as data loss or information leakage.

The message displayable on the Login panel must be no more than 1,000 characters. If a message with the same content is registered in a different language for each locale, the message can be automatically switched to match the locale of the web browser.

When setting up a message, you must log on as a user who has the Administrator permissions in Windows, or as the root user in Solaris or Linux.

Warning banner settings can also be specified from Web Client. However, if the system is in a cluster configuration, the settings from Web Client are only applied to the executing node. To apply the settings to the standby node, switch the nodes, and then specify the same settings. For details on how to operate Web Client, see the Device Manager online Help.

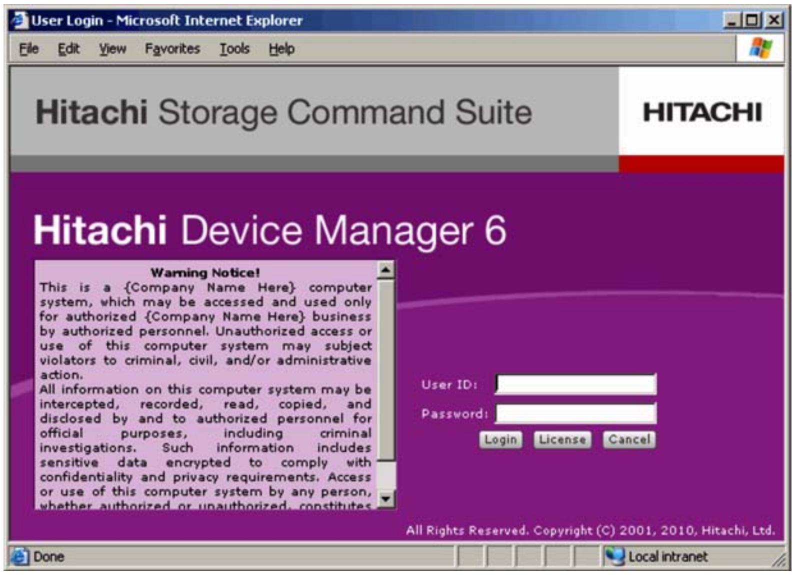
Editing the Message

You edit the message in HTML format. No more than 1,000 characters can be used. In addition to the usual characters, you can use HTML tags to change font attributes or place line breaks in desired locations. (The tag characters are also counted in the number of characters.) Usable characters are from the Unicode UTF-8 encoding.

The following show an example of message editing, and the results (the warning banner) after the message has been registered.

Example of editing a message:

```
<center><b>Warning Notice!</b></center>
This is a {Company Name Here} computer system, which may be accessed and used only for
authorized {Company Name Here} business by authorized personnel. Unauthorized access or use
of this computer system may subject violators to criminal, civil, and/or administrative
action.<br> All information on this computer system may be intercepted, recorded, read,
copied, and disclosed by and to authorized personnel for official purposes, including
criminal investigations.Such information includes sensitive data encrypted to comply with
confidentiality and privacy requirements. Access or use of this computer system by any
person, whether authorized or unauthorized, constitutes consent to these terms. There is no
right of privacy in this system.
```


User Login - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Hitachi Storage Command Suite
HITACHI
Hitachi Device Manager 6
User ID:
Password:
Login
License
Cancel
Done
Local intranet

Warning Notice!

This is a {Company Name Here} computer system, which may be accessed and used only for authorized {Company Name Here} business by authorized personnel. Unauthorized access or use of this computer system may subject violators to criminal, civil, and/or administrative action.

All information on this computer system may be intercepted, recorded, read, copied, and disclosed by and to authorized personnel for official purposes, including criminal investigations. Such information includes sensitive data encrypted to comply with confidentiality and privacy requirements. Access or use of this computer system by any person, whether authorized or unauthorized, constitutes

All Rights Reserved. Copyright (C) 2001, 2010, Hitachi, Ltd.

Figure 4-1 Displayed Results After Registering the Message

Caution:

- When the message is registered, the HTML syntax is neither checked nor corrected. Edit the message correctly in accordance with HTML syntax rules because the edited message will be registered as is. If there is an error in the HTML syntax in the message, the message might not be displayed correctly in the Login panel.
- There are no restrictions on the characters usable in the message, other than that the character encoding must be Unicode (UTF-8). To display a character used in HTML syntax (for example, `< > “ ‘ &`), use the HTML escape sequence. For example, to display an ampersand (&) in the Login panel, write `&amp;` in the HTML file.
- To use line breaks to display the message in a desired location, use the HTML tag `<BR>`. Even if there are linefeed characters in the message, they will be ignored when the message is registered.

Note: Sample messages in English (`bannermsg.txt`) and Japanese (`bannermsg_ja.txt`) are provided in the following locations:

- In Windows:
  `installation-folder-for-Common-Component``\sample\resource`
- In Solaris or Linux:
  `installation-directory-for-Common-Component``/sample/resource`

These sample files are overwritten at installation so, if you wish to use a sample file, copy it and then edit it.

Registering the Message

Use the `hcmdsbanner` command to register an edited message. If a message for the specified locale is already registered, it will be updated by being overwritten. Execute the following command:

- In Windows:

  ```
  installation-folder-for-Common-Component\bin\hcmdsbanner /add
  /file file-name [/locale locale-name]
  ```

  The following shows an example of executing the command:

  ```
  C:\Program Files\HiCommand\Base\bin\hcmdsbanner /add /file
  C:\W_Banner\wbfile1 /locale en
  ```

- In Solaris or Linux:

  ```
  installation-directory-for-Common-Component/bin/hcmdsbanner -add
  -file file-name [-locale locale-name]
  ```

  The following shows an example of executing the command:

  ```
  # /opt/HiCommand/Base/bin/hcmdsbanner -add -file
  /opt/W_Banner/wbfile1 -locale en
  ```

file-name

Using an absolute path, specify the file that stores the message. In Solaris or Linux, do not specify a path that includes a space.

locale-name

Specify the locale of the language used for the message (for example, `en` for English, or `ja` for Japanese). If omitted, the default locale will be specified.

When you use Web Client on multiple locales, if you register a message with the same contents in a different language for each locale, the message can be automatically switched to match the locale of the Web browser.

The locale for a warning banner displayed in Web Client is set, according to the priority of the language set for the Web browser that is used.

If the `locale` option is omitted, you can edit the registered contents from Web Client also. However, available HTML tags are limited when you edit from Web Client.

Return values

0: Normal termination

253: The number of characters in the message exceeds 1,000 characters.

255: Failure

For details about errors, see the contents of the following log files.

- In Windows: *installation-folder-for-Common-Component*\log\hcmdsbanner*n*.log

- In Solaris or Linux: `/var/`*`installation-directory-for-Common-Component`*`/log/hcmdsbanner`*`n`*`.log`

Deleting the Message

Use the `hcmdsbanner` command to delete a registered message:

– In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsbanner /delete
[/locale locale-name]
```

The following shows an example of executing the command:

```
C:\Program Files\HiCommand\Base\bin\hcmdsbanner /delete /locale
en
```

– In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsbanner -
delete [-locale locale-name]
```

The following shows an example of executing the command:

```
# /opt/HiCommand/Base/bin/hcmdsbanner -delete -locale en
```

`locale-name`

Specify the locale of the message to be deleted (for example, `en` for English, or `ja` for Japanese). If omitted, the default locale will be specified.

Return values

0: Normal termination

254: A message of the specified locale has not been registered.

255: Failure

For details about errors, see the contents of the following log files.

- In Windows: *`installation-folder-for-Common-Component`*`\log\hcmdsbanner`*`n`*`.log`
- In Solaris or Linux: `/var/`*`installation-directory-for-Common-Component`*`/log/hcmdsbanner`*`n`*`.log`

Security Settings Related to Communication

By using TLS or SSL, Device Manager can maintain the integrity of transmitted and received information. TLS/SSL provides the following functions:

- Verifies the identities of connecting applications
- Encrypts data transferred between servers and clients
- Detects data that was tampered with during transfer

Device Manager can use TLS/SSL for the following communication:

- Communication routes between the management server and management client (Web Client)

  If you specify both the following settings, the management server and management client communicate using TLS/SSL:

  – Settings for communication between the Device Manager server and Web Client

    For details about how to specify these settings, see Security Settings for the Device Manager Server (Communication with Web Client or CLI).

  – Settings for communication between Common Component and Web Client

    For details about how to specify these settings, see Security Settings for Common Component (Communication with Web Client).

- Communication routes between the management server and management client (CLI)

  If you specify both the following settings, the management server and management client (CLI) communicate using TLS/SSL:

  – Settings for communication between the Device Manager server and CLI

    For details about how to specify these settings, see Security Settings for the Device Manager Server (Communication with Web Client or CLI).

  – Environment settings for the management client (CLI)

    For details about how to specify these settings, see the *Hitachi Device Manager Software Command Line Interface (CLI) User's Guide*..

- Communication route between the management server and CIM client

  For details about how to specify these settings, see Security Settings for the Device Manager Server (Communication with a CIM Client) and Security Settings for a CIM Client (Communication with the Device Manager Server).

- Communication route between the management server and LDAP directory server

  For details about how to specify these settings, see Security Settings for the Common Component (Communication with an LDAP Directory Server).

- Communication routes between the management server and storage subsystems

  TLS/SSL can be used for communication with the following storage subsystems:

  – Universal Storage Platform V/VM

  – Hitachi USP

  – Hitachi AMS 2000

  – Hitachi SMS

  – SMI-S Enabled subsystem (SMI-S provider)#

    #: TLS/SSL can be used to receive event indications from an SMI-S provider.

  You do not need to set up a Device Manager environment for communication with Universal Storage Platform V/VM or Hitachi USP because such communication always uses SSL.

  To use SSL for communication with Hitachi AMS 2000 or Hitachi SMS, you need to specify the settings for Web Client or CLI. For details about how to specify the settings, see the Device Manager online Help or the *Hitachi Device Manager Software Command Line Interface (CLI) User's Guide*.

  For details about how to specify settings to use TLS/SSL for event indications, see Security Settings for the Device Manager Server (Communication with SMI-S Provider).

This section describes how to configure Device Manager to enable secure communications over the Internet or an intranet by using TLS/SSL. For details about the SSL settings for linked applications, see the documentation for the relevant application.

Note: If you enable security on Device Manager, you must make sure that the key pair and associated server certificate do not expire. If either the key pair or the server certificate expires, users might not be able to connect to the Device Manager server or Common Component (HBase Storage Mgmt Web Service) with Web Client. For details, see Creating a Keypair, Creating a Certificate Signing Request (CSR) (Security Settings for Common Component)and Creating a Self-Signed Certificate.

This section includes the following terms:

- *host-name* indicates the name of the host that is running the Device Manager server or HBase Storage Mgmt Web Service, unless otherwise specified.
- *installation-directory-for-Java-Web-Start* indicates the default Java Web Start installation directory on a client computer. If a client's Java Web Start directory is not located in the default location, adjust commands or paths accordingly. The default directories are as follows:

  – In Windows: `program-files-folder\Java\version-of-JRE\bin`

- In Solaris: `/usr/j2se/jre/javaws`
- In Linux: `/usr/Java/`*`version-of-JRE`*`/javaws`
- In HP-UX®: `/opt/`*`version-of-JRE`*`/jre/javaws`

- **Public Key Infrastructure (PKI)** is a cryptographic technology developed under the guidance of the Internet Engineering Task Force (IETF) to create a secure networking system that can have interoperative characteristics between multiple vendors.
- **Secure Sockets Layer (SSL)** is a protocol first developed by Netscape® to securely transmit data over the Internet. Two SSL-enabled peers use their private and public keys to establish a secure communication session, with each peer encrypting transmitted data with a randomly generated and agreed-upon symmetric key.
- **Transport Layer Security (TLS)** is the successor protocol to SSL. For more information, see the RFC, The TLS Protocol (version 1.0) at:

  http://www.ietf.org/rfc/rfc2246.txt
- A **keypair** is two mathematically-related cryptographic keys consisting of a private key and its associated public key.
- A **keystore** is a file that contains the keypair, which is used for TLS/SSL connections and the corresponding server certificate.
- A **private key password** is a password for restoring the keypair used to encrypt TLS/SSL connections and the corresponding server certificate.
- A **truststore** is a file containing a signed and trusted server certificate.
- A **server certificate** (**digitally-signed certificate**) forms an association between an ID (the Device Manager server or HBase Storage Mgmt Web Service of Common Component) and a specific keypair. A server certificate is used to identify the Device Manager server or HBase Storage Mgmt Web Service to a client so that the server and client can communicate using TLS/SSL. Server certificates used in Device Manager are X.509 certificates in DER or PEM format (Device Manager server) or X.509 certificates in PEM format (HBase Storage Mgmt Web Service). Server certificates come in two basic types:
  - Self-signed: This is a certificate self-signed by the issuer of the certificate. Users can create certificates of this type by themselves. For example, if you use HiKeytool to create a keypair, you will have a keypair and an associated self-signed certificate. Although you can use a self-signed certificate to establish encrypted communications, a warning message might be output depending on the browser because the security level of self-signed certificates is low. Therefore, we recommend that you use a self-signed certificate only to test encrypted communications.

– Signed and trusted: This is a certificate signed by a trusted certificate authority (CA). To obtain a signed certificate from a certificate authority, generate a certificate signing request (CSR), send it to a certificate authority (the root certificate authority or other certificate authorities trusted by different certificate authorities), and then have it returned from the certificate authority. A well-known and trusted certificate authority meets the following requirements:

4. A certificate for that certificate authority is located inside the Device Manager server truststore.
5. A certificate for that certificate authority is located in the database of trusted certificate authorities within browsers supported by Device Manager.
6. A certificate for that certificate authority is located within the truststore distributed with Java Web Start.
7. A certificate for that certificate authority is located within the truststore used by Common Component.
8. A certificate for that certificate authority is located within the truststore used by SMI-S clients and SMI-S Indication clients. SMI-S Indication clients.

Note:

- The locations of the truststore for the Device Manager server and the default truststore for Java Web Start are as follows:

  Truststore for the Device Manager server:
  installation-directory-for-Common-Component/`jdk/jre/lib/security/cacerts`

  Default truststore for Java Web Start:
  Java-Web-Start-installation-directory/`cacerts`

  The default location of the truststore for the Device Manager server can be changed by using the `server.https.security.truststore` property.

- The truststore for Common Component is in the following location:
  installation-directory-for-Common-Component/`jdk/jre/lib/security/jssecacerts`
- The default truststore for the CIM/WBEM server is in the following location:

  installation-directory-for-the-Device-Manager-server/`HiCommandServer/wsi/server/jserver/bin`
- Unless otherwise noted, the following description uses examples displayed in a Windows environment.

Security Settings for the Device Manager Server (Communication with Web Client or CLI)

This section describes the settings required to use SSL or TLS to encrypt network transmissions between the Device Manager server and management clients (Web Client and CLI). To use SSL or TLS for this encryption, you need to perform the following operations:

- Create a keypair.
- Enable TLS/SSL server security.
- Create a certificate signing request (CSR).
- Import a digitally-signed certificate into the keystore.

Note: You can also use HiKeytool to specify security settings for CIM/WBEM. For details about how to do this, see Specifying Two-way Authentication for Object Operations and Specifying Two-way Authentication for Event Indications.

Creating a Keypair

Throughout this section, use the default values presented unless you are either very familiar with the area of cryptography and Java(TM) security or are otherwise instructed.

Caution:

- If you make a mistake during this process and need to start over, exit by typing Ctrl+C and restart HiKeytool.
- Start HiKeytool as a user with Administrator privileges (in Windows), or as a root user (in Solaris or Linux).

To create a keypair:

1. After opening a command prompt or terminal window, move to the following directory, and start HiKeytool.

   installation-directory-for-the-Device-Manager-server/HiCommandServer

   – In Windows, enter `HiKeytool.bat`**,** and then press **Enter**.

   – In Solaris or Linux, enter `HiKeytool.sh`, and then press **Enter**.

   The HiKeytool main panel appears.

```
1) SSL configuration for Device Manager Server
2) SSL configuration for SMI-S
3) Exit
```

2. Enter 1.

   The server main panel appears.

```
>1

1) Make KeyPair/Self-Signed Certificate
2) Set Device Manager Server Security Level
3) Generate CSR
4) Import Digitally Signed Certificate
5) Display contents of Device Manager Server KeyStore
6) Display verbose contents of Device Manager Server KeyStore
7) Delete an entry from the Device Manager Server KeyStore
8) Change Device Manager Server KeyPair/Self-Signed Certificate Keypass
9) Change Device Manager Server KeyStore Password
10) Import Certificate to Device Manager Server TrustStore
11) Display contents of Device Manager Server TrustStore
12) Display verbose contents of Device Manager Server TrustStore
13) Delete an entry from the Device Manager Server TrustStore
14) Change Device Manager Server TrustStore Password
15) Exit
```

3. Enter 1 (`Make KeyPair/Self-Signed Certificate`).

4. Enter the server name.

   If the management server is running in a cluster environment, specify the logical host name.

   Use the default value unless your computer is visible to the LAN or WAN under a different name, in which case you should use the name by which the Device Manager server is visible. Any SSL-encrypted communications with the server must use this server name, or you will receive an authentication error.

5. Enter the organizational unit [default=`Device Manager Administration`].

   The default value is recommended, but you can use anything meaningful, for example, Marketing.

6. Enter your organization name.

   Ordinarily you would use the default value or your host name, but you can use another name, such as the name of your company.

7. Enter your city or locality.

   There is no default value for this field.

8. Enter your state or province.

   Make sure to spell it out instead of using an abbreviation. There is no default provided.

9. Enter your two-character country code [default=`US`].

10. Enter your key alias.

    This should be the local host name of the Device Manager server. Make sure to use the same value that you previously used for the server name.

11. Enter the private key password (6 characters minimum) [default=passphrase].

    This is the value used to access the keypair entry by the Device Manager server.

12. Enter the key algorithm [default=RSA].

    Only RSA is supported.

13. Enter the key size (default is `2048`).

    Only 2048-bit keys are supported.

14. Enter the signature algorithm (default is `SHA256withRSA`).

    `SHA256withRSA`, `SHA1withRSA` and `MD5withRSA` are supported.

15. Enter the number of days valid [default=`365`].

    This is the period during which the Device Manager server keypair will be valid:

    – If you have your server certificate signed by a well-known and trusted certificate authority, the number of valid days specified by that authority will override the value you place in this field. Make sure to check the Web site of your vendor for specific requirements and calendar the need to renew your certificate, because if the key pair and associated server certificate expire, users will be unable to establish a secure connection with the Device Manager server via TLS/SSL.

    – If you elect not to have your server certificate signed, the value that you place in this field will determine the period during which the keypair and associated server certificate will be valid. The default is 365 days.

16. Enter the keystore password (6 characters minimum) [default=passphrase].

    This is the value used to protect and verify the integrity of the keystore. Once you have completed these steps, Device Manager will generate the Device Manager server keypair and associated certificate. The keypair is placed inside the keystore for the Device Manager server.

Note: If you create a keypair with a size of 2048, you might have to wait up to a minute for the keypair to generate.

17. Restart the Device Manager server for the changes to take effect.

```
>1

Enter Server Name [default=example]:example.com

Enter Organizational Unit [default=Device Manager Administration]:

Enter Organization Name [default=example]:Hitachi

Enter your City or Locality:New York

Enter your State or Province:New York

Enter your two-character country-code [default=US]:

Enter Key Alias [default=example]:example.com

Passwords must only contain characters (A-Z,a-z), digits (0-9) and whitespaces.
Do not enter special characters for your password!
This may render your keystore damaged or unusable!

Enter Key Password (6 characters minimum) [default=passphrase]:
```

```
Enter Key Algorithm [default=RSA]:

Enter Key Size [default=2048]:

Enter Signature Algorithm [default=SHA256withRSA]:

Enter number of days valid [default=365]:

Passwords must only contain characters (A-Z,a-z), digits (0-9) and whitespaces.
Do not enter special characters for your password!
This may render your keystore damaged or unusable!

Enter KeyStore Password (6 characters minimum) [default=passphrase]:

Creating new X500Name for
example.com...

Creating the Device Manager Server KeyPair for example.com at:
        C:\Program Files\HiCommand\DeviceManager\HiCommandServer\keystore
        <this can take up to a minute>
        Updating KeyStore password in server.properties...
        Saving new KeyStore password to disk...
        Updating keypass in server properties...
        Saving new keypass to disk...

All done.
```

Enabling TLS/SSL Server Security

⚠ ***Caution:*** If the Device Manager server manages SMI-S Enabled subsystems, the setting specified below will also be used when Device Manager receives event indications from an SMI-S provider.

To enable TLS/SSL server security:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 2 (`Set Device Manager Server Security Level`).

   The current security level and two available levels of security are displayed:

   – 1:Basic authentication, which requires a valid username and password.

   ⚠ ***Note:*** This is the default. Information will be base64 encoded, but it might be unencoded if the communications were intercepted.

   – 2:Encrypted using TLS/SSL, which is discussed in this section.

3. To enable TLS/SSL (Secure Sockets), enter 2 and then press **Enter**.

   The display will confirm that you have selected TLS/SSL.

4. Restart the Device Manager server for these changes to take effect.

```
>2

Current Device Manager Server Security Level = User Logon (Basic Authentication)
```

```
Options:
1) User Logon (Basic Authentication)
2) TLS/SSL (Secure Sockets)
Enter selection: [default=1]:2

Device Manager Server Security level set to: TLS/SSL Secure Socket
You must restart the Device Manager Server for this change to take effect.
```

Creating a Certificate Signing Request (CSR) (Security Settings for the Device Manager Server)

If you want to use a digitally-signed certificate issued by a certificate authority, all certificates issued by authorities between the certificate authority that issued the digitally-signed certificate and the root certificate authority must be registered to form a certificate chain in the Device Manager server truststore.

See Displaying Contents of the Device Manager Server Truststore (Regular Mode) or Displaying Contents of the Device Manager Server Truststore (Verbose Mode) to make sure that certificates of the certificate authorities are registered in the truststore. If they are not registered, see Importing a Digitally-signed Certificate into the Device Manager Truststore to import the certificates for the certificate authorities to the truststore.

To create a CSR:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 3 (`Generate CSR`).

   HiKeytool displays a message reporting that a CSR has been saved as a file named host-name.csr in the following location:

   installation-directory-for-the-Device-Manager-server/HiCommandServer

```
>3

Generating CSR...
CSR has been written to disk and saved at:
C:\Program Files\HiCommand\DeviceManager\HiCommandServer\example.com.csr
All done!
```

   The following shows an example of a CSR:

```
-----BEGIN NEW CERTIFICATE REQUEST-----
MIIC0zCCAbsCAQAwgY0xCzAJBgNVBAYTAkpQMREwDwYDVQQIEwhLYW5hZ2F3YTERMA8GA1UEBxMI
Ww9rb2hhbWExEjAQBgNVBAoTCVMxMDM4NDc3MzEwMC4GA1UECxMnSGlDb21tYW5kIERldmljZSBN
YW5hZ2VyIEFkbWluaXN0cmF0aW9uMRIwEAYDVQQDEwlTMTAzODQ3NzMwggEiMA0GCSqGSIb3DQEB
                            ...
                            ...
                            ...
wEYfCLrKBtlGrzv9eRpcelQIs5bRbzM9S4KGPwbnYKym31281m6MiN27U7t0XWOoI73xC/jJVlK2
5+s0tVyerxO9zVYvtirWO2Q+H4KUeQ6tJHo79nY5W2OCVsWr/Vuyh+XvbVtVnLI8oVPkMUIFnhOQ
ijq+VPSaSlKjiba6NA/+jgT4Fe0dfq31zJ8ELIN/YtlKCl8txEhO2MXwOQ==
-----END NEW CERTIFICATE REQUEST-----
```

Note: Your CSR will contain extra carriage returns and line feeds which must be included when it is sent to the certificate authority, or it will not be processed correctly.

3. You will then send the CSR to the certificate authority of your choice to be digitally signed.

   The application for digital signing can be done online, and the response is typically returned to you via email from the certificate authority.

Caution: Certificates used for the TLS/SSL settings in Device Manager server are X.509 certificates in DER or PEM format.

4. If you intend to have a self-signed certificate digitally signed by a certificate authority, check their web site for specifics.

   If your certificate authority's requirements are sufficiently different, you may want to re-create the Device Manager server keypair before generating a CSR. To re-create the keypair, first delete the existing keypair (see Deleting an Entry from the Device Manager Server Keystore for instructions), and then create a new keypair as described in Creating a Keypair.

Note: There must be only one entry in the Device Manager server keystore, or you could have problems when you are running the Device Manager server in secure mode.

Importing a Digitally-signed Certificate into the Device Manager Server Keystore

Once you receive your digitally-signed certificate from the certificate authority, you can use HiKeytool to import it. Some certificate authorities will return your digitally-signed certificate as an attached file with a .cer extension. Others will return the response as text in the body of an email, in which case you should use a text editor such as Notepad or WordPad to save the response in a new file.

The following shows an example of a digitally-signed certificate:

```
-----BEGIN CERTIFICATE-----
MIIDMDCCApmgAwIBAgIDOBcYMA0GCSqGSIb3DQEBBAUAMIGHMQswCQYDVQQGEwJa
QTEiMCAGA1UECBMZRk9SIFRFU1RJTkcgUFVSUE9TRVMgT05MWTEdMBsGA1UEChMU
VGhhd3RlIENlcnRpZmljYXRpb24xFzAVBgNVBAsTDlRFU1QgVEVTVCBURVNUMRww
                                    ...
                                    ...
                                    ...
ADANBgkqhkiG9w0BAQQFAAOBgQBtzeFG4IfvpPnA7G/khD4rrT1TvjbK4Y1pcROM
cel43uUfKgNYgY35UukoNtd120XOoudLwKvJu5JK7846zWIbEJmCr5BYlmywZuao
MQdXMyPOUnqucgg44/JG2F27xqP4atWEZsNlj5R7XGGXi4RPAO5Y0YbbbvMJD0QR
yV0Oxw==
-----END CERTIFICATE-----
```

To import a digitally-signed certificate into the Device Manager server keystore:

1. After moving the file that contains the digitally-signed certificate to the following location, name the file in the format *alias*.cer (use the host name for alias).

   installation-directory-for-the-Device-Manager-server/HiCommandServer

Note: Make sure to save the response from your certificate authority.

2. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

3. In the server main panel, enter 4 (Import Digitally Signed Certificate).

   You will be prompted to enter the location of the digitally-signed certificate.

4. If the certificate is in the default location, press **Enter**.

   Otherwise, enter the complete absolute path, and then press **Enter**.

5. You will be notified when the digitally-signed certificate has been imported.

```
>4

Preparing to import digitally signed certificate.
Enter the location of the digitally signed certificate [default=C:\Program
Files\HiCommand\DeviceManager\HiCommandServer\example.com.cer]:
Beginning import...

Digitally signed certificate imported. You must restart the Device Manager
Server for the changes to take effect.
```

6. Restart the Device Manager server for the changes to take effect.

7. Connect to the Device Manager server from the management client, and then import a digitally-signed certificate.

   For details on the tasks you need to perform on the management client, see the Device Manager online Help or the *Hitachi Device Manager Software Command Line Interface (CLI) User's Guide*.

Displaying the Contents of the Device Manager Keystore (Regular Mode)

To display the contents of the Device Manager keystore in regular mode:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 5 (Display contents of Device Manager Server KeyStore).

   Information similar to that below will be displayed. It might include the alias for the keystore entry, the date the entry was created, and the MD5 Fingerprints for the entry, as follows:

```
>5

Listing Contents of Device Manager Server KeyStore

   Alias
   ==========

1) example.com, Tue Apr 01 09:48:02 JST 2008
   MD5  Fingerprints:FC:59:A5:8A:5A:27:5E:70:E4:6B:21:30:39:D1:00:1D
```

Displaying the Contents of the Device Manager Keystore (Verbose Mode)

To display the contents of the Device Manager keystore in verbose mode:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 6 (`Display verbose contents of Device Manager Server KeyStore`).

   HiKeytool displays the verbose contents of the Device Manager Server keystore.

```
>6

Listing Contents of Device Manager Server KeyStore

1)
alias: example.com
Certificate chain length: 1
Issued by: example.com: Hitachi
Server Name: example.com
Organizational Unit: Device Manager Administration
Organization: Hitachi
Locality: New York
State: New York
Country: US
Created: Tue Apr 01 09:48:02 JST 2008
Entry Type: Key Entry
Certificate Version: 1
Serial Number: 47f18642
Valid from: Tue Apr 01 09:48:02 JST 2008
Valid to: Wed Apr 01 09:48:02 JST 2009
Certificate: VALID
MD5  Fingerprints: FC:59:A5:8A:5A:27:5E:70:E4:6B:21:30:39:D1:00:1D
SHA1 Fingerprints: F7:C4:2D:F3:E3:F3:5A:AB:E1:57:D1:E8:9C:80:07:89:2C:2A:48:7A
```

Deleting an Entry from the Device Manager Server Keystore

To delete an entry from the Device Manager server keystore:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 7 (`Delete an entry from the Device Manager Server KeyStore`).

   This displays information about the contents of the Device Manager server keystore, and prompt you to enter the number of the Device Manager server keypair to be deleted.

```
>7

Delete an entry from the Device Manager Server KeyStore.

   Alias
   ==========
1) example.com, Tue Apr 01 09:48:02 JST 2008
   MD5  Fingerprints:FC:59:A5:8A:5A:27:5E:70:E4:6B:21:30:39:D1:00:1D
Enter number of alias to delete (0 to abort) [default=0]:1
```

HiKeytool will request confirmation of the deletion.

3. Enter Y to confirm the deletion.

Changing the Device Manager Server Private Key Password

To change the Device Manager server private key password:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 8 (`Change Device Manager Server KeyPair/Self-Signed Certificate Keypass`).
3. Enter the existing Device Manager server keystore password.
4. Enter the existing private key password, and then press **Enter**.
5. Enter the new private key password, and then press **Enter**. Private key passwords are case sensitive.

WARNING: Enter only characters (`A-Z`, `a-z`), numbers (`0-9`) or white space, or you can render your keystore unusable.

   You will be prompted for confirmation of the new private key password.

6. Enter the new password again, and then press **Enter**.
7. Restart the Device Manager server for the changes to take effect.

Changing the Device Manager Server Keystore Password

To change the Device Manager server keystore password:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 9 (`Change Device Manager Server KeyStore Password`).
3. Enter the current keystore password, then press **Enter**.

   You will be prompted for your new keystore password.

4. Enter the new keystore password, and then press **Enter**.

   You can use the following characters:

   `A-Z a-z 0-9` spaces

   The password is case sensitive. If you enter a character other than the above, you might render your keystore unusable.

5. Confirm the new password.
6. Restart the Device Manager server for the changes to take effect.

Importing a Digitally-signed Certificate into the Device Manager Truststore

To import a digitally-signed certificate, the certificate authority that issued the certificate must already be registered in the truststore. If that certificate authority is not registered, import the certificate for the certificate authority to the truststore by following the procedure below. Note that, if one or more intermediate certificate authorities exist between the certificate authority that issued the certificate and the root certificate authority, all of them must be also registered in the truststore.

To import a digitally-signed certificate into the Device Manager server truststore:

1. Obtain the certificates for all the necessary certificate authorities including intermediate certificate authorities.

   Device Manager supports X.509-formatted certificates. For details on how to obtain certificates, contact each certificate authority.
2. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.
3. In the server main panel, enter 10 (`Import Certificate Device Manager Server TrustStore`).

   You will be prompted to enter the alias of the certificate to be imported.
4. Enter the alias, and then press **Enter**.

   You will be prompted to enter the location of the certificate to be imported.
5. Enter the absolute path of the certificate, and then press **Enter**.

   You will be notified when the certificate has been imported.
6. Repeat steps 3 through 5 if you import more than one certificate.

Displaying Contents of the Device Manager Server Truststore (Regular Mode)

To display contents of the Device Manager server truststore in regular mode:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.
2. In the server main panel, enter 11 (`Display contents of Device Manager Server TrustStore`).

   The display will include the entry alias, the date the certificate was created, and the MD5 Fingerprints for that entry.

```
>11

Listing Contents of Device Manager Server TrustStore

   Alias
   ==========
1) verisignclass3ca, Fri Nov 25 12:04:38 JST 2005
MD5  Fingerprints:10:FC:63:5D:F6:26:3E:0D:F3:25:BE:5F:79:CD:67:67
2) verisignclass3g2ca, Fri Nov 25 12:04:37 JST 2005
MD5  Fingerprints:A2:33:9B:4C:74:78:73:D4:6C:E7:C1:F3:8D:CB:5C:E9
3) verisignclass2g2ca, Fri Nov 25 12:04:35 JST 2005
MD5  Fingerprints:2D:BB:E5:25:D3:D1:65:82:3A:B7:0E:FA:E6:EB:E2:E1
4) verisignclass1g2ca, Fri Nov 25 12:04:34 JST 2005
MD5  Fingerprints:DB:23:3D:F9:69:FA:4B:B9:95:80:44:73:5E:7D:41:83
5) verisignclass3g3ca, Fri Nov 25 12:04:37 JST 2005
MD5  Fingerprints:CD:68:B6:A7:C7:C4:CE:75:E0:1D:4F:57:44:61:92:09
6) verisignclass2g3ca, Fri Nov 25 12:04:36 JST 2005
MD5  Fingerprints:F8:BE:C4:63:22:C9:A8:46:74:8B:B8:1D:1E:4A:2B:F6
7) verisignclass1g3ca, Fri Nov 25 12:04:34 JST 2005
MD5  Fingerprints:B1:47:BC:18:57:D1:18:A0:78:2D:EC:71:E8:2A:95:73
8) verisignclass1ca, Fri Nov 25 12:04:35 JST 2005
MD5  Fingerprints:97:60:E8:57:5F:D3:50:47:E5:43:0C:94:36:8A:B0:62
9) verisignserverca, Fri Nov 25 12:04:38 JST 2005
MD5  Fingerprints:74:7B:82:03:43:F0:00:9E:6B:B3:EC:47:BF:85:A5:93
10) verisignclass2ca, Fri Nov 25 12:04:36 JST 2005
MD5  Fingerprints:B3:9C:25:B1:C3:2E:32:53:80:15:30:9D:4D:02:77:3E
```

Displaying Contents of the Device Manager Server Truststore (Verbose Mode)

To display contents of the Device Manager server truststore in verbose mode:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 12 (`Display verbose contents of Device Manager Server TrustStore`).

   This will display the verbose information for each entry in the Device Manager server truststore.

```
>12

Listing Contents of Device Manager Server TrustStore

1)
alias: verisignclass3ca
Issued by: "VeriSign, Inc."
Organizational Unit: Class 3 Public Primary Certification Authority
Organization: "VeriSign, Inc."
Country: US
Created: Fri Nov 25 12:04:38 JST 2005
Entry Type: Trusted
Certificate Version: 1
Serial Number: 70bae41d10d92934b638ca7b03ccbabf
Valid from: Mon Jan 29 09:00:00 JST 1996
Valid to: Wed Aug 02 08:59:59 JST 2028
Certificate: VALID
MD5  Fingerprints: 10:FC:63:5D:F6:26:3E:0D:F3:25:BE:5F:79:CD:67:67
SHA1 Fingerprints: 74:2C:31:92:E6:07:E4:24:EB:45:49:54:2B:E1:BB:C5:3E:61:74:E2
```

Deleting a Digitally-signed Certificate Entry from the Device Manager Server Truststore

To delete a digitally-signed certificate entry from the Device Manager server truststore:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 13 (`Delete an entry from the Device Manager Server TrustStore`).

   HiKeytool will display a list of all entries in the Device Manager server truststore.

3. Enter the number of the alias to be deleted from the Device Manager server truststore, and then press **Enter**.

```
>13

Delete an entry from the Device Manager Server TrustStore.

Alias
==========
1) verisignclass3ca, Fri Nov 25 12:04:38 JST 2005
   MD5  Fingerprints:10:FC:63:5D:F6:26:3E:0D:F3:25:BE:5F:79:CD:67:67
2) verisignclass3g2ca, Fri Nov 25 12:04:37 JST 2005
   MD5  Fingerprints:A2:33:9B:4C:74:78:73:D4:6C:E7:C1:F3:8D:CB:5C:E9
3) verisignclass2g2ca, Fri Nov 25 12:04:35 JST 2005
   MD5  Fingerprints:2D:BB:E5:25:D3:D1:65:82:3A:B7:0E:FA:E6:EB:E2:E1
4) verisignclass1g2ca, Fri Nov 25 12:04:34 JST 2005
   MD5  Fingerprints:DB:23:3D:F9:69:FA:4B:B9:95:80:44:73:5E:7D:41:83
5) verisignclass3g3ca, Fri Nov 25 12:04:37 JST 2005
   MD5  Fingerprints:CD:68:B6:A7:C7:C4:CE:75:E0:1D:4F:57:44:61:92:09
6) verisignclass2g3ca, Fri Nov 25 12:04:36 JST 2005
   MD5  Fingerprints:F8:BE:C4:63:22:C9:A8:46:74:8B:B8:1D:1E:4A:2B:F6
7) verisignclass1g3ca, Fri Nov 25 12:04:34 JST 2005
   MD5  Fingerprints:B1:47:BC:18:57:D1:18:A0:78:2D:EC:71:E8:2A:95:73
8) verisignclass1ca, Fri Nov 25 12:04:35 JST 2005
   MD5  Fingerprints:97:60:E8:57:5F:D3:50:47:E5:43:0C:94:36:8A:B0:62
9) verisignserverca, Fri Nov 25 12:04:38 JST 2005
   MD5  Fingerprints:74:7B:82:03:43:F0:00:9E:6B:B3:EC:47:BF:85:A5:93
10) verisignclass2ca, Fri Nov 25 12:04:36 JST 2005
   MD5  Fingerprints:B3:9C:25:B1:C3:2E:32:53:80:15:30:9D:4D:02:77:3E
Enter number of alias to delete (0 to abort) [default=0]:1
Delete verisignclass3ca [1] ?  [default=No]:
```

   HiKeytool will request confirmation from the user to delete the designated entry.

4. Enter Y to delete the entry.

   HiKeytool will delete the nominated entry, and redisplay the contents of the Device Manager server truststore.

5. Confirm that the deletion has been completed.

Changing the Device Manager Server Truststore Password

To change the Device Manager server truststore password:

1. Open the server main screen.

   For details, see steps 1 and 2 in Creating a Keypair.

2. In the server main panel, enter 14 (Change Device Manager Server TrustStore Password).
3. Enter the existing truststore password, and then press **Enter**.

   The default password is changeit.
4. Enter the new truststore password, and then press **Enter**.

   You can use the following characters:

   A-Z a-z 0-9 spaces

   The password is case sensitive. If you enter a character other than the above, you might render your keystore unusable.
5. Enter the new password again, and then press **Enter**.
6. Restart the Device Manager server for the changes to take effect.

Security Settings for Common Component (Communication with Web Client)

This section describes the settings required to encrypt network transmissions between Common Component and Web Client by using SSL (version 3) or TLS (version 1.0). To encrypt network transmissions by using SSL or TLS, you need to perform the following operations:

- Generate a private key.
- Create a certificate signing request (CSR).
- Enable SSL.

⚠ ***Note:*** If you use TLS/SSL-encrypted communication, you need to change the URLs used for accessing Hitachi Storage Command Suite products. For details on how to do this, see Changing the URLs for Accessing Hitachi Storage Command Suite Products. You also need to enter https:// for the URLs when accessing Hitachi Storage Command Suite products.

Generating a Private Key

To create a private key, use the hcmdssslc genrsa utility (for Windows) or the sslc genrsa utility (for Solaris or Linux). You can either use the private key as the basis for a certificate signing request (see Creating a Certificate Signing Request (CSR) (Security Settings for Common Component)), or you can use it as a self-signed certificate to test the web server. The installation locations of the hcmdssslc genrsa utility and the sslc genrsa utility are as follows:

For hcmdssslc genrsa:

```
installation-folder-for-Common-Component\Base\bin
```

For sslc genrsa:

installation-directory-for-Common-Component`/httpsd/sslc/bin`

The formats for the `hcmdssslc genrsa` utility and the `sslc genrsa` utility are as follows:

For `hcmdssslc genrsa`: `hcmdssslc genrsa -out` *key-file* `[ 512 | 1024 | 2048 ]`

For `sslc genrsa`: `sslc genrsa -out` *key-file* `[ 512 | 1024 | 2048 ]`

- `-out key-file` specifies the file that will contain the private key.
- `[ 512 | 1024 | 2048 ]` specifies the bit length of the private key.

For example, to use the `sslc genrsa` utility to output a 2048-bit private key to the `httpsdkey.pem` file, you would execute the command as shown below. In this example, you first move to the directory for storing the sslc utility, and then execute the command.

- `# .\sslc genrsa -out demoCA/httpsdkey.pem 2048` (Windows)
- `# ./sslc genrsa -out demoCA/httpsdkey.pem 2048` (Solaris or Linux)

This would generate the following output:

```
Generating 2 prime RSA private key, 2048 bit long modulus
..............................................+++++
.........................+++++
e is 65537 (0x10001)
```

Creating a Certificate Signing Request (CSR) (Security Settings for Common Component)

Use the `hcmdssslc req` utility (for Windows) or the `sslc req` utility (for Solaris or Linux) to create a CSR, which you send to a certificate authority (CA). Then, submit the created CSR file to CA and have a signed certificate issued. A CSR is created in a form complying with PKCS#10. For notes on the settings that you need to specify for a CSR, ask the CA that you will use. Note that certificates issued by a CA have an expiration date. You need to have a certificate reissued before your certificate expires.

The `sslc.cnf` file to be specified in the `hcmdssslc` req and `sslc req` utilities is stored in the following directories.

If Device Manager has been installed in the default directory, the location of the `sslc.cnf` file to be specified by the `hcmdssslc req` utility or the `sslc req` utility is as follows:

For `hcmdssslc req`:

installation-folder-for-Common-Component`\httpsd\sslc\bin\demoCA`

For `sslc req`:

installation-directory-for-Common-Component`/httpsd/sslc/bin/demoCA`

The formats for the `hcmdssslc req` utility and the `sslc req` utility are as follows:

For `hcmdssslc req`:

```
hcmdssslc req -config configuration-file -new -key key-file -out
CSR-file
```

For `sslc req`:

```
sslc req -config configuration-file -new -key key-file -out CSR-
file
```

- `-config configuration-file` specifies the `sslc.cnf` file that contains the information you want the utility to access. When you define information in the `sslc.cnf` file in advance, you do not need to enter information such as `Country Name` and `Locality Name` on the command line. If you want to use information that is different than previously defined, you need to specify it when prompted.
- `-new` (create a new CSR) is a required item.
- `-key key-file` specifies the private key file created in Generating a Private Key.
- `-out CSR-file` specifies the file to which a CSR will be output.

For example, to use the `sslc req` utility to output a CSR when the configuration file is `demoCA/sslc.cnf`, the key file is `demoCA/httpsdkey.pem`, and the name of the CSR file is `demoCA/httpsd.csr`, you would execute the command as shown below. In this example, you first move to the directory for storing the `sslc` utility, and then execute the command.

- `# .\sslc req -config demoCA\sslc.cnf -new -key demoCA\httpsdkey.pem -out demoCA\httpsd.csr` (Windows)
- `# ./sslc req -config demoCA/sslc.cnf -new -key demoCA/httpsdkey.pem -out demoCA/httpsd.csr` (Solaris or Linux)

The utility would prompt you to enter certain information, including the country name and locality. To leave a field blank, enter a period (.). To select the default, press **Enter**.

Note: For **Common Name**, specify the host name used when connecting to the web server (HBase Storage Mgmt Web Service of Common Component) from Web Client. You can also specify the host name in FQDN format. If the management server is running in a cluster environment, specify the logical host name.

The prompts generally appear as follows.

```
Using configuration from demoCA/sslc.cnf
You will be prompted to enter information to incorporate
into the certificate request.
This information is called a Distinguished Name or a DN.
There are many fields however some can remain blank.
Some fields have default values.
Enter '.', to leave the field blank.
-----
Country Name (2 letter code) []:US
State or Province Name (full name) []:New York
Locality Name (eg, city) []:New York
Organization Name (eg, company) []:HITACHI
Organizational Unit Name (eg, section) []:Device Manager Administration
Common Name (eg, YOUR name) []:example.com
Email Address []:

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
```

Creating a Self-Signed Certificate

If you use a self-signed certificate, instead of a certificate signed by a certificate authority, to test encrypted communications or for other purposes, you can create a self-signed certificate by using the `hcmdssslc x509` utility (for Windows) or the `sslc x509` utility (for Solaris or Linux). The formats for the `hcmdssslc x509` utility and the `sslc x509` utility are as follows:

For `hcmdssslc x509`:

> `hcmdssslc x509 -in` *`CSR-file`* `-out` *`certificate-file`* `-req -signkey` *`key-file`* `-days` *`valid-period`*

For `sslc x509`:

> `sslc x509 -in` *`CSR-file`* `-out` *`certificate-file`* `-req -signkey` *`key-file`* `-days` *`valid-period`*

- `-in` *`CSR-file`* specifies the certificate signing request (CSR) file created in Creating a Certificate Signing Request (CSR) (Security Settings for Common Component).
- `-out` *`certificate-file`* specifies the file for containing the created self-signed certificate.
- `-req` (request) is a required item.
- `-signkey` *`key-file`* specifies the private key file created in Generating a Private Key.

- -days *valid-period* specifies the number of days during which the self-signed certificate is valid.

For example, to use the sslc x509 utility to create a self-signed certificate when the CSR file is demoCA/httpsd.csr, the key file is demoCA/httpsdkey.pem, and the name of the file that will contain the self-signed certificate is demoCA/httpsd.pem, you would execute the command as shown below. In this example, you first move to the directory for storing the sslc utility, and then execute the command.

- # .\sslc x509 -in demoCA\httpsd.csr -out demoCA\httpsd.pem -req -signkey demoCA\httpsdkey.pem -days 365 (Windows).
- # ./sslc x509 -in demoCA/httpsd.csr -out demoCA/newcert.pem -req -signkey demoCA/httpsdkey.pem -days 365 (Solaris or Linux).

This would create the following output:

```
Signature OK
subject=/C=US/ST=New York/L=New York/O=HITACHI/OU=Device Manager
Administration/CN=example.com
Obtaining Private key
```

Enabling SSL

To enable SSL:

1. If HiCommand Suite products whose versions are earlier than 5.7 are installed, stop their services. For details, see the manual for your product version.
2. Stop the Hitachi Storage Command Suite product services and Common Component.
   - In Windows:

     Select **Start, All Programs, Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server with Common Services**.
   - In Solaris or Linux:

     installation-directory-for-Common-Component/bin/hcmdssrv -stop
3. Copy the following files to an appropriate directory.
   - Private key file
   - Signed certificate file received from CA, or self-signed certificate file

   We recommend copying these files into the following directory:
   - In Windows:

     installation-folder-for-Common-Component\httpsd\conf\ssl\server
   - In Solaris or Linux:

     installation-directory-for-Common-Component/httpsd/conf/ssl/server

4. Open the `httpsd.conf` file.

   The `httpsd.conf` file is stored in the following location:

   – In Windows:

     `installation-folder-for-Common-Component``\httpsd\conf\httpsd.conf`

   – In Solaris or Linux:

     `installation-directory-for-Common-Component``/httpsd/conf/httpsd.conf`

5. Make the directives for the SSL port and logical host effective by deleting the pound sign (#) at the beginning of the corresponding lines.

   The following shows the format of the `httpsd.conf` file:

```
ServerName logical-host-name
 :
Listen 23015
Listen [::]:23015
SSLDisable

SSLSessionCacheSize 0
Listen 23016
Listen [::]:23016
<VirtualHost *:port-number>
  ServerName logical-host-name
  SSLEnable
  SSLProtocol SSLv3 TLSv1
  SSLRequiredCiphers AES256-SHA:AES128-SHA:DES-CBC3-SHA
  SSLRequireSSL
  SSLCertificateFile signed-certificate-file
  SSLCertificateKeyFile private-key-file-for-the-web-server
  SSLCACertificateFile certificate-file-of-chained-authorized-body
  SSLSessionCacheTimeout 3600
</VirtualHost>
```

   – For the items shown below, specify the host name that you specified for Common Name in Creating a Certificate Signing Request (CSR) (Security Settings for Common Component). Note that host names are case sensitive.

     - ServerName at the beginning of the httpsd.conf file
     - ServerName enclosed by `<VirtualHost>` and `</VirtualHost>`

   – For <VirtualHost>, usually specify an asterisk (*), although you can also specify a host name.

   – Specify the full path name of the certificate file received from the CA or the self-signed certificate file in `SSLCertificateFile`.

  If you use a certificate issued by a chained CA, specify the full path name in `SSLCACertificateFile`. Multiple PEM format certificates can be contained in one file by chaining multiple certificate files by using a text editor. If you do not use a certificate issued by a chained CA, you do not need to specify a value in `SSLCACertificateFile`.

  Do not specify a symbolic link and junction for the path.

- Specify the full path name of the private key file for the web server in SSLCertificateKeyFile.

  Do not specify a symbolic link and junction for the path.

If you are using an IPv6 environment, you must also specify the settings for IPv6. For details on these settings, see Settings Required to Migrate Device Manager to an IPv6 Environment.

Caution: The non-SSL port (default: 23015) is used for communication within Device Manager even if SSL is enabled. Do not delete or comment out the line `Listen 23015` (this line is for when the default port is used) because the line is the setting for the non-SSL port.

6. Start the Hitachi Storage Command Suite product services and Common Component.
   - In Windows:

     Select **Start, All Programs, Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server with Common Services**.
   - In Solaris or Linux:

     Execute this command:

     `installation-directory-for-Common-Component/``bin/hcmdssrv -start`
7. If Hitachi Storage Command Suite products whose versions are earlier than 5.7 have been installed, start their services as required. For details, see the manual for your product version.

Following are examples of enabling SSL. Note, the signed certificate received from the CA is `httpsd.pem`, and the private key is `httpsdkey.pem`. Also, the line beginning with a pound sign (#) is a comment line.

- In Windows:

```
ServerName example.com
:
Listen 23015
Listen [::]:23015
SSLDisable

SSLSessionCacheSize 0
Listen 23016
Listen [::]:23016
<VirtualHost *:23016>
  ServerName example.com
  SSLEnable
  SSLProtocol SSLv3 TLSv1
  SSLRequiredCiphers AES256-SHA:AES128-SHA:DES-CBC3-SHA
  SSLRequireSSL
  SSLCertificateFile "C:/Program Files/HiCommand/Base/httpsd/conf/ssl/server/httpsd.pem"
  SSLCertificateKeyFile "C:/Program
Files/HiCommand/Base/httpsd/conf/ssl/server/httpsdkey.pem"
#  SSLCACertificateFile "C:/Program
Files/HiCommand/Base/httpsd/conf/ssl/cacert/anycert.pem"
  SSLSessionCacheTimeout 3600
</VirtualHost>
```

- In Solaris or Linux:

```
ServerName example.com
:
Listen 23015
Listen [::]:23015
SSLDisable

SSLSessionCacheSize 0
Listen 23016
Listen [::]:23016
<VirtualHost *:23016>
  ServerName example.com
  SSLEnable
  SSLProtocol SSLv3 TLSv1
  SSLRequiredCiphers AES256-SHA:AES128-SHA:DES-CBC3-SHA
  SSLRequireSSL
  SSLCertificateFile /opt/HiCommand/Base/httpsd/conf/ssl/server/httpsd.pem
  SSLCertificateKeyFile /opt/HiCommand/Base/httpsd/conf/ssl/server/httpsdkey.pem
#  SSLCACertificateFile /opt/HiCommand/Base/httpsd/conf/ssl/cacert/anycert.pem
  SSLSessionCacheTimeout 3600
</VirtualHost>
SSLCacheServerPort /opt/HiCommand/Base/httpsd/logs/gcache_port
SSLCacheServerPath /opt/HiCommand/Base/httpsd/sbin/gcache
SSLCacheServerRunDir /opt/HiCommand/Base/httpsd/logs
```

Disabling SSL

To disable SSL:

1. If HiCommand Suite products whose versions are earlier than 5.7 have been installed, stop their services.

   For details about how to stop these services, see the manual for your product version.

2. Stop the Hitachi Storage Command Suite product services and Common Component.

   In Windows:

   Select **Start, All Programs, Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server with Common Services**.

   In Solaris or Linux:

   Execute the following command:

   `installation-directory-for-Common-Component/bin/hcmdssrv -stop`

3. Comment out the settings for the SSL port and logical host in the `httpsd.conf` file.

   The `httpsd.conf` file is stored in the following location:

   In Windows:

   `installation-folder-for-Common-Component\httpsd\conf\httpsd.conf`

   In Solaris or Linux:

installation-directory-for-Common-Component/httpsd/conf/httpsd.conf

The following shows an example of disabling SSL:

Note: A line that begins with a hash mark (#) is a comment line.

– In Windows:

```
ServerName example.com
:
Listen 23015
Listen [::]:23015
SSLDisable

SSLSessionCacheSize 0
#Listen 23016
#Listen [::]:23016
#<VirtualHost *:23016>
#  ServerName example.com
#  SSLEnable
#  SSLProtocol SSLv3 TLSv1
#  SSLRequiredCiphers AES256-SHA:AES128-SHA:DES-CBC3-SHA
#  SSLRequireSSL
#  SSLCertificateFile "C:/Program Files/HiCommand/Base/httpsd/conf/ssl/server/httpsd.pem"
#  SSLCertificateKeyFile "C:/Program
Files/HiCommand/Base/httpsd/conf/ssl/server/httpsdkey.pem"
#  SSLCACertificateFile "C:/Program
Files/HiCommand/Base/httpsd/conf/ssl/cacert/anycert.pem"
#  SSLSessionCacheTimeout 3600
#</VirtualHost>
```

– In Solaris or Linux:

```
ServerName example.com
:
Listen 23015
Listen [::]:23015
SSLDisable

SSLSessionCacheSize 0
#Listen 23016
#Listen [::]:23016
#<VirtualHost *:23016>
#  ServerName example.com
#  SSLEnable
#  SSLProtocol SSLv3 TLSv1
#  SSLRequiredCiphers AES256-SHA:AES128-SHA:DES-CBC3-SHA
#  SSLRequireSSL
#  SSLCertificateFile /opt/HiCommand/Base/httpsd/conf/ssl/server/httpsd.pem
#  SSLCertificateKeyFile /opt/HiCommand/Base/httpsd/conf/ssl/server/httpsdkey.pem
#  SSLCACertificateFile /opt/HiCommand/Base/httpsd/conf/ssl/cacert/anycert.pem
#  SSLSessionCacheTimeout 3600
#</VirtualHost>
#SSLCacheServerPort /opt/HiCommand/Base/httpsd/logs/gcache_port
#SSLCacheServerPath /opt/HiCommand/Base/httpsd/sbin/gcache
#SSLCacheServerRunDir /opt/HiCommand/Base/httpsd/logs
```

4. Start the Hitachi Storage Command Suite product services and Common Component.

   – In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server with Common Services**.

- In Solaris or Linux:

  Execute the following command:

  ```
  installation-directory-for-Common-Component/bin/hcmdssrv -start
  ```

5. If HiCommand Suite products whose versions are earlier than 5.7 have been installed, start their services as required.

   For details about how to start these services, see the manual for your product version.

Changing a Port Assigned to SSL

The default port of SSL for HBase Storage Mgmt Web Service is 23016. To change the port, edit the `httpsd.conf` file. The `httpsd.conf` file is stored in the following location:

- In Windows:

  ```
  installation-folder-for-Common-Component\httpsd\conf\httpsd.conf
  ```

- In Solaris or Linux:

  ```
  installation-directory-for-Common-Component/httpsd/conf/httpsd.conf
  ```

Stop the Device Manager server and Common Component, and then edit the `httpsd.conf` file. After editing these files, start the Device Manager server and Common Component to apply the changes.

Security Settings for the Device Manager Server (Communication with a CIM Client)

CIM/WBEM functions supported in SSL communications include the following:

- Object operations

  In the object operation feature, a CIM client acts as an SSL client and the Device Manager server acts as an SSL server. By default, you can perform SSL communication in object operations. If you want to modify the Device Manager server keystore file used for SSL, see Modifying the Keystore File for Object Operations.

- Event indications

  During the sending/receiving of CIM event indications, the Device Manager server acts as an SSL client and a CIM client (Indication Listener) acts as an SSL server. By default, the Device Manager server can use SSL communication to receive event indications by following the CIM client requests. In this case, settings must be specified beforehand to enable SSL communication between the CIM clients.

You can also strengthen security by applying two-way authentication for object operations and event indications. Two-way authentication enables communications between pre-specified trusted users. In this way, users can accept object operations from specific CIM clients only, and send event indications to specific CIM clients only. For details on the setting procedures, see Specifying Two-way Authentication for Object Operations and Specifying Two-way Authentication for Event Indications.

⚠ ***Caution:*** Use a Java tool to set up SSL. For details on how to use the commands, see section, see **Security Settings for a CIM** Client (Communication with the Device Manager Server).

Modifying the Keystore File for Object Operations

To use a self-signed certificate other than the default, re-create a keystore file. The Device Manager server self-signed certificate used for CIMOM object operations is stored in the keystore file shown below. The signature algorithm of the default self-signed certificate is SHA256withRSA, and the key size is 2,048 bits.

In Windows: `*installation-folder-for-the-Device-Manager-server*\HiCommandServer\wsi\server\jserver\bin\.keystore`

In Solaris or Linux: `*installation-directory-for-the-Device-Manager-server*/HiCommandServer/wsi/server/jserver/bin/.keystore`

To modify the keystore file:

1. Delete the existing keystore file for object operations (`.keystore`).
2. Create a keystore file.

   Create a Device Manager server keystore file by using the `hcmdskeytool` utility in Windows, or the `keytool` utility in Solaris or Linux. These tools are installed in the following locations:

   The `hcmdskeytool` utility:

   installation-folder-for-Common-Component\bin

   The `keytool` utility:

   installation-directory-for-Common-Component/jdk/bin

   To create a keystore file, execute the following commands:

   For the `hcmdskeytool` utility:

   keytool -genkey -keystore *keystore-file-name* -storepass *keystore-password* -alias *alias* -dname *entity-distinguished-name* -validity *validity-of-certificate* -keypass *private-key-password* -keyalg *key-algorithm* -sigalg *signature-algorithm* -keysize *key-size*

For the keytool utility:

```
hcmdskeytool -genkey -keystore keystore-file-name -storepass
keystore-password -alias alias -dname entity-distinguished-name -
validity validity-of-certificate -keypass private-key-password -
keyalg key-algorithm -sigalg signature-algorithm -keysize key-
size
```

- For *keystore-file-name*, specify .keystore to change from the default keystore file.
- Specify the same password for -storepass option and -keypass option.

You can check the contents of the self-signed certificate created in the keystore file by using the following commands:

For the hcmdskeytool utility:

```
hcmdskeytool -list -keystore keystore-file-name -storepass
keystore-password
```

For the keytool utility:

```
keytool -list -keystore keystore-file-name -storepass keystore-
password
```

3. Use WSIEncryptString.jar to encrypt the keystore password that was specified during creation of the keystore file in step 2. WSIEncryptString.jar is stored in the following location:
   - In Windows:

     installation-folder-for-the-Device-Manager-server\HiCommandServer\wsi\server\jserver\lib
   - In Solaris or Linux:

     installation-directory-for-the-Device-Manager-server/HiCommandServer/wsi/server/jserver/lib/

   After executing the command, the encrypted character string of the keystore password is displayed. This character string is used in a later step.
4. Stop the Device Manager server.
   - In Windows:

     Select **Start, All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**.
   - In Solaris or Linux:

     installation-directory-for-the-Device-Manager-server/suitesrvcntl -stop_hdvm
5. Modify the MOF file (CIMXMLSCOMATLSSettingData_instances.mof).

   In the MOF file, specify the keystore password that was encrypted in step 3 of this procedure. The MOF file is stored in the following location:
   - In Windows:

     installation-folder-for-the-Device-Manager-server\HiCommandServer\wsi\server\jserver\mof\wbemserver
   - In Solaris or Linux:

installation-directory-for-the-Device-Manager-server/HiCommandServer/wsi/server/jserver/mof/wbemserver

Example of a MOF file:

```
instance of HITACHI_CIMXMLSCOMATLSSettingData {

    InstanceID          = HITACHI:HITACHI_CIMXMLSCOMATLSSettingData:001";
    ElementName         = "CIM-XML Client Adapter TLS Settings";
    MutualAuthenticationRequired = false;
    KeyStoreFile        = "{0}/jserver/bin/.keystore";
    KeyStorePassword = "xxxxxxx";
    TrustStoreFile      = "{0}/jserver/bin/.truststore";
};
```

The `KeyStorePassword` entry specifies the encrypted keystore password for the default keystore file. In `xxxxxxx`, specify the keystore password that you encrypted in step 3.

6. After opening a command prompt or terminal window, move to the following directory, and start HiKeytool.

   installation-directory-for-the-Device-Manager-server/HiCommandServer

   – In Windows, enter `HiKeytool.bat`, and then press **Enter**.

   – In Solaris or Linux, enter `HiKeytool.sh`, and then press **Enter**.

7. After the HiKeytool main panel is displayed, enter 2.

   The SMI-S main panel appears as in the example below.

```
1) Set Security Level for Object Operations
(Current setting:SSL without two-way authentication)
2) Set Security Level for Event Indications
(Current setting:SSL without two-way authentication)
3) Import Client's Certificate to TrustStore for Object Operations
4) Import Client's Certificate to TrustStore for Event Indications
5) Export Server's Certificate from KeyStore for Object Operations
6) Export Server's Certificate from KeyStore for Event Indications
7) Exit

>
```

8. In the SMI-S main panel, enter 5.

   This option starts processing to export the Device Manager server certificate from the keystore file for object operations.

9. Enter the keystore password, the alias, and the name of the Device Manager server certificate file.

   Use an absolute path to specify the certificate file name.

   An example of entering this information is shown below.

```
Enter keystore-password:serverssl
Enter alias:foocorpserver
Enter authentication-filename(absolute path):c:\tmp\server.cer
```

After the processing finishes, you are returned to the SMI-S main panel.

10. Compile the MOF file.

    Use the `mofcomp` command to compile the MOF file. The command is stored in the following location:

    – In Windows:

      ```
      installation-folder-for-the-Device-Manager-
      server\HiCommandServer\wsi\bin\mofcomp.bat
      ```

    – In Solaris or Linux:

      ```
      installation-directory-for-the-Device-Manager-
      server/HiCommandServer/wsi/bin/mofcomp
      ```

    Example of executing the command:

    ```
    > mofcomp -m -
    o ..\server\jserver\logr ..\server\jserver\mof\wbemserver\CIMXMLSCO
    MATLSSettingData_instances.mof
    ```

11. Start the Device Manager server.

    – In Windows:

      Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.

    – In Solaris or Linux:

      Execute the following command:

      ```
      installation-directory-for-the-Device-Manager-
      server/suitesrvcntl -start_hdvm
      ```

After you have completed the settings on the Device Manager server, import the Device Manager server certificate specified in step 9 into the truststore file on the CIM client. For details on how to create a truststore file and import the certificate, see Creating a Truststore File and Importing Certificate.

Specifying Two-way Authentication for Object Operations

This section describes how to specify the settings for using two-way authentication for object operations.

Before specifying the settings on the Device Manager server, you must perform the following operations in the CIM client:

- Create a keystore file

  For details on how to create a keystore file, see Creating a Keystore File.

- Export the CIM client server certificate

  For details on how to export the CIM client server certificate, see Exporting a Certificate from a Keystore File.

After finishing the preparations in the CIM client, perform the following operations on the Device Manager server by using HiKeytool.

- Set up two-way authentication
- Import the CIM client server certificate

- Export the server certificate for the Device Manager server

To specify the settings for using two-way authentication for object operations on the Device Manager server:

1. After opening a command prompt or terminal window, move to the following directory, and start HiKeytool.

   installation-directory-for-the-Device-Manager-server/HiCommandServer

   – In Windows, enter `HiKeytool.bat`, and then press **Enter**.

   – In Solaris or Linux, enter `HiKeytool.sh`, and then press **Enter**.

2. The HiKeytool main panel appears. Enter `2`.

   The SMI-S main panel appears as in the example shown below.

```
1) Set Security Level for Object Operations
(Current setting:SSL without two-way authentication)
2) Set Security Level for Event Indications
(Current setting:SSL without two-way authentication)
3) Import Client's Certificate to TrustStore for Object Operations
4) Import Client's Certificate to TrustStore for Event Indications
5) Export Server's Certificate from KeyStore for Object Operations
6) Export Server's Certificate from KeyStore for Event Indications
7) Exit

>
```

3. If `(Current setting:SSL without two-way authentication)` appears at item 1 in the SMI-S main panel, enter `1`.

   If `(Current setting:SSL with two-way authentication)` appears in the SMI-S main panel, skip to step 6.

   When you enter `1` in the SMI-S main panel, a submenu appears as in the example shown below.

```
You must stop the Device Manager Server before specifying this setting.
1) SSL without two-way authentication
2) SSL with two-way authentication

>
```

4. Stop the Device Manager server as indicated in the displayed message.

   – In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**.

   – In Solaris or Linux, execute the following command:

   installation-directory-for-the-Device-Manager-server/suitesrvcntl -stop_hdvm

5. Enter `2` in the submenu.

   The `mofcomp` command is executed and the MOF file is compiled. You are returned to the SMI-S main panel when the `mofcomp` command has completed execution.

Caution:

- If you enter the same number as the current setting, you are immediately returned to the SMI-S main panel.
- If `mofcomp` command execution fails, the following message appears: `The compilation of the MOF file failed`. In this case, collect all files in the following directory, and then contact maintenance personnel.
  - In Windows: *`installation-folder-for-the-Device-Manager-server`*`\HiCommandServer\wsi\server\jserver\mof\wbemserver`
  - In Solaris or Linux: *`installation-directory-for-the-Device-Manager-server`*`/HiCommandServer/wsi/server/jserver/mof/wbemserver`

6. In the SMI-S main panel, enter `3`.

   This option starts processing to import the CIM client certificate to the truststore file for object operations.

Caution: Before starting the import processing, delete the truststore file for object operations (`.truststore`). The truststore file for object operations (the truststore password is `trustssl`) is stored in the following location:

In Windows:

`installation-folder-for-the-Device-Manager-server``\HiCommandServer\wsi\server\jserver\bin\.truststore`

In Solaris or Linux:

`installation-directory-for-the-Device-Manager-server``/HiCommandServer/wsi/server/jserver/bin/.truststore`

7. Enter the alias, the truststore password, and the name of the CIM client certificate file.

   Use an absolute path to specify the certificate file name.

   An example of entering this information is shown below.

```
Enter alias:foocorpclient
Enter truststore-password:trustssl
Enter authentication-filename(absolute path):c:\tmp\client.cer
```

   At completion of processing, you are returned to the SMI-S main panel.

8. In the SMI-S main panel, enter `5`.

   This option starts processing to export the Device Manager server certificate from the keystore file for object operations.

9. Enter the keystore password, the alias, and the name of the Device Manager server certificate file.

   Use an absolute path to specify the certificate file name.

   An example of entering this information is shown below.

```
Enter keystore-password:serverssl
Enter alias:foocorpserver
Enter authentication-filename(absolute path):c:\tmp\server.cer
```

At completion of processing, you are returned to the SMI-S main panel.

10. Start the Device Manager server if stopped.
    - In Windows:

      Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.
    - In Solaris or Linux, execute the following command:

      ```
      installation-directory-for-the-Device-Manager-server/suitesrvcntl -start_hdvm
      ```

After you have completed the settings on the Device Manager server, import the Device Manager server certificate specified in step 9 into the truststore file on the CIM client. For details on how to create a truststore file and import the certificate, see Creating a Truststore File and Importing Certificate.

Specifying Two-way Authentication for Event Indications

This section describes how to specify the settings for using two-way authentication for event indications.

Before specifying the settings on the Device Manager server, you must perform the following operations in the CIM client:

- Create a keystore file

  For details on how to create a keystore file, see Creating a Keystore File.
- Export the CIM client certificate

  For details on how to export the CIM client certificate, see Exporting a Certificate from a Keystore File.

After finishing the preparations in the CIM client, perform the following operations on the Device Manager server.

- Create a Device Manager server keystore file
- Set up two-way authentication (by using HiKeytool)
- Import the CIM client certificate (by using HiKeytool)
- Export the server certificate for the Device Manager server (by using HiKeytool)

To specify the settings for using two-way authentication for event indications:

1. If necessary, create a keystore file used for event indication.

   The self-signed certificate used for event indications is stored in the keystore file shown below. The signature algorithm of the default self-signed certificate is SHA256withRSA, and the key size is 2,048 bits.

- In Windows: *installation-folder-for-the-Device-Manager-server*`\HiCommandServer\wsi\server\jserver\bin\.ind.keystore`
- In Solaris or Linux: *installation-directory-for-the-Device-Manager-server*`/HiCommandServer/wsi/server/jserver/bin/.ind.keystore`

If you use the default self-signed certificate, go to step 6.

If you use a self-signed certificate other than the default, delete the existing keystore file (`.ind.keystore`), and then re-create a keystore file.

To create a keystore file, use the `hcmdskeytool` utility in Windows, or the `keytool` utility in Solaris or Linux, which are located in the following locations:

The `hcmdskeytool` utility:

installation-folder-for-Common-Component`\bin`

The `keytool` utility:

installation-directory-for-Common-Component/`jdk/bin`

To create a keystore file, execute the following commands:

For the `hcmdskeytool` utility:

```
keytool -genkey -keystore keystore-file-name -storepass keystore-password -alias alias -dname entity-distinguished-name -validity validity-of-certificate -keypass private-key-password -keyalg key-algorithm -sigalg signature-algorithm -keysize key-size
```

The `keytool` utility:

```
hcmdskeytool -genkey -keystore keystore-file-name -storepass keystore-password -alias alias -dname entity-distinguished-name -validity validity-of-certificate -keypass private-key-password -keyalg key-algorithm -sigalg signature-algorithm -keysize key-size
```

- For *keystore-file-name*, specify `.ind.keystore` to change from the default keystore file.
- Specify the same password for `-storepass` option and `-keypass` option.

  You can check the contents of the self-signed certificate created in the keystore file by using the following commands:

For the `hcmdskeytool` utility:

```
hcmdskeytool -list -keystore keystore-file-name -storepass keystore-password
```

For the `keytool` utility:

```
keytool -list -keystore keystore-file-name -storepass keystore-password
```

2. Use `WSIEncryptString.jar` to encrypt the keystore password that was specified during creation of the keystore file in step 1. `WSIEncryptString.jar` is stored in the following location:
   - In Windows:

     installation-folder-for-the-Device-Manager-server`\HiCommandServer\wsi\server\jserver\lib`

   - In Solaris or Linux:

     installation-directory-for-the-Device-Manager-server/HiCommandServer/wsi/server/jserver/lib/

   Example command execution: `> java -jar WSIEncryptString.jar` *`keystore-password`*

   After executing the command, the encrypted character string of the keystore password displays. This character string is used in a later step.

3. Stop the Device Manager server.

   - In Windows:

     Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**.

   - In Solaris or Linux, execute the following command:

     installation-directory-for-the-Device-Manager-server/suitesrvcntl -stop_hdvm

4. Modify the MOF file (CIMXMLSIndicationHandlerTLSSettingData_instances.mof).

   In the MOF file, specify the encrypted keystore password that was obtained in step 2 of this procedure. In addition, change the value of MutualAuthenticationRequired from false to true. The MOF file is stored in the following location:

   - In Windows: *installation-folder-for-the-Device-Manager-server*\HiCommandServer\wsi\server\jserver\mof\wbemserver

   - In Solaris or Linux: *installation-directory-for-the-Device-Manager-server*/HiCommandServer/wsi/server/jserver/mof/wbemserver

   Example of a MOF file:

```
instance of HITACHI_CIMXMLSIndicationHandlerTLSSettingData {

    InstanceID          = "HITACHI:HITACHI_CIMXMLSIndicationHandlerTLSSettingData:001";
    ElementName         = "CIM_XML-TLS Indication Handler Settings";
    MutualAuthenticationRequired = true;
    KeyStoreFile        = "{0}/jserver/bin/.ind.keystore";
    KeyStorePassword = "xxxxxxx";
    TrustStoreFile      = "{0}/jserver/bin/.ind.truststore";
};
```

   The `KeyStorePassword` entry specifies the encrypted keystore password for the default keystore file. In `xxxxxxx`, specify the keystore password that you encrypted in step 2.

5. Compile the MOF file.

   Use the mofcomp command to compile the file. The mofcomp command is stored in the following location:

   - In Windows:

     installation-folder-for-the-Device-Manager-server\HiCommandServer\wsi\bin\mofcomp.bat

   - In Solaris or Linux:

```
installation-directory-for-the-Device-Manager-server/HiCommandServer/wsi/bin/mofcomp
```

Example of executing the command:

```
> mofcomp -m -
o ..\server\jserver\logr ..\server\jserver\mof\wbemserver\CIMXMLSIn
dicationHandlerTLSSettingData_instances.mof
```

6. After opening a command prompt or terminal window, move to the following directory, and start HiKeytool.

   installation-directory-for-the-Device-Manager-server/HiCommandServer

   – In Windows, enter `HiKeytool.bat`, and then press **Enter**.

   – In Solaris or Linux, enter `HiKeytool.sh`, and then press **Enter**.

7. The HiKeytool main panel appears. Enter `2`.

   The SMI-S main panel appears.

```
1) Set Security Level for Object Operations
(Current setting:SSL without two-way authentication)
2) Set Security Level for Event Indications
(Current setting:SSL without two-way authentication)
3) Import Client's Certificate to TrustStore for Object Operations
4) Import Client's Certificate to TrustStore for Event Indications
5) Export Server's Certificate from KeyStore for Object Operations
6) Export Server's Certificate from KeyStore for Event Indications
7) Exit

>
```

8. If `(Current setting:SSL without two-way authentication)` appears at item `2` in the SMI-S main panel, enter `2`.

   If `(Current setting:SSL with two-way authentication)` appears in the SMI-S main panel, skip to step 11.

   When you enter `2` in the SMI-S main panel, a submenu appears as in the example shown below.

```
You must stop the Device Manager Server before specifying this setting.
1) SSL without two-way authentication
2) SSL with two-way authentication

>
```

9. Stop the Device Manager server, if running, as indicated in the displayed message.

   – In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**.

   – In Solaris or Linux, execute the following command:

   ```
   installation-directory-for-the-Device-Manager-server/suitesrvcntl -stop_hdvm
   ```

10. Enter `2` in the submenu.

The mofcomp command is executed and the MOF file is compiled. You are returned to the SMI-S main panel when the mofcomp command has completed execution.

Caution:

- If you enter the same number as the current setting, you are immediately returned to the SMI-S main panel.
- If mofcomp command execution fails, the following message appears: The compilation of the MOF file failed. In this case, collect all files in the following directory, and then contact maintenance personnel.
  - In Windows: *installation-folder-for-the-Device-Manager-server*\HiCommandServer\wsi\server\jserver\mof
  - In Solaris or Linux: *installation-directory-for-the-Device-Manager-server*/HiCommandServer/wsi/server/jserver/mof

11. In the SMI-S main panel, enter 4.

    This option starts processing to import the CIM client certificate to the truststore file for event indications.

Caution: Before importing the file, make sure that the truststore file for event indications (.ind.truststore) has been deleted from the server. The truststore file for event indications (the truststore password is indtrust) is stored in the following location:

In Windows:

installation-folder-for-the-Device-Manager-server\HiCommandServer\wsi\server\jserver\bin\.ind.truststore

In Solaris or Linux:

installation-directory-for-the-Device-Manager-server/HiCommandServer/wsi/server/jserver/bin/.ind.truststore

12. Enter the alias, the truststore password, and the name of the CIM client certificate file.

    Use an absolute path to specify the certificate file name.

    An example of entering this information is shown below.

```
Enter alias:foocorpindclient
Enter truststore-password:indtrust
Enter authentication-filename(absolute path):c:\tmp\clientind.cer
```

    At completion of processing, you are returned to the SMI-S main panel.

13. In the SMI-S main panel, enter 6.

    This option starts processing to export the Device Manager server certificate from the keystore file for event indications.

14. Enter the keystore password, the alias, and the name of the Device Manager server certificate file.

Use an absolute path to specify the certificate file name.

An example of entering this information is shown below.

```
Enter keystore-password:serverindtrust
Enter alias:foocorpindserver
Enter authentication-filename(absolute path):c:\tmp\serverind.cer
```

At completion of processing, you are returned to the SMI-S main panel.

15. Start the Device Manager server if stopped.

    – In Windows:

      Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.

    – In Solaris or Linux, execute the following command:

      installation-directory-for-the-Device-Manager-server/suitesrvcntl -start_hdvm

After you have completed the settings on the Device Manager server, import the Device Manager server certificate specified in step 14 into the truststore file on the CIM client. For details on how to a truststore file and import the certificate, see Creating a Truststore File and Importing Certificate.

Disabling Two-way Authentication

The procedure for disabling two-way authentication for object operations or event indications is described below. Use HiKeytool for this task.

1. After opening a command prompt or terminal window, move to the following directory, and start HiKeytool.

   installation-directory-for-the-Device-Manager-server/HiCommandServer

   – In Windows, enter `HiKeytool.bat`, and then press **Enter**.

   – In Solaris or Linux, enter `HiKeytool.sh`, and then press **Enter**.

2. The HiKeytool main panel appears. Enter 2.

   The SMI-S main panel appears as in the example shown below.

```
1) Set Security Level for Object Operations
(Current setting:SSL with two-way authentication)
2) Set Security Level for Event Indications
(Current setting:SSL with two-way authentication)
3) Import Client's Certificate to TrustStore for Object Operations
4) Import Client's Certificate to TrustStore for Event Indications
5) Export Server's Certificate from KeyStore for Object Operations
6) Export Server's Certificate from KeyStore for Event Indications
7) Exit

>
```

3. To disable two-way authentication for object operations, enter `1` in the SMI-S main panel. To disable two-way authentication for event indications, enter `2` in the SMI-S main panel.

A panel appears as in the example below.

```
You must stop the Device Manager Server before specifying this setting.
1) SSL without two-way authentication
2) SSL with two-way authentication

>
```

4. Stop the Device Manager server as indicated in the displayed message.
   - In Windows:

     Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**.
   - In Solaris or Linux, execute the following command:

     installation-directory-for-the-Device-Manager-server/`suitesrvcntl -stop_hdvm`
5. Enter `1`.

   The `mofcomp` command is executed and the MOF file is compiled. You are returned to the SMI-S main panel when the `mofcomp` command has completed execution.

Caution:

- If you enter the same number as the current setting, you are immediately returned to the SMI-S main panel.
- If `mofcomp` command execution fails, the following message appears: `The compilation of the MOF file failed.` In this case, collect all files in the following directory and contact maintenance personnel.
  - In Windows: *installation-folder-for-the-Device-Manager-server*`\HiCommandServer\wsi\server\jserver\mof`
  - In Solaris or Linux: *installation-directory-for-the-Device-Manager-server*`/HiCommandServer/wsi/server/jserver/mof`

6. Start the Device Manager server.
   - In Windows:

     Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.
   - In Solaris or Linux, execute the following command:

installation-directory-for-the-Device-Manager-server/`suitesrvcntl -start_hdvm`

Security Settings for a CIM Client (Communication with the Device Manager Server)

To use SSL to protect communication between the Device Manager server and the CIM client when using CIM/WBEM functions, you need to perform the following operations:

- Create a keystore file.

- Export a certificate from a keystore file.
- Create a truststore file and importing a certificate.

You use the `keytool` utility for these operations. To use the `keytool` utility in a CIM client, install Java (JDK1.5) on the CIM client machine.

Note the following when using the keytool utility to specify the file name, the alias, and the password for the keystore file or the truststore file:

- Do not use the following symbols in the file name:
  `: , ; * ? " < > |`
- Specify the file name as a character string of no more than 255 bytes.
- Do not include double quotation marks (") in the alias or password.

Note: This section assumes that a path to the `keytool` utility has been added to the environment variable `PATH`.

Creating a Keystore File

To create a keystore file:

1. Execute the following command:

   ```
   keytool -genkey -keystore keystore-file-name -storepass keystore-
   password -alias alias -dname entity-distinguished-name -validity
   validity-of-certificate -keypass private-key-password -keyalg key-
   algorithm -sigalg signature-algorithm -keysize key-size
   ```

Caution: Specify the same password for the `-storepass` option and the `-keypass` option.

2. Check the created keystore file.

   Execute the following command:

   ```
   keytool -list -keystore keystore-file-name -storepass keystore-
   password
   ```

Exporting a Certificate from a Keystore File

To export a certificate:

1. Export the certificate.

   Execute the following command:

   ```
   keytool -export -keystore keystore-file-name -storepass keystore-
   password -alias alias -file certificate-file-name
   ```

2. Check the exported certificate.

   Execute the following command:

   ```
   keytool -printcert -v -file certificate-file-name
   ```

Creating a Truststore File and Importing Certificate

To create a truststore file and import the certificate:

1. Create the truststore file and import the certificate.

   Execute the following command:

   keytool -import -alias *alias* -keystore *truststore-file-name* -storepass *truststore-password* -trustcacerts -file *certificate-file-name*

2. Check the created truststore file.

   Execute the following command:

   keytool -list -keystore *truststore-file-name* -storepass *truststore-password*

Security Settings for the Common Component (Communication with an LDAP Directory Server)

In Hitachi Storage Command Suite products, when performing user authentication or authorization by linking with an LDAP directory server, you can encrypt network transmissions between Common Component and the LDAP directory server by using StartTLS. To use StartTLS to protect communications between the management server and LDAP directory server, you need to perform the following operations:

- Obtain a certificate for the LDAP directory server
- Import the certificate into the truststore file

To encrypt network transmissions between Common Component and an LDAP directory server, you also need to set up the `exauth.properties` file. For details on how to do this, see REF _Ref256668853 \h * MERGEFORMAT Settings Required to Authenticate Users by Using an External Authentication Server.

⚠ ***Caution:*** The CN of the certificate for the LDAP directory server must be the same as the value specified for the following attribute in the `exauth.properties` file.

If the authentication method is LDAP:

`auth.ldap.`*`value-specified-for-auth.server.name`*`.host`

If the authentication method is RADIUS and an external authorization server is also linked to:

If the external authentication server and the external authorization server are running on the same computer:

`auth.radius.`*`value-specified-for-auth.server.name`*`.host`

If the external authentication server and the external authorization server are running on different computers:

`auth.group.`*`domain-name`*`.host`

If the authentication method is Kerberos and an external authorization server is also linked to:

`auth.kerberos.`*`value-specified-for-auth.kerberos.realm_name`*`.kdc`

Obtaining a Certificate for the LDAP Directory Server

Obtain a server certificate for the LDAP directory server that communicates with the management server. For details, see the documentation for the LDAP directory server you use.

If you have obtained a certificate for the LDAP directory server from a well-known CA, the CA certificate might already be set up in the standard truststore referenced by Common Component. Execute the command below to check this. If the certificate for the LDAP directory server is authenticated by the already-registered CA certificate, you do not need to set up the truststore `jssecacerts` explained in Importing the Certificate to the Truststore File.

In Windows:

```
hcmdskeytool -list -v -keystore truststore-file-name -storepass
password-to-access-the-truststore
```

In Solaris or Linux:

```
keytool -list -v -keystore truststore-file-name -storepass password-
to-access-the-truststore
```

- `-keystore` *`truststore-file-name`* specifies the truststore file to be referenced.

  In Windows:

  `installation-folder-for-Common-Component``\jdk\jre\lib\security\cacerts`

  In Solaris or Linux:

  `installation-directory-for-Common-Component``/jdk/jre/lib/security/cacerts`

- `-storepass` *`password-to-access-the-truststore`* specifies the password used to reference the truststore `cacerts`. The default is `changeit`.

The following shows an example of executing the command:

```
# /opt/HiCommand/Base/jdk/bin/keytool -list -v -keystore
/opt/HiCommand/Base/jdk/jre/lib/security/cacerts -storepass changeit
```

Caution: Do not import and use your own certificate into the truststore `cacerts` because that truststore is updated when Common Component is upgraded.

Importing the Certificate to the Truststore File

Import the certificate for the LDAP directory server into the truststore used by Common Component. Store that truststore (`jssecacerts`) in the following locations. If no truststore file exists, create a truststore file.

In Windows:

```
installation-folder-for-Common-
Component\jdk\jre\lib\security\jssecacerts
```

In Solaris or Linux:

```
installation-directory-for-Common-
Component/jdk/jre/lib/security/jssecacerts
```

To create a truststore file, import a certificate, and check the contents, use the `hcmdskeytool` utility (for Windows) or the `Keytool` utility (for Solaris or Linux). These utilities are stored in the following locations:

For hcmdskeytool:

```
installation-folder-for-Common-Component\bin\hcmdskeytool.exe
```

For keytool:

```
installation-directory-for-Common-Component/jdk/bin/keytool
```

To create a truststore file and import a certificate, execute the following command:

In Windows:

```
hcmdskeytool -import -alias unique-name-in-the-truststore -file
certificate-file-name -keystore truststore-file-name -storepass
password-to-access-the-truststore
```

In Solaris or Linux:

```
keytool -import -alias unique-name-in-the-truststore -file
certificate-file-name -keystore truststore-file-name -storepass
password-to-access-the-truststore
```

- `-alias` *`unique-name-in-the-truststore`* specifies the name used to identify the certificate in the truststore
- `-file` *`certificate-file-name`* specifies the certificate file.
- `-keystore` *`truststore-file-name`* specifies jssecacerts, which is the truststore file to be registered and created.
- `-storepass` *`password-to-access-the-truststore`* specifies the password used to access the truststore (`jssecacerts`).

For example, to use the `keytool` utility to import a certificate file when the certificate file is `/tmp/ldapcert.der`, the password to access the truststore is changeit, and the unique name in the truststore is `ldaphost`, you would execute the command as shown below.

```
# /opt/HiCommand/Base/jdk/bin/keytool -import -alias ldaphost -file
/tmp/ldapcert.der -keystore
/opt/HiCommand/Base/jdk/jre/lib/security/jssecacerts -storepass
changeit
```

To view the contents of the truststore, execute the following command:

In Windows:

`hcmdskeytool -list -v -keystore` *`truststore-file-name`* `-storepass` password-to-access-the-truststore

In Solaris or Linux:

```
keytool -list -v -keystore truststore-file-name -storepass
password-to-access-the-truststore
```

- `-keystore` *`truststore-file-name`* specifies jssecacerts, which is the truststore file to be registered and created.
- `-storepass` *`password-to-access-the-truststore`* specifies the password used to update the truststore `jssecacerts`.

```
# /opt/HiCommand/Base/jdk/bin/keytool -list -v -keystore
/opt/HiCommand/Base/jdk/jre/lib/security/jssecacerts -storepass
changeit
```

Note that, to apply the truststore, you need to restart the Hitachi Storage Command Suite product services and Common Component.

In Windows:

Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**.

After the Device Manager server stops, select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.

In Solaris or Linux:

```
installation-directory-for-the-Device-Manager-server/suitesrvcntl -
stop_hdvm
```

```
installation-directory-for-the-Device-Manager-server/suitesrvcntl -
start_hdvm
```

⚠

Caution:

- If there is more than one certificate file, import a certificate file by specifying an alias name that is not used in `jssecacerts`.
- Note the following when you use the `hcmdskeytool` or `keytool` utility to specify a unique name in the truststore, the truststore file name, and the password:
  - Do not use the following symbols in the file name:
    `:  ,  ;  *  ?  "  <  >  |`
  - Specify the file name as a character string of no more than 255 bytes.
  - Do not include double quotation marks (") in the unique name in the truststore or the password.

Security Settings for the Device Manager Server (Communication with SMI-S Provider)

If Device Manager manages SMI-S Enabled subsystems, Device Manager can use TLS/SSL to receive event indications from an SMI-S provider.

⚠

Caution:

- These security settings will also be used for communication between the Device Manager server and Web Client.
- If you want to use TLS/SSL for event indications, you need to specify the settings for an SMI-S provider. For details, see the documentation for your SMI-S provider.

To use TLS/SSL for event indications:

1. Create a keypair used for communication between the Device Manager server and SMI-S provider.

   For details on how to create a keypair, see Creating a Keypair.
2. Enable TLS/SSL server security for the Device Manager server.

   For details on how to do this, see Enabling TLS/SSL Server Security.
3. If there is a possibility that you will change the settings for an SMI-S Enabled subsystem from Tiered Storage Manager, refresh the target SMI-S Enabled subsystem.

Specifying Which Device Manager Clients Can Access the Device Manager Server

To control which Web Clients are able to connect to the Device Manager server:

1. If HiCommand Suite products whose versions are earlier than 5.7 are installed, stop their services. For details, see the manual for your product version.
2. Stop the Hitachi Storage Command Suite product services and Common Component.
   - In Windows, select **Start**, **All Program**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server with Common Services**.
   - In Solaris or Linux, execute the following command:

     installation-directory-for-Common-Component`/bin/hcmdssrv -stop`
3. Open the `httpsd.conf` file, located in the following directory:

   The `httpsd.conf` file is stored in the following location:
   - In Windows: *installation-folder-for-Common-Component*`\httpsd\conf\httpsd.conf`
   - In Solaris or Linux: *installation-directory-for-Common-Component*`/httpsd/conf/httpsd.conf`
4. In the last line of the `httpsd.conf` file, register information about management clients that can be connected to the Device Manager server.

   The following shows how to specify the `httpsd.conf` file:

   ```
   <Location /DeviceManager>
           order allow,deny
           allow from management-client [management-client...]
   </Location>
   ```

   Hosts can be written in the following formats:
   - The domain name (***example:*** `hitachi.datasystem.com`)
   - Part of the domain name (***example:*** `hitachi`)
   - The whole IPv4 and IPv6 address (***example:*** `10.1.2.3 127.0.0.1 2001::123:4567:89ab:cdef`)
   - Part of the IPv4 address (***example:*** `10.1` which, in this case, means `10.1.0.0/16`)
   - IPv4 Network/Netmask format (dot notation) (***example:*** `10.1.0.0/255.255.0.0`)
   - IPv4 and IPv6 Network/*c* (CIDR notation: *c* is a decimal integer that indicates the number of bits for identifying a network) (***example:*** `10.1.0.0/16 2001:0:0:1230::/64`)

If you want to specify multiple management clients in a command line for `allow from`, delimit the hosts with a space.

Multiple lines can be used to specify hosts for `allow from`.

If you attempt to connect from a computer which has Device Manager installed, you must also specify the local loop-back address (`127.0.0.1` or `localhost`).

Be sure to specify `order` in accordance with the specified format. If extra spaces or tabs are inserted, the operation will fail.

The following example shows how to register management clients in the `httpsd.conf` file:

```
<Location /DeviceManager>
order allow,deny
allow from 127.0.0.1 10.0.0.1 2001::123:4567:89ab:cdef
allow from 10.1.0.0/16 2001:0:0:1230::/64
</Location>
```

5. Register information about the management clients in the `server.http.security.clientIP` or `server.http.security.clientIPv6` property.

   For details on how to specify the `server.http.security.clientIP` property, see server.http.security.clientIP. For details on how to specify the `server.http.security.clientIPv6` property, see server.http.security.clientIPv6.

6. Start the Hitachi Storage Command Suite product services and Common Component.
   - In Windows, select **Start-All Programs-Hitachi Storage Command Suite-Device Manager-Start Server with Common Services.**
   - In Solaris or Linux, execute the following command:

     `*installation-directory-for-Common-Component*/bin/hcmdssrv -start`

7. If HiCommand Suite products whose versions are earlier than 5.7 is installed, start their services as required. For details, see the manual for your product version.

Caution: If you log on to a Hitachi Storage Command Suite product from a management client that is not registered in the `httpsd.conf` file, the Device Manager server cannot be started from that Hitachi Storage Command Suite product.

Changing the Password-Encoding Level in CLI of Device Manager or Tiered Storage Manager

In Device Manager CLI or Tiered Storage Manager CLI, you can preset a password in the properties file or password file. By specifying this setting, you can omit specifying the password when executing commands.

We recommend that you specify the character string of the encoded password in the properties file or password file. This section explains how to change the level (complexity) used when encoding the password. For details about how to encode a password, see the *Hitachi Device Manager Software Command Line Interface (CLI) User's Guide* and the *Hitachi Tiered Storage Manager Software CLI Reference Guide*.

There are two levels for encoding passwords, NORMAL and HIGH. In the NORMAL level, a password is encoded with a 128-bit key length. In the HIGH level, it is encoded with a 256-bit key length. If you want to change the encoding level to HIGH, you need to download and install the Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy Files for the JRE version you are using. Download the Jurisdiction Policy files from the Sun Microsystems website (if the management client OS is Windows, Solaris, HP-UX, or Linux) or the IBM website (if the management client OS is AIX®). For details about how to install the files, see the documentation provided with the Jurisdiction Policy files.

Advanced Security Mode

To use Device Manager in a configuration that satisfies the following security requirements, you need to specify the settings for SSL/TLS communications and set user passwords.

Digital signature hash algorithm

SHA-256 or higher

Cryptographic algorithms

RSA (whose key size is 2,048 bits or more)

AES (whose key size is 128 bits or more)

3KeyTDES

This section describes the tasks required to run Device Manager in the *advanced security mode*.

Settings Required to Communicate with Management Clients (Settings for Common Component)

To enable communication between the management server and management clients (Web Client) in the advanced security mode, you need to perform the tasks described below in Common Component.

Creating a Private Key and Certificate Signing Request

Create a private key, certificate signing request (CSR) to be sent to a certificate authority (CA), and self-signed certificate by using the `hcmdsssltool` command. Executing this command creates a CSR and self-signed certificate whose private key size is 2,048 bits and whose signature algorithm is SHA256withRSA.

Then, submit the created CSR file to CA and have a signed certificate issued. A CSR is created in a form complying with PEM. For notes on the settings that you need to specify for a CSR, ask the CA that you will use. Note that certificates issued by a CA have an expiration date. You need to have a certificate reissued before your certificate expires.

Caution:

- If you want to use an external CA, make sure that the CA supports signatures using SHA256withRSA.
- Although you can use the `hcmdsssltool` command to create a self-signed certificate, we recommend that you use the command only to test encrypted communications.

The `hcmdsssltool` command is installed in the following location:

In Windows:

installation-folder-for-Common-Component\bin

In Solaris or Linux:

installation-folder-for-Common-Component/bin

The following shows the format of the `hcmdsssltool` command:

In Windows:

hcmdssltool /key *key-file* /csr *CSR-file* /cert *certificate-file* /certtext *file-for-displaying-the-contents-of-the-certificate* [/validity *number-of-valid-days*] [/dname *DN*]

In Solaris or Linux:

hcmdsssltool -key *key-file* -csr *CSR-file* -cert *certificate-file* -certtext *file-for-displaying-the-contents-of-the-certificate* [-validity *number-of-valid-days*] [-dname *DN*]

- *key-file* specifies the absolute path of a file to which a private key will be output. The size of a private key is 2,048 bits.
- csr *CSR-file* specifies the absolute path of a file to which a certificate signing request (CSR) will be output.
- cert *certificate-file* specifies the absolute path of a file to which a self-signed certificate will be output.
- certtext *file-for-displaying-the-contents-of-the-certificate* specifies the absolute path of a file to which the contents of a self-signed certificate will be output in text format.
- validity *number-of-valid-days* specifies the number of days during which the self-signed certificate is valid.
- dname *DN* specifies the DN to be included in the self-signed certificate and CSR. If you execute the command without this option, you can specify the DN interactively.

  To specify the DN, combine each attribute type with the corresponding attribute value into one attribute by using an equal sign (=), and then specify the attributes by separating each by a comma. For the DN, you cannot specify a double quotation mark (") or backslash (\). In addition, specify each attribute value as defined by RFC2253. For example, if the specified DN includes any of the following characters, escape each of them by using a backslash (\).

  – A space at the beginning of or at the end of the DN

  – A hash mark (#) at the beginning of the DN

  – A plus sign (+), comma (,), semicolon (;), left angle bracket (<), equal sign (=), or right angle bracket (>)

  The following table lists and describes the attribute types and values specified for the DN.

Table 4-1 Attribute Types and Values Specified for the DN

Attribute Type	Full Name of Attribute Type	Attribute Value
CN	Common Name	Specify the host name of the management server (HBase Storage Mgmt Web Service). This attribute is required. Specify the host name used when connecting to the web server (HBase Storage Mgmt Web Service of Common Component) from Web Client. You can also specify the host name in FQDN format. If the management server is running in a cluster environment, specify the logical host name.
OU	Organizational Unit Name	Specify the name of the organizational unit.
O	Organization Name	Specify the organizational name. This attribute is required.
L	Locality Name	Specify the name of the city, town, or other locality.

Attribute Type	Full Name of Attribute Type	Attribute Value
ST	State or Province Name	Specify the name of the state or province.
C	Country Name	Specify the two-letter country code.

Configuring the httpsd.conf File

In addition to the settings described in Enabling SSL , to limit the cipher strength, specify the SSLProtocol and SSLRequiredCiphers directives between the SSLEnable and SSLRequireSSL directives as shown in the following example.

```
:
  SSLEnable
  SSLProtocol SSLv3 TLSv1
  SSLRequiredCiphers AES256-SHA:AES128-SHA:DES-CBC3-SHA
  SSLRequireSSL
:
```

Settings Required to Communicate with Management Clients (Settings for the Device Manager Server)

To enable communication between the management server and management clients (Web Client and CLI) in the advanced security mode, you need to perform the tasks described below in the Device Manager server.

- To use a self-signed certificate in order to use SSL/TLS communication, specify SHA256withRSA for the signature algorithm when you create a keypair by using HiKeytool.

  For details on how to create a keypair, see Creating a Keypair.

- To use a digitally-signed certificate issued by an external certificate authority (CA), make sure that the CA supports SHA256withRSA signatures.

  For details on how to create a certificate signing request, see Creating a Certificate Signing Request (CSR) (Security Settings for the Device Manager Server). For details on how to import a digitally-signed certificate into the Device Manager server keystore, see Importing a Digitally-signed Certificate into the Device Manager Server Keystore.

Settings Required to Communicate with an LDAP Directory Server

To enable StartTLS communication between the management server and an LDAP directory server in the advanced security mode, you need to import a certificate signed with SHA256withRSA to the truststore for Common Component.

For details on how to check and import server certificates, see Security Settings for the Common Component (Communication with an LDAP Directory Server).

Setting User Passwords

In Hitachi Storage Command Suite products, user passwords are hashed and then stored in the database. In version 6.4 or later, a safer and more secure hash method is used.

After performing an update installation of a Hitachi Storage Command Suite product version 6.4 or later or importing a database that was exported in version 6.3 or earlier, if you want to save user passwords in the new hash method, you need to set them again. For details on how to set passwords, see the Device Manager online Help.

Notes on System Configuration

The following provides notes on system configuration when using Device Manager in the advanced security mode.

- The Web browser used by the management client must support certificates signed with SHA256withRSA. If you use Device Manager in the advanced security mode, you cannot use the following browsers from among the browsers supported by Device Manager and Tiered Storage Manager Web Client.

Table 4-2 Browsers That Can Not Be Used When Using Device Manager in the Advanced Security Mode

Management Client OS	Browser
Windows XP (SP2)	Internet Explorer 6.0 Internet Explorer 7.0
Windows Server 2003#	Internet Explorer 6.0 Internet Explorer 7.0
Windows Server 2003 R2#	Internet Explorer 6.0 Internet Explorer 7.0
#: If you apply the hotfix 938397, which is available from Microsoft, to this OS, the OS can be used even if Device Manager is used in the advanced security mode.	

Communication between the Device Manager server and a CIM client does not support the advanced security mode.

5

Settings Required for Linking with Related Products

This chapter describes the Device Manager settings required for linking with related products.

Settings for Linking with Storage Navigator Modular 2

By linking Device Manager with Storage Navigator Modular 2, you can view details about the following storage subsystems and change their configuration.

- Hitachi AMS 2000 or Hitachi SMS

  If you register a Hitachi AMS 2000 or Hitachi SMS, the settings are automatically configured so that the Storage Navigator Modular 2 window can be displayed. Therefore, you do not need to specify the launch environment settings.

  In the navigation area of Web Client, if you choose the Storage Navigator Modular 2 object from the storage subsystems object tree, the Storage Navigator Modular 2 window is displayed in the application area.

- Hitachi AMS/WMS or Thunder 9500V

  On the management server, specify the launch environment settings for Storage Navigator Modular 2.

  After specifying the launch environment settings, you can launch the Storage Navigator Modular 2 window by clicking the **Physical View** button in the subsystem-name subwindow of Web Client.

This section describes prerequisites and environment settings for linking with Storage Navigator Modular 2.

Prerequisites for Linking with Storage Navigator Modular 2

The prerequisites and notes for using Storage Navigator Modular 2 are as follows:

Prerequisites for Using Storage Navigator Modular 2

- Device Manager supports linkage with Storage Navigator Modular 2 only if the management server is in a non-cluster configuration and its OS is Windows or Solaris.
- Use Common Component for the web server that runs Storage Navigator Modular 2.
- Install Storage Navigator Modular 2 on the computer where the Device Manager server is installed.
- If you operate Storage Navigator Modular (for Web) and Storage Navigator Modular 2 on the same computer, do not use the same port number for RMI communication between Storage Navigator Modular (for Web) and Storage Navigator Modular 2. For details on how to change the port number for RMI communication, see the documentation for Storage Navigator Modular 2 or Storage Navigator Modular (for Web).

- The web server for Storage Navigator Modular 2 can be accessed via only one NIC even if multiple NICs are installed on the computer. To link with Storage Navigator Modular 2 in a computer environment where multiple NICs are installed, you need to specify the NIC to be used to access the web server for Storage Navigator Modular 2. The IP address specified for this setting must be the same as that specified during installation of the Device Manager server. For details on how to specify the settings, see the documentation for Storage Navigator Modular 2.
- Make sure that Storage Navigator Modular 2 works properly by itself. You need to set up the Java Plug-in in Storage Navigator Modular 2. For details about how to specify environment settings and how to start Storage Navigator Modular 2, see the documentation for Storage Navigator Modular 2.
- In Storage Navigator Modular 2, you can register only storage subsystems that are supported by Device Manager.
- To manage Hitachi AMS 2000 and Hitachi SMS, register a user who satisfies all of the following conditions:
  - The Modify permission of Storage Navigator Modular 2 has been set.
  - The Modify permission of Device Manager has been set.
  - `All Resources` has been assigned as a resource group.

  To register a user who has both the Modify permission of Storage Navigator Modular 2 and the Modify permission of Device Manager, you need to use Storage Navigator Modular 2. For details on how to do this, see the documentation for Storage Navigator Modular 2.

  For details on how to assign a resource group, see the Device Manager online Help.
- For storage subsystems for which password protection or account authentication is enabled, do not use a user ID that starts with `HDvM`.

  If you launch Storage Navigator Modular 2 while password protection or account authentication is enabled, the system creates a temporary user account for Storage Navigator Modular 2 to access the storage subsystem. This user account is automatically registered into the system with a user ID that starts with `HDvM`, and is automatically deleted after you exit Storage Navigator Modular 2. Therefore, manually registering a user account that starts with `HDvM` or changing the registration details might cause the launch to fail.
- When you enable or disable the advanced security mode in a Hitachi AMS 2000 or Hitachi SMS storage subsystem, user accounts registered in that storage subsystem will be deleted. To re-register them, use Storage Navigator Modular 2.
- To manage Hitachi AMS 2000 and Hitachi SMS, match the communication protocol setting in Storage Navigator Modular 2 to the setting in Device Manager Web Client or CLI.

If you change the communication protocol of a storage subsystem registered in the Device Manager server, make sure that you change the protocol from Device Manager. If you do so from Storage Navigator Modular 2, the Device Manager server and the storage subsystem might not be able to communicate.

Note on Linking with Storage Navigator Modular 2

- Because Storage Navigator Modular 2 does not support Thunder 9200, if you manage Thunder 9200 by using Device Manager, you need to install Storage Navigator Modular (for Web) on the computer where Storage Navigator Modular 2 is installed.
- If you specify settings in which both Storage Navigator Modular 2 and Storage Navigator Modular (for Web) are to be launched, Storage Navigator Modular 2 will take priority and be launched, unless using Thunder 9200.
- Do not access the same storage subsystem from multiple Storage Navigator Modular 2 clients at the same time.

Launch Settings for Storage Navigator Modular 2

Use the simple setup tool `launchapptool` to set the launch environment for Storage Navigator Modular 2.

The following conditions must be met when you set the launch environment:

- The launchapp.properties file must exist in the installation directory and must be write-enabled.

  For details on the `launchapp.properties` file, see Device Manager Launchable Applications Properties.
- Common Component must be running.

  For details on how to check the Common Component operating status, see Checking the Operating Status of the Device Manager Server and Common Component.

To specify the launch environment settings for Storage Navigator Modular 2:

1. Install Storage Navigator Modular 2. For details, see the documentation for Storage Navigator Modular 2.
2. Execute the following command from the command prompt or terminal window:
   - In Windows: `*installation-folder-for-the-Device-Manager-server*\HiCommandServer\tools\launchapptool.bat`
   - In Solaris: `*installation-directory-for-the-Device-Manager-server*/HiCommandServer/tools/launchapptool.sh`

3. The main menu appears. Select **1**.

```
launchapptool
```

```
1) Storage Navigator Modular 2 launch setup
2) Storage Navigator Modular (for Web) launch setup
3) Disk Array Management Program (for Web) launch setup
4) Delete launch settings
5) Exit

>1
Launch Settings for Storage Navigator Modular 2 will now Start.
```

   If the launch environment settings for Storage Navigator Modular 2 have already been specified, a confirmation message asks if you want to change the current settings.

4. Select **y** to change the settings, or **n** to leave the settings unchanged.
5. Specify the protocol to be used in the web server URL.

   Select **1** to use the http protocol, or **2** to use https protocol.

```
Specify the URL protocol.
1) http
2) https
Caution: To use https, settings to enable SSL communication
with the web server must be specified in advance.
Enter Value [default=1]
>1
```

Caution: For option **2,** the web server must be set up for SSL communication.

6. Enter the IP address or host name to be used in the web server's URL.

   Specify an IP address in IPv4 format or a host name that can be accessed from the client on which Web Client is running.

```
Specify the IP address or hostname of the web server.
Enter Value [default=10.208.64.140]
>10.208.64.134
```

Notes:

- To use a local host, specify its IP address rather than the host name.
- If the management server has multiple NICs, for the IP address, specify the IP address on the network that connects to the management client (Web Client). Do not specify the host name.

7. Enter the port number to be used in the web server's URL.

```
Specify the port number of the web server.
Enter Value [default=23015]
>23015
```

8. If you changed the port number for RMI communication in Storage Navigator Modular 2, enter the new port number.

```
Specify the port number for RMI communications.
Enter Value [default=1099]
```

```
>1099
```

Caution: Do not enter anything if you did not change the communication port number.

9. Restart the Device Manager server and Common Component.The changes to the launch environment settings now apply.

```
Launch setup has successfully completed.
You must restart the Device Manager Server and Common Component Services
for this these changes to take effect.
Exit - Default is n?(y, n):
```

10. Refresh the storage subsystems to be operated on by Storage Navigator Modular 2.

Deleting Launch Settings for Storage Navigator Modular 2

Use the simple setup tool `launchapptool` to delete the launch environment settings.

For Storage Navigator Modular 2, you can delete the launch settings if the `launchapp.properties` file resides in the installation directory and is write-enabled. For details on the `launchapp.properties` file, see Device Manager Launchable Applications Properties.

To delete the launch environment settings:

1. Execute the following command from the command prompt or terminal window:

   – In Windows: *installation-folder-for-the-Device-Manager-server*`\HiCommandServer\tools\launchapptool.bat`

   – In Solaris: *installation-directory-for-the-Device-Manager-server*`/HiCommandServer/tools/launchapptool.sh`

2. The main menu appears. Select **4**.

   A list of the launch environment settings appears.

3. Select **1**.

   A deletion confirmation message appears.

```

launchapptool



1) Storage Navigator Modular 2 launch setup
2) Storage Navigator Modular (for Web) launch setup
3) Disk Array Management Program (for Web)
4) Delete launch settings
5) Exit

>4
Specify the launch setting to be deleted.
1) Storage Navigator Modular 2
2) Storage Navigator Modular (for Web)
```

```
3) Disk Array Management Program (for Web)
4) Cancel
Enter Value
>1

Launch settings will now be deleted.
Would you like to delete launch settings?(y, n):y
```

4. Select **y** to delete the launch environment settings; select **n** to cancel deletion.

5. Restart the Device Manager server and Common Component.

   The launch environment settings are now deleted.

```
Launch settings have successfully been deleted.
You must restart the Device Manager Server and Common Component Services
for this these changes to take effect.
Exit - Default is n?(y, n):
```

Settings for Linking with Storage Navigator Modular (for Web)

By linking Device Manager with Storage Navigator Modular (for Web), you can view details about the following storage subsystems and change their configuration in the Physical View dialog box of Web Client:

- Hitachi AMS/WMS
- Thunder 9500V
- Thunder 9200

To link with Storage Navigator Modular (for Web), you need to specify the launch environment settings on the management server. This section describes prerequisites and environment settings for linking with Storage Navigator Modular (for Web).

Prerequisites for Linking with Storage Navigator Modular (for Web)

This section contains notes and a description of the prerequisites for using Storage Navigator Modular (for Web).

Prerequisites for Using Storage Navigator Modular (for Web)

- Device Manager supports linkage with Storage Navigator Modular (for Web) only if the management server OS is Windows or Solaris.
- Storage Navigator Modular (for Web) cannot be used together with DAMP (for Web).
- Use Common Component for the web server that runs Storage Navigator Modular (for Web).
- Install Storage Navigator Modular (for Web) on the computer where the Device Manager server is installed.
- If you operate Storage Navigator Modular (for Web) and Storage Navigator Modular 2 on the same computer, do not specify the same port number for RMI communication between Storage Navigator Modular (for Web) and Storage Navigator Modular 2. For details on how to change the port number for RMI communication, see the documentation for Storage Navigator Modular 2 or Storage Navigator Modular (for Web).
- The web server for Storage Navigator Modular (for Web) can be accessed via only one NIC even if multiple NICs are installed on the computer. To link with Storage Navigator Modular (for Web) in a computer environment where multiple NICs are installed, you need to specify the NIC to be used to access the web server for Storage Navigator Modular (for Web). The IP address specified for this setting must be the same as that specified during installation of the Device Manager server. For details on how to specify the settings, see the documentation for Storage Navigator Modular (for Web).

- To link with Storage Navigator Modular (for Web) in a cluster environment, the name of the host you specify for accessing the web server of Storage Navigator Modular (for Web) must be identical to the logical host name you specified when installing the Device Manager server. For details on how to set the host name, see the documentation for Storage Navigator Modular (for Web).
- For storage subsystems for which password protection or account authentication is enabled, do not use a user ID that starts with `HDvM`.

  If you launch Storage Navigator Modular (for Web) while password protection or account authentication is enabled, the system creates a temporary user account for the Storage Navigator Modular (for Web) to access the storage subsystem. This user account is automatically registered into the system with a user ID that starts with `HDvM`, and is automatically deleted after you exit the Storage Navigator Modular (for Web). Therefore, manually registering a user account that starts with `HDvM` or changing the registration details might cause the launch to fail.

Note on Linking with Storage Navigator Modular (for Web)

- Multiple Storage Navigator Modular (for Web) clients cannot concurrently access the same storage subsystem.
- If the storage subsystem to be monitored is Hitachi AMS/WMS or Thunder 9500V, and you specify settings in which both Storage Navigator Modular (for Web) and Storage Navigator Modular 2 are to be launched, Storage Navigator Modular 2 will take priority and be launched.

Launch Settings for Storage Navigator Modular (for Web)

Use the simple setup tool `launchapptool` to set the launch environment for Storage Navigator Modular (for Web).

The following conditions must be met when you set the launch environment:

- The `launchapp.properties` file and `httpsd.conf` file must exist in the installation directory and must be write-enabled.

  For details on the `launchapp.properties` file, see Device Manager Launchable Applications Properties. The `httpsd.conf` file is stored in the following location:

  In Windows:*`installation-folder-for-Common-Component`*`\httpsd\conf`

  In Solaris:*`installation-directory-for-Common-Component`*`/httpsd/conf`
- Common Component must be running.

  For details on how to check the Common Component operating status, see Checking the Operating Status of the Device Manager Server and Common Component.

To specify the launch environment settings for Storage Navigator Modular (for Web):

1. Install Storage Navigator Modular (for Web). For details, see the *Storage Navigator Modular (for Web) User's Guide*.

2. Execute the following command from the command prompt or terminal window:

   – In Windows: `installation-folder-for-the-Device-Manager-server\HiCommandServer\tools\launchapptool.bat`

   – In Solaris: `installation-directory-for-the-Device-Manager-server/HiCommandServer/tools/launchapptool.sh`

3. The main menu appears. Select **2**.

   ```
   launchapptool

   1) Storage Navigator Modular 2 launch setup
   2) Storage Navigator Modular (for Web) launch setup
   3) Disk Array Management Program (for Web) launch setup
   4) Delete launch settings
   5) Exit

   >2
   Launch Settings for Storage Navigator Modular (for Web) will now Start.
   ```

   If the launch environment settings for Storage Navigator Modular (for Web) have been specified, a confirmation message asks if you want to change the current settings.

4. Select **y** to change the settings, or **n** to leave the settings unchanged.

5. Specify the protocol to be used in the web server URL. Select **1** to use the http protocol, or **2** to use the https protocol.

   ```
   Specify the URL protocol.
   1) http
   2) https
   Caution: To use https, settings to enable SSL communication
   with the web server must be specified in advance.
   Enter Value [default=1]
   >1
   ```

Caution: For option **2,** the web server must be set up for SSL communication.

6. Enter the IP address in IPv4 format or the host name to be used in the web server's URL.

   Specify an IP address or host name that can be accessed from the client computer on which the Web Client program is running.

   ```
   Specify the IP address or hostname of the web server.
   Enter Value [default=10.208.64.134]
   >10.208.64.134
   ```

Notes:

- To use a local host, specify its IP address rather than the host name.
- If the management server has multiple NICs, for the IP address, specify the IP address on the network that connects to the management client (Web Client). Do not specify the host name.

7. Enter the port number to be used in the web server’s URL.

```
Specify the port number of the web server.
Enter Value [default=23015]
>23015
```

8. If you changed the port number for RMI communication in Storage Navigator Modular (for Web), enter the new port number.

```
Specify the port number for RMI communications.
Enter Value [default=1099]
>1099
```

Caution: Do not enter anything if you did not change the communication port number.

9. Enter the installation directory of Storage Navigator Modular (for Web).

```
Specify the installation directory path name of Storage Navigator Modular (for Web).
Caution: Make sure that the specified installation directory
path name ends with a forward slash (/).
Caution: Replace backslashes (\) with forward slashes (/)
in the specified installation directory path name.
Enter Value [default=C:/Program Files/Storage Navigator Modular Web/]
>D:/Storage Navigator Modular Web/
```

Caution:

- Make sure that the path ends with a forward slash (/).
- In Windows, replace back slash (\) with forward slash (/) in the path name.

```
Example: “C:/Program Files/Storage Navigator Modular Web/”
```

10. Restart the Device Manager server and Common Component.

    The changes to the launch environment settings now apply.

```
Launch setup has successfully completed.
You must restart the Device Manager Server and Common Component Services
for this these changes to take effect.
Exit - Default is n?(y, n):
```

11. Check whether Storage Navigator Modular (for Web) runs on Common Component: Specify the following URL in the browser, then verify that the Storage Navigator Modular (for Web) window appears.

```
http://host-name-or-IPv4-address-for-web-server:port-number-for-web-
server/program/DeviceManager/snm/default.htm
```

Caution: You cannot use an IP address in IPv6 format. In IPv6 environments, specify a host name.

12. Refresh the storage subsystems to be operated by Storage Navigator Modular (for Web).

Note: If you use the simple setup tool to set up the launch environment , the URL associated with Storage Navigator Modular (for Web) is set as alias information in Common Component. This alias information remains if you subsequently uninstall Device Manager or Storage Navigator Modular (for Web). To delete the alias information and other launch settings, see Deleting Launch Settings for Storage Navigator Modular (for Web).

Deleting Launch Settings for Storage Navigator Modular (for Web)

Use the simple setup tool `launchapptool` to delete the launch environment settings.

For Storage Navigator Modular (for Web) or DAMP (for Web), you can delete the launch settings if the `launchapp.properties` file and `httpsd.conf` file reside in the installation directory and are write-enabled. For details on the `launchapp.properties` file, see Device Manager Launchable Applications Properties. The `httpsd.conf` file is stored in the following location:

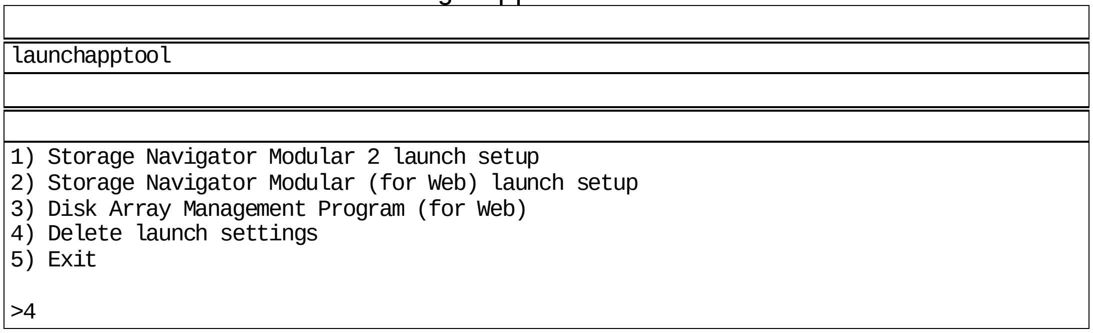
- In Windows:
  `installation-folder-for-Common-Component``\httpsd\conf`
- In Solaris:
  `installation-directory-for-Common-Component``/httpsd/conf`

To delete the launch environment settings:

1. Execute the following command from the command prompt or terminal window:
   - In Windows: *`installation-folder-for-the-Device-Manager-server`*`\HiCommandServer\tools\launchapptool.bat`
   - In Solaris: *`installation-directory-for-the-Device-Manager-server`*`/HiCommandServer/tools/launchapptool.sh`
2. The main menu appears. Select **4**.

   A list of the launch environment settings appears.
3. Select **2**.

   A deletion confirmation message appears.



```
launchapptool

1) Storage Navigator Modular 2 launch setup
2) Storage Navigator Modular (for Web) launch setup
3) Disk Array Management Program (for Web)
4) Delete launch settings
5) Exit

>4
```

```
Specify the launch setting to be deleted.
1) Storage Navigator Modular 2
2) Storage Navigator Modular (for Web)
3) Disk Array Management Program (for Web)
4) Cancel
Enter Value
>2

Launch settings will now be deleted.
Would you like to delete launch settings?(y, n):y
```

4. Select **y** to delete the launch environment settings; select **n** to cancel deletion.

5. Restart the Device Manager server and Common Component.

   The launch environment settings are now deleted.

```
Launch settings have successfully been deleted.
You must restart the Device Manager Server and Common Component Services
for this these changes to take effect.
Exit - Default is n?(y, n):
```

Settings for Linking with DAMP (for Web)

By linking Device Manager with DAMP (for Web), you can view details about the following storage subsystems and change their configuration in the Physical View dialog box of Web Client:

- Thunder 9500V
- Thunder 9200

To link with DAMP (for Web), you need to specify the launch environment settings on the management server. This section describes prerequisites and environment settings for linking with DAMP (for Web). This section also describes storage subsystem information to be registered into DAMP (for Web).

Prerequisites for Linking with DAMP (for Web)

This section contains notes and a description of the prerequisites for using DAMP (for Web).

Prerequisites for Using DAMP (for Web)

- Device Manager supports linkage with DAMP (for Web) only if the management server OS is Windows or Solaris.
- To perform DAMP launching, the DAMP (for Web) version must be 10.00 or later.
- DAMP (for Web) cannot be used together with Storage Navigator Modular (for Web) or Storage Navigator Modular 2, and cannot be used while Hitachi AMS 2000, Hitachi SMS or Hitachi AMS/WMS is in use.
- Use Common Component for the web server that runs DAMP (for Web).
- Install DAMP (for Web) on the computer where the Device Manager server is installed.
- The web server for DAMP (for Web) can be accessed via only one NIC even if multiple NICs are installed on the computer. To link with DAMP (for Web) in a computer environment where multiple NICs are installed, you need to specify the NIC to be used to access the web server for DAMP (for Web). The IP address specified for this setting must be the same as that specified during installation of the Device Manager server. For details on how to specify the settings, see the document for DAMP (for Web) or Disk Array Management Program 3 (for Web).
- To link with DAMP (for Web) in a cluster environment, the name of the host you specify for accessing DAMP's web server must be identical to the logical host name you specified when installing the Device Manager server. For details on setting the host name, see the document for DAMP (for Web) or Disk Array Management Program 3 (for Web).

Note on Linking with DAMP (for Web)

If the storage subsystem to be monitored is the Thunder 9500V, and you specify settings in which both DAMP (for Web) and Storage Navigator Modular 2 are to be launched, Storage Navigator Modular 2 will take priority and be launched.

In addition, If password protection is enabled on Thunder 9200 or Thunder 9500V, DAMP (for Web) operations launched from Physical View might fail, or Web Client operations# or CLI operations# might fail. The following are ways to avoid this problem:

- Change the application you use from DAMP (for Web) to Storage Navigator Modular (for Web).
- Use DAMP (for Web) by directly connecting to it from the browser.

  When you connect to DAMP (for Web), you must use a user ID different from the one you used when you registered Thunder 9200 or Thunder 9500V in Device Manager.

  In this case, you cannot perform DAMP (for Web) operations and operations for Web Client or CLI# at the same time for the same storage subsystem (Thunder 9200 or Thunder 9500V). This however is the normal situation when password protection is enabled.
- Stop the polling of the Device Manager server, and try not to perform DAMP (for Web) operations and operations for Web Client or CLI# at the same time for the same storage subsystem (Thunder 9200 or Thunder 9500V).

  To stop the polling of the Device Manager server:

  1. Specify `0` for the `server.dispatcher.daemon.pollingPeriod` property in the `dispatcher.properties` file.

     For details about this property, see server.dispatcher.daemon.pollingPeriod.
  2. To enable the property settings, restart the Device Manager server.

     This operation disables the alert detection performed by polling. However, for the following storage subsystems, you can detect alerts by using SNMP traps:

     – Universal Storage Platform V/VM

     – Hitachi USP

     – Lightning 9900V

     – Lightning 9900

#:

Includes such operations as changing the configuration of, or refreshing the storage subsystem, by using Web Client or CLI

Launch Settings for DAMP (for Web)

Use the simple setup tool `launchapptool` to set the launch environment for DAMP (for Web).

The following conditions must be met when you set the launch environment:

- The `launchapp.properties` file and `httpsd.conf` file must exist in the installation directory and must be write-enabled.
- Common Component must be running.

Note:

- For details on the `launchapp.properties` file, see Device Manager Launchable Applications Properties.
- The `httpsd.conf` file is stored in the following location:
  - In Windows: *`installation-folder-for-Common-Component`*`\httpsd\conf`
  - In Solaris: *`installation-directory-for-Common-Component`*`/httpsd/conf`
- For details on how to check the Common Component operating status, see Checking the Operating Status of the Device Manager Server and Common Component.

To specify launch environment settings for DAMP (for Web):

1. Install DAMP (for Web). For details, see the *Disk Array Management Program 2 (for Web) User's Guide* or *Disk Array Management Program 3 (for Web) User's Guide*.
2. Execute the following command from the command prompt or terminal window:
   - In Windows: *`installation-folder-for-the-Device-Manager-server`*`\HiCommandServer\tools\launchapptool.bat`
   - In Solaris: *`installation-directory-for-the-Device-Manager-server`*`/HiCommandServer/tools/launchapptool.sh`
3. The main menu appears. Select **3**.

```
launchapptool

1) Storage Navigator Modular 2 launch setup
2) Storage Navigator Modular (for Web) launch setup
3) Disk Array Management Program (for Web) launch setup
4) Delete launch settings
5) Exit

>3
Launch settings will now be deleted.
Would you like to delete launch settings?(y, n):y
```

If launch environment settings already exist for DAMP (for Web), a confirmation message asks if you want to change the current settings.

4. Select **y** to change the settings, or **n** to leave the settings unchanged.
5. Specify the protocol to be used in the web server URL. Select **1** to use the http protocol, or **2** to use the https protocol.

```
Specify the URL protocol.
1) http
2) https
Caution: To use https, settings to enable SSL communication
with the web server must be specified in advance.
Enter Value [default=1]
>1
```

Caution: For option **2,** the web server must be set up for SSL communication.

6. Enter the IP address in IPv4 format or the host name to be used in the web server's URL.

   Specify an IP address or host name that can be accessed from the client computer on which the Web Client program is running.

```
Specify the IP address or hostname of the web server.
Enter Value [default=10.208.64.134]
>10.208.64.134
```

Notes:

- To use a local host, specify its IP address rather than the host name.
- If the management server has multiple NICs, for the IP address, specify the IP address on the network that connects to the management client (Web Client). Do not specify the host name.

7. Enter the port number to be used in the web server's URL.

```
Specify the port number of the web server.
Enter Value [default=23015]
>23015
```

8. Enter the installation directory of DAMP (for Web).

```
Specify the installation directory path name of Disk Array Management Program (for
Web).
Caution: Make sure that the specified installation directory
path name ends with a forward slash (/).
Caution: Replace backslashes (\) with forward slashes (/)
in the specified installation directory path name.
Enter Value [default=C:/Program Files/DA Manager Web/]
>C:/Program Files/DA Manager Web/
```

Caution:

- Make sure that the path ends with a forward slash (/).
- In Windows, replace back slash (\) with forward slash (/) in the path name.

```
Example: “C:/Program Files/DA Manager Web/”
```

9. Restart the Device Manager server and Common Component.

   The changes to the launch environment settings now apply.

```
Launch setup has successfully completed.
You must restart the Device Manager Server and Common Component Services
for this these changes to take effect.
Exit - Default is n?(y, n):
```

10. Check whether DAMP (for Web) runs on Common Component. Specify the following URL in the browser, and then make sure that the DAMP (for Web) window appears.

```
http://host-name-or-IPv4-address-for-web-server:port-number-for-web-
server/program/DeviceManager/damp/default.htm
```

Caution: You cannot use an IP address in IPv6 format. In IPv6 environments, specify a host name.

11. Refresh the storage subsystems to be operated on by DAMP (for Web).

Note: If you use the simple setup tool to set up the launch environment, the URL associated with DAMP (for Web) is set as alias information in Common Component. This alias information remains if you subsequently uninstall Device Manager or DAMP (for Web). To delete the alias information and other launch settings, see Deleting Launch Settings for Storage Navigator Modular (for Web).

Registering Storage Subsystem Information with DAMP (for Web)

- To operate storage subsystems by launching DAMP (for Web) from the Device Manager server, the storage subsystem information must be registered in advance by using DAMP (for Web). For details, see the *Disk Array Management Program 2 (for Web) User’s Guide* or *Disk Array Management Program 3 (for Web) User’s Guide*.

- To register a unit name of the storage subsystem by using DAMP (for Web), use an IP address with an `H` added as a prefix. (Example: If the IP address is `192.168.108.123`, the unit name will be `H192.168.108.123`.)

  The IP address used for the unit name is the IP address specified for **IP address 1** or **IP address 2** when the storage subsystem was registered in Device Manager.

- When DAMP (for Web) is directly used without launching DAMP (for Web) after the launch settings for DAMP (for Web) are configured, specify the following URL in the browser:

```
http://host-name-or-IP-address:portID/program/DeviceManager/damp/default.htm
```

This way, you can also register information about storage subsystems.

Settings for Linking with Tuning Manager

This section describes the settings required for linking with Tuning Manager whose version is 6.0 or later. If you want to link Device Manager with an instance of Tuning Manager installed on a different computer from the computer on which Device Manager is installed, you must specify the following settings in Device Manager. Specifying these settings is not required when Device Manager and Tuning Manager are installed on the same computer.

- Enabling remote connection with Tuning Manager
- Specifying the remote connection port
- Changing the OS firewall settings

Note:

- When Tuning Manager and Device Manager are installed on different computers, the following restrictions apply to communication with Tuning Manager:
  - Communication using IPv6 is not supported.
  - Communication encrypted by SSL or TLS is not supported.
- Some database operation commands might initialize the settings for remote connection with Tuning Manager. If you execute either of the following commands, re-specify the settings:
  - `hcmdsdbclustersetup` (cluster setup)
  - `hcmdsdbremake` (database re-creation)
- If you execute any of the following commands or the following combination of commands to perform database migration, you must re-specify the settings for remote connection with Tuning Manager on the destination computer:
  - `hcmdsdbtrans`
  - `hcmdsdbmove`
  - `hcmdsbackups` and `hcmdsdb -restore`

Settings in a Non-cluster Environment

In a non-cluster environment, to enable or disable remote connection with Tuning Manager, or to change the connection port that will be used:

1. Make sure that the host name and IP address of the local computer are registered in the host settings file.

   The host settings file is typically stored in the following location:

   - In Windows: `*Windows-system-folder*\system32\drivers\etc\hosts`
   - In Solaris or Linux: `/etc/hosts`

2. If Common Component is running, stop it.

For details on how to check the Common Component operating status, see Checking the Operating Status of the Device Manager Server and Common Component.

3. In Linux, if the firewall function is enabled, make sure that the remote connection port is set correctly.

   If Windows Firewall is used, this step is unnecessary.

   For details on the port numbers that must be registered as firewall exceptions, see Settings Required for Operation in a Firewall Environment.

4. Execute the `htmsetup` command.

   For details on how to use the `htmsetup` command, see htmsetup Command.

5. When an interactive menu appears, use it to specify settings.

   When you complete specifying the settings, HiRDB starts.

Settings in a Cluster Environment

In a cluster environment, to enable or disable a remote connection with Tuning Manager or to change the connection port that will be used, follow the procedure shown below:

For Microsoft Cluster Service

To specify settings when using Microsoft Cluster Service as the cluster software:

1. On the executing and standby nodes, if the physical host name and IP address of the local computer are not registered in the host settings file, register them.

   The host settings file is typically stored in the following location:

```
Windows-system-folder\system32\drivers\etc\hosts
```

2. Remove the services and cluster groups of Hitachi Storage Command Suite products from cluster management.

   Steps 3 to 6 describe how to do this.

> ***Note:*** For details about the services and resource groups that need to be removed from cluster management, see the documentation for the corresponding Hitachi Storage Command Suite product.

3. In the cluster application, take the following services offline:
   - HiCommandServer
   - HBase Storage Mgmt Web Service
   - Hbase Storage Mgmt Common Service
   - Hitachi Storage Command Suite product resources other than the above

   Each resource name is the name you registered.

4. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-folder-for-Common-Component\bin\hcmdssrv /stop
```

5. In the cluster application, take the following service offline:

   HiRDB/ClusterService _HD0

6. In the cluster application, disable the failover of resource groups.

   Right-click the following services, select **Properties**, the **Advanced** tab, **Do not restart**, and then click **OK**:

   - Hbase Storage Mgmt Common Service
   - HBase Storage Mgmt Web Service
   - HiCommandServer
   - HiRDB/ClusterService _HD0
   - Services that were taken offline in step 3

   Each resource name is the name you registered.

7. Execute the `htmsetup` command.

   For details on how to use the `htmsetup` command, see htmsetup Command.

8. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-folder-for-Common-Component\bin\hcmdssrv /stop
```

9. Move the group in which the Hitachi Storage Command Suite product services have been registered to the standby node.

10. On the standby node, execute the `htmsetup` command. Specify the same settings as those on the executing node.

11. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-folder-for-Common-Component\bin\hcmdssrv /stop
```

12. Place the services and cluster groups of Hitachi Storage Command Suite products under cluster management.

    Steps 13 to 14 describe how to do this.

13. In the Services window, open the properties for the following services, and then change **Startup Type** from **Automatic** to **Manual**:

    - HBase Storage Mgmt Common Service
    - HBase Storage Mgmt Web Service
    - HiCommandServer

14. In the cluster application, enable the failover of resource groups.

    Right-click the following services, select **Properties**, the **Advanced** tab, **Restar**t, and then click **OK**:

    - Hbase Storage Mgmt Common Service
    - HBase Storage Mgmt Web Service

- HiCommandServer
- HiRDB/ClusterService _HD0
- Hitachi Storage Command Suite product resources other than the above

Each resource name is the name you registered.

15. In the cluster application, bring online the group in which the Hitachi Storage Command Suite product services have been registered.

For Microsoft Failover Cluster

To specify settings when using Microsoft Failover Cluster as the cluster software:

1. On the executing and standby nodes, if the physical host name and IP address of the local computer are not registered in the host settings file, register them.

   The host settings file is typically stored in the following location:

```
Windows-system-folder\system32\drivers\etc\hosts
```

2. Remove the services and resource groups of Hitachi Storage Command Suite products from cluster management.

   Steps 3 to 6 describe how to do this.

Note: For details about the services and resource groups that need to be removed from cluster management, see the documentation for the corresponding Hitachi Storage Command Suite product.

3. In the cluster application, take the following services offline:HiCommandServer

   - HBase Storage Mgmt Web Service
   - Hbase Storage Mgmt Common Service

   Each resource name is the name you registered.

4. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-folder-for-Common-Component\bin\hcmdssrv /stop
```

5. In the cluster application, take the following service offline:

   HiRDB/ClusterService _HD0

6. In the cluster application, disable the failover of resource groups.

   Right-click the following services, select **Properties**, the **Policies** tab, **If resource fails, do not restart**, and then click **OK**:

   - Hbase Storage Mgmt Common Service
   - HBase Storage Mgmt Web Service
   - HiCommandServer
   - HiRDB/ClusterService _HD0

   Each resource name is the name you registered.

7. Execute the htmsetup command.

   For details on how to use the htmsetup command, see htmsetup Command.

8. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-folder-for-Common-Component\bin\hcmdssrv /stop
```

9. Move the group in which the Hitachi Storage Command Suite product services have been registered to the standby node.

10. On the standby node, execute the htmsetup command. Specify the same settings as those on the executing node.

11. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-folder-for-Common-Component\bin\hcmdssrv /stop
```

12. Place the services and resource groups of Hitachi Storage Command Suite products under cluster management.

    Steps 13 to 14 describe how to do this.

13. In the Services window, open the properties for the following services, and then change **Startup Type** from **Automatic** to **Manual**:

    – HBase Storage Mgmt Common Service

    – HBase Storage Mgmt Web Service

    – HiCommandServer

14. In the cluster application, enable the failover of resource groups.

    Right-click the following services, from the **Policies** tab under **Properties**, select **If resource fails. Attempt restart on current node** and **If restart is unsuccessful, fail over all resources in this service or application**, and then click **OK**:

    – Hbase Storage Mgmt Common Service

    – HBase Storage Mgmt Web Service

    – HiCommandServer

    – HiRDB/ClusterService _HD0

    – Hitachi Storage Command Suite product resources other than the above

    Each resource name is the name you registered.

15. In the cluster application, bring online the group in which the Hitachi Storage Command Suite product services have been registered.

For Veritas Cluster Server

To specify settings when using Veritas Cluster Service as the cluster software:

1. On the executing and standby nodes, if the physical host name and IP address of the local computer are not registered in the host settings file, register them.

   The host settings file is typically stored in the following location:

```
/etc/hosts
```

2. Remove the services and resource groups of Hitachi Storage Command Suite products from cluster management.

   Steps 3 to 10 describe how to do this.

> ⚠ ***Note:*** For details about the services and resource groups that need to be removed from cluster management, see the documentation for the corresponding Hitachi Storage Command Suite product.

3. On the executing node, start Cluster Manager in Java Console.
4. Take the following services offline:
   - HiCommandServer
   - HBase Storage Mgmt Web Service
   - Hbase Storage Mgmt Common Service
   - Hitachi Storage Command Suite product resources other than the above

   Each resource name is the name you registered.
5. Select and right-click each service described in step 4, and then clear **Enabled**.
6. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-directory-for-Common-Component/bin/hcmdssrv -stop
```

7. Take the HiRDB service offline:
8. Select and right-click the HiRDB service, and then clear **Enabled** from the displayed context menu.
9. In the Cluster Explorer window, select the **Service Groups** tab.
10. Select and right-click the group in which the Hitachi Storage Command Suite product services have been registered, and then select Freeze and then **Temporary** from the displayed context menu.
11. Execute the `htmsetup` command.

    For details on how to use the `htmsetup` command, see htmsetup Command.
12. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-directory-for-Common-Component/bin/hcmdssrv -stop
```

13. Move the group in which the Hitachi Storage Command Suite product services have been registered to the standby node.

    Steps 14 to 15 describe how to do this.
14. In the Cluster Explorer window, select the **Service Groups** tab.
15. Select and right-click the group in which the Hitachi Storage Command Suite product services have been registered, and then, from the displayed context menu, execute the following three operations in order:
    - Select **Unfreeze**.

- Select **Switch To** and then the host name of the standby node.
- Select **Freeze** and then **Temporary**.

16. On the standby node, execute the `htmsetup` command.

    Specify the same settings as those on the executing node.

17. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-directory-for-Common-Component/bin/hcmdssrv -stop
```

18. Place the services and resource groups of Hitachi Storage Command Suite products under cluster management.

    Steps 19 to 24 describe how to do this.

19. Start Cluster Manager in Java Console.
20. In the Cluster Explorer window, select the **Service Groups** tab. Select and right-click the group in which the Hitachi Storage Command Suite product services have been registered, and then select **Unfreeze** from the displayed context menu.
21. Select and right-click the group in which the Hitachi Storage Command Suite product services have been registered, and then select **Enable Resources** from the displayed context menu.
22. Save the changes in the Veritas Cluster Server configuration file.

    From the **File** menu, select **Save Configuration**.

23. Close the Veritas Cluster Server configuration file.

    From the **File** menu, select **Close Configuration**.

24. On the executing node, bring online the group in which the Hitachi Storage Command Suite product services have been registered.

For Sun Cluster

To specify settings when using Sun Cluster as the cluster software:

1. On the executing and standby nodes, if the physical host name and IP address of the local computer are not registered in the host settings file, register them.

   The host settings file is typically stored in the following location:

```
/etc/hosts
```

2. Remove the services and resource groups of Hitachi Storage Command Suite products from cluster management.

   Steps 3 to 7 describe how to do this.

Note: For details about the services and resource groups that need to be removed from cluster management, see the documentation for the corresponding Hitachi Storage Command Suite product.

3. On the executing node, execute the following commands to disable monitoring of the resources of Common Component (except HiRDB) and Device Manager:

```
# /usr/cluster/bin/scswitch -n -M -j CommonWebService
# /usr/cluster/bin/scswitch -n -M -j HiCommandServer
# /usr/cluster/bin/scswitch -n -M -j SingleSignOnService
```

   Each resource name is the name you registered.

   You also need to disable monitoring of any other Hitachi Storage Command Suite product resources.

4. Execute the following commands to disable the resources of Common Component (except HiRDB) and Device Manager:

```
# /usr/cluster/bin/scswitch -n -j CommonWebService
# /usr/cluster/bin/scswitch -n -j HiCommandServer
# /usr/cluster/bin/scswitch -n -j SingleSignOnService
```

   Each resource name is the name you registered.

   You also need to disable any other Hitachi Storage Command Suite product resources.

5. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-directory-for-Common-Component/bin/hcmdssrv -stop
```

6. Execute the following command to disable monitoring of the HiRDB resource:

```
# /usr/cluster/bin/scswitch -n -M -j HiRDB
```

   The resource name is the name you registered.

7. Execute the following command to disable the HiRDB resource:

```
# /usr/cluster/bin/scswitch -n -j HiRDB
```

   The resource name is the name you registered.

8. Execute the `htmsetup` command. For details on how to use the `htmsetup` command, see htmsetup Command.

9. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-directory-for-Common-Component/bin/hcmdssrv -stop
```

10. Execute the following command to move the group in which the Hitachi Storage Command Suite product services have been registered to the standby node:

```
# /usr/cluster/bin/scswitch -z -g group-name -h host-name
```

11. On the standby node, execute the `htmsetup` command. Specify the same settings as those on the executing node.

12. Execute the following command to stop the Common Component and Hitachi Storage Command Suite product services:

```
installation-directory-for-Common-Component/bin/hcmdssrv -stop
```

13. Place the services and resource groups of Hitachi Storage Command Suite products under cluster management.

    Steps 14 to 17 describe how to this.

14. Execute the following commands to enable the services of Common Component and Device Manager:

```
# /usr/cluster/bin/scswitch -e -j HiRDB
# /usr/cluster/bin/scswitch -e -j SingleSignOnService
# /usr/cluster/bin/scswitch -e -j CommonWebService
# /usr/cluster/bin/scswitch -e -j HiCommandServer
```

    Each resource name is the name you registered.

    You also need to enable any other Hitachi Storage Command Suite product resources you have disabled.

15. Execute the following commands to enable monitoring of the services of Common Component and Device Manager:

```
# /usr/cluster/bin/scswitch -e -M -j HiRDB
# /usr/cluster/bin/scswitch -e -M -j SingleSignOnService
# /usr/cluster/bin/scswitch -e -M -j CommonWebService
# /usr/cluster/bin/scswitch -e -M -j HiCommandServer
```

    Each resource name is the name you registered.

    You also need to enable monitoring of any other Hitachi Storage Command Suite product resources you have disabled monitoring of.

16. Start Cluster Manager in Java Console.
17. On the executing node, bring online the group in which the Hitachi Storage Command Suite product services have been registered.

htmsetup Command

To change the settings for remote connection with Tuning Manager, use the `htmsetup` command. To execute the `htmsetup` command, you must be a member of the Administrators group or a root user. This section describes how to use the `htmsetup` command.

Conditions for executing the `htmsetup` command:

- When a remote connection is to be enabled, the host name and IP address of the local computer must be registered in the host settings file.
- Common Component must be stopped.
- Other commands that change the Common Component settings must not be running.
- The `htmsetup` command must not already be running.
- In a cluster environment, the services and resource groups of Hitachi Storage Command Suite products must not be registered as cluster monitoring targets on both the executing and standby nodes.

Location of the `htmsetup` command:

– In Windows:

installation-folder-for-the-Device-Manager-server`\HiCommandServer\tools\htmsetup.bat`

– In Solaris or Linux:

installation-directory-for-the-Device-Manager-server`/HiCommandServer/tools/htmsetup.sh`

Description:

The `htmsetup` command lets you interactively change the settings for remotely connecting HiRDB with Tuning Manager. You can use the `htmsetup` command for the following operations:

– Enabling or disabling remote connection (default: disabling)

– Specifying the port number used when remote connection is enabled (range of specifiable values: 5001 to 65535, default: 24220)

In an OS in which Windows Firewall has been installed, the command also performs registration in the Windows Firewall exception list when remote connection is enabled, and performs unregistration when remote connection is disabled. When the settings have been completed, HiRDB is activated.

Options:

None

Settings for Starting HSSM from the Dashboard

To link with HSSM and start HSSM from the **Dashboard** menu, create the `StorageServicesManager.conf` file in the following directory if the file has not been created yet. This file is stored in the following location:

In Windows:

```
installation-folder-for-Common-Component\common
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/common
```

In the `StorageServicesManager.conf` file, specify the `LaunchURL` parameter in the following format:

```
LaunchURL=HSSM-URL
```

In *`HSSM-URL`*, specify the URL used to start HSSM. For details about this URL, see the HSSM documentation.

For example, if the name of the HSSM management server is *`computer-name`*, configure the `StorageServicesManager.conf` as follows:

For Secure Connections:

```
LaunchURL=https://computer-name
```

For Nonsecure Connections:

```
LaunchURL=http://computer-name
```

Settings for Starting Applications from Web Client

When you select **Go** and then **Links** in the global tasks bar area of Web Client, a dialog box is displayed with links for starting applications for which the user is registered. By registering the web applications that you often use or the information that you want to reference (such as a device installation chart) to this window, you can easily call a desired application from Web Client. To register a desired application or cancel the registration, you use the `hcmdslink` command. This section describes how to use the `hcmdslink` command.

Format:

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdslink {/add |
/delete } /file user-defined-application-file [/nolog] /user user-
identifier /pass password
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdslink {-add | -
delete } -file user-defined-application-file [-nolog] -user user-
identifier -pass password
```

Function:

The `hcmdslink` command registers a Web application to allow you to start the desired application from Web Client, or cancels the registration.

In the user-defined application file, you specify a desired application name, URL, and name to be displayed. Then, use the hcmdslink command to register that information. The link to the registered application will be displayed in the link dialog box that appears when you select **Go** and then **Links** in the global tasks bar area of Web Client.

Note: Once you register a link for starting an application, do not delete the user-defined application file used in the hcmdslink command. If you do, you cannot delete the link for the registered application.

Options:

`add`: Registers an application.

`delete`: Deletes an application.

`file`: Specifies the name of the user-defined application file. In Solaris or Linux, do not specify a path that includes a space.

`user`: Specifies a user ID used to register or delete the user-defined application link. Specify the user ID of a user who has the Admin permission.

`pass`: Specifies the password for the user ID used to register or delete the user-defined application link.

`nolog`: Suppresses outputting messages to the command line. However, even when this option is specified, messages for option errors are displayed.

User-defined application file:

The following shows a coding example in the user-defined application file.

Caution: To code the user-defined application file, use ASCII characters only. Also note that you cannot use the control code other than the CR and LF control code.

```
@TOOL-LINK
@NAME SampleApp
@URL http://SampleApp/index.html
@DISPLAYNAME SampleApplication
@DISPLAYORDER 1
@ICONURL http://SampleApp/graphic/icon.gif
@TOOL-END
```

The items to be specified in the user-defined application file are as follows:

`@TOOL-LINK`: The start key. The information between the start key and the end key is the setting information. This item is required.

`@NAME`: Information used as the key for registration. Specify a unique name. This item is required. The maximum length of the name is 256 bytes. Use alphanumeric characters only.

`@URL`: The URL of the target of the link from Web Client. The maximum length of the URL is 256 bytes. You cannot use an IPv6 address. You must use a host name to specify the URL in an IPv6 environment.

`@DISPLAYNAME`: The name displayed in the link dialog box that appears when you select **Go** and then **Links** in the global tasks bar area of Web Client. If no information is specified, the name specified in @NAME is displayed. You can specify a Unicode code point in the range from U+10000 to U+10FFFF. The maximum length of the name is 80 characters.

`@DISPLAYORDER`: The order of the applications displayed in the link dialog box that appears when you select **Go** and then **Links** in the global tasks bar area of Web Client. The applications are displayed in ascending order of this value. You can specify a value in the range from -2147483648 to 2147483647.

`@ICONURL`: The URL of the icon displayed beside the link. The maximum length of the URL is 256 bytes. You cannot use an IPv6 address. You must use a host name to specify the URL in an IPv6 environment.

`@TOOL-END`: The end key. This item is required.

Return values:

0: Normal termination

255: Failure

If you do not specify the `nolog` option, you can determine whether the command was successful from the output message. If you specify the `nolog` option, no message is output. Therefore, you need to use the return value of the command to determine whether the command was successful.

For details about errors, see the following log files.

- In Windows:

  installation-folder-for-Common-Component\log\hcmdslink*n*.log

- In Solaris or Linux:

  /var/*installation-directory-for-Common-Component*/log/hcmdslink*n*.log

Command execution examples (in Windows)

The following command adds a link for an application (note that this command is entered on one line):

```
C:\Program Files\HiCommand\Base\bin\hcmdslink /add /file
C:\SampleLink.txt /user system /pass manager
```

The following command deletes a link for an application (note that this command is entered on one line):

```
C:\Program Files\HiCommand\Base\bin\hcmdslink /delete /file
C:\SampleLink.txt /user system /pass manager
```

Command execution examples (in Solaris or Linux)

The following command adds a link for an application (note that this command is entered on one line):

```
# /opt/HiCommand/Base/bin/hcmdslink -add -file /opt/SampleLink.txt -user system -pass
manager
```

The following command deletes a link for an application (note that this command is entered on one line):

```
# /opt/HiCommand/Base/bin/hcmdslink -delete -file /opt/SampleLink.txt -user system -
pass manager
```

6

Settings for Logs and Alerts

This chapter describes the settings required to use Device Manager to monitor the status of the system and monitor for errors.

Settings for Integrated Logs

Common Component provides a common library used to acquire log data for Hitachi Storage Command Suite products, which use common log files. Device Manager uses this library to output log data to log files.

Setting the Number of Common Component Trace Log Files

You can set a maximum of 16 trace log files. However, a larger number of trace log files can make it more difficult to find specific information.

> ***WARNING:*** Changing the common trace log settings affects other program products that use the common trace logs.

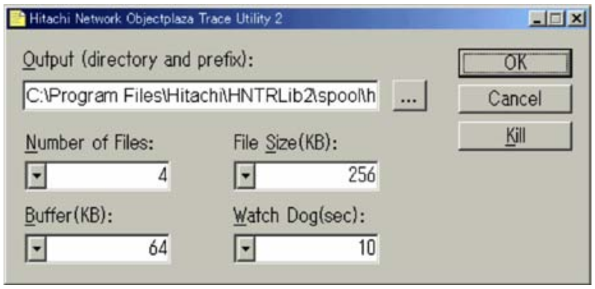
In Windows

Location of the Windows **HNTRLib2** utility:

`program-files-folder``\Hitachi\HNTRLib2\bin\hntr2util.exe`

To specify the number of trace log files:

1. Log in to the system as a user with **Administrator** privileges.
2. Execute `hntr2util.exe`. The Hitachi Network Objectplaza Trace Utility 2 window is displayed.



Output (directory and prefix): C:\Program Files\Hitachi\HNTRLib2\spool\h

Number of Files: 4

File Size(KB): 256

Buffer(KB): 64

Watch Dog(sec): 10

Figure 6-1 Hitachi Network Objectplaza Trace Utility 2 Window

3. Type the desired number of trace log files, and then select **OK.**

In Solaris or Linux

The utility program is stored in the following path:

```
# /opt/hitachi/HNTRLib2/bin/hntr2util
```

1. Log in to the system as root.
2. Execute `hntr2util`.

   A menu appears.
3. From the menu, select **Number of log files**.

The submenu appears.

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility Rel 1.0
  Type the number of files [1-16] (Type ‘!’ to return)

  Current Number: 4
      New Number:
```

4. In the submenu, enter the desired number for trace log files, and then press **Enter**. If you do not want to change the number, enter `!`, and then press **Enter**.
5. Check the contents you specified, enter `e`, and then press **Enter**.

   A message appears to check if you want to save the changes.
6. Enter `y` to save your changes or enter `n` to exit without saving your changes.

Setting the Size of Common Component Trace Log Files

You can set the size of each Common Component trace log file, from 8 KB to 4 MB (4096 KB). The Common Component trace log monitoring program switches to the next file when the current output file reaches the specified size.

Note: The value should be larger than the value that you have set for the buffer.

WARNING: Changing the common trace log settings affects other program products that use the common trace logs.

In Windows

Location of the Windows **HNTRLib2** utility:

`program-files-folder``\Hitachi\HNTRLib2\bin\hntr2util.exe`

To change the size of the trace log files:

1. Log in to the system as a user with Administrator privileges.
2. Execute `hntr2util.exe`. The Hitachi Network Objectplaza Trace Utility 2 window is displayed (see Figure 6-1).
3. Type the desired size for the trace log files, and then select **OK**.

In Solaris or Linux

The utility program is stored in the following path:

`/opt/hitachi/HNTRLib2/bin/hntr2util`

To change the size of the trace log files:

1. Log in to the system as root.

2. Execute `hntr2util`.

   A menu appears.

3. From the menu, select **Size of a log file**.

   The submenu appears.

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility Rel 1.0
  Type new file size [8-4096] (Type ‘!’ to return)

  Current Size(KB): 256
      New Size(KB):
```

4. In the submenu, enter the desired size for the trace log files, and then press **Enter**. If you do not want to change the size, enter `!`, and then press **Enter**.

5. Check the contents you specified, enter `e`, and then press **Enter**.

   A message appears to check if you want to save the changes.

6. Enter `y` to save your changes or enter `n` to exit without saving your changes.

Settings Required for Generating Audit Logs

In Device Manager and other Hitachi storage-related products, user operations can be recorded in audit logs in order to prove to auditors and evaluators the compliance with regulations, security evaluation standards, and other business standards. To generate audit log data, you must edit the environment settings file (`auditlog.conf`). For details on this file, see Editing the Audit Log Environment Settings File.

For Windows, the audit log data is output to the event log files (application log files). For Solaris and Linux, the data is output to the `syslog` file.

Table 6-1 shows the categories of audit log data that can be generated from Hitachi storage-related products.

Table 6-1 Categories and Descriptions

Categories	Description
`StartStop`	Events indicating starting or stopping of hardware or software: ▪ Starting or shutting down an OS ▪ Starting or stopping a hardware component (including micro components) ▪ Starting or stopping software on a storage subsystem or SVP, and Hitachi Storage Command Suite products
`Failure`	Events indicating hardware or software failures: ▪ Hardware failures ▪ Software failures (memory error, etc.)
`LinkStatus`	Events indicating link status among devices: ▪ Whether a link is up or down
`ExternalService`	Events indicating communication results between Hitachi storage-related products and external services: ▪ Communication with an external server, such as NTP or DNS ▪ Communication with a management server (SNMP)
`Authentication`	Events indicating that a device, administrator, or end user succeeded or failed in connection or authentication: ▪ FC login ▪ Device authentication (FC-SP authentication, iSCSI login authentication, SSL server/client authentication) ▪ Administrator or end user authentication
`AccessControl`	Events indicating that a device, administrator, or end user succeeded or failed in gaining access to resources: ▪ Access control for devices ▪ Access control for the administrator or end users
`ContentAccess`	Events indicating that attempts to access important data succeeded or failed: ▪ Access to important files on NAS or to contents when HTTP is supported ▪ Access to audit log files

Categories	Description
ConfigurationAccess	Events indicating that the administrator succeeded or failed in performing an allowed operation: ▪ Reference or update of the configuration information ▪ Update of account settings including addition or deletion of accounts ▪ Security configuration ▪ Reference or update of audit log settings
Maintenance	Events indicating that a performed maintenance operation succeeded or failed: ▪ Addition or deletion of hardware components ▪ Addition or deletion of software components
AnomalyEvent	Events indicating that an anomaly such as a threshold being exceeded, occurred: ▪ A network traffic threshold was exceeded ▪ A CPU load threshold was exceeded ▪ Pre-notification that a limit is being reached or a wraparound occurred for audit log data temporarily saved internally
	Events indicating that abnormal communication occurred: ▪ SYN flood attacks to a regularly used port, or protocol violations ▪ Access to an unused port (port scanning, etc.)

Different products generate different types of audit log data. The following sections describe the audit log data that can be generated by Device Manager and Provisioning Manager. For details on the audit log data generated by other products, see the manual for the corresponding product.

For details on the contents of the output audit log data, see Checking Audit Log Data.

Audit Events and Categories of Information Output to Audit Logs

In Device Manager, the following categories of audit events are output to audit logs:

- StartStop
- Authentication
- ConfigurationAccess

Each audit event is assigned a severity level. You can filter audit log data to be output according to the severity levels of events.

Table 6-2 to Table 6-4 list the audit events that are output to audit logs in Device Manager.

Table 6-2 Audit Events That Are Output to Audit Logs (When the Category Is StartStop)

Type Description	Audit Event	Severity	Message ID
Start and stop of software	Successful SSO server start	6	KAPM00090-I
	Failed SSO server start	3	KAPM00091-E
	SSO server stop	6	KAPM00092-I

Table 6-3 Audit Events That Are Output to Audit Logs (When the Category Is Authentication)

Type Description	Audit Event	Severity	Message ID
Administrator or end user authentication	Successful login	6	KAPM01124-I
	Successful login (to the external authentication server)	6	KAPM02450-I
	Failed login (wrong user ID or password)	4	KAPM02291-W
	Failed login (logged in as a locked user)	4	KAPM02291-W
	Failed login (logged in as a non-existing user)	4	KAPM02291-W
	Failed login (no permission)	4	KAPM01095-E
	Failed login (authentication failure)	4	KAPM01125-E
	Failed login (to the external authentication server)	4	KAPM02451-W
	Successful logout	6	KAPM08009-I
Automatic account lock	Automatic account lock (repeated authentication failure or expiration of account)	4	KAPM02292-W

Table 6-4 Audit Events That Are Output to Audit Logs (When the Category Is ConfigurationAccess)

Type Description	Audit Event	Severity	Message ID
User registration (GUI)	Successful user registration	6	KAPM07230-I
	Failed user registration	3	KAPM07240-E
User deletion (GUI)	Successful single user deletion	6	KAPM07231-I
	Failed single user deletion	3	KAPM07240-E
	Successful multiple user deletion	6	KAPM07231-I
	Failed multiple user deletion	3	KAPM07240-E
Password change (from the administrator window)	Successful password change by the administrator	6	KAPM07232-I
	Failed password change by the administrator	3	KAPM07240-E

Type Description	Audit Event	Severity	Message ID
Password change (from the user's own window)	Failed authentication processing for verifying old password	3	KAPM07239-E
	Successful change of login user's own password (from the user's own window)	6	KAPM07232-I
	Failed change of login user's own password (from the user's own window)	3	KAPM07240-E
Profile change	Successful profile change	6	KAPM07233-I
	Failed profile change	3	KAPM07240-E
Permission change	Successful permission change	6	KAPM02280-I
	Failed permission change	3	KAPM07240-E
Account lock	Successful account lock[#1]	6	KAPM07235-I
	Failed account lock	3	KAPM07240-E
Account lock release	Successful account lock release[#2]	6	KAPM07236-I
	Failed account lock release	3	KAPM07240-E
	Successful account lock release using the hcmdsunlockaccount command	6	KAPM07236-I
	Failed account lock release using the hcmdsunlockaccount command	3	KAPM07240-E
Authentication method change	Successful authentication method change	6	KAPM02452-I
	Failed authentication method change	3	KAPM02453-E
Authorization group addition (GUI)	Successful addition of an authorization group	6	KAPM07247-I
	Failed addition of an authorization group	3	KAPM07248-E
Authorization group deletion (GUI)	Successful deletion of one authorization group	6	KAPM07249-I
	Failed deletion of one authorization group	3	KAPM07248-E
	Successful deletion of multiple authorization groups	6	KAPM07249-I
	Failed deletion of multiple authorization groups	3	KAPM07248-E
Authorization group permission change (GUI)	Successful change of an authorization group's permission	6	KAPM07250-I
	Failed change of an authorization group's permission	3	KAPM07248-E
User registration (GUI and CLI)	Successful registration of user	6	KAPM07241-I
	Failed to register user	3	KAPM07242-E
User information update	Successful update of user information	6	KAPM07243-I

Type Description	Audit Event	Severity	Message ID
(GUI and CLI)	Failed to update user information	3	KAPM07244-E
User deletion (GUI and CLI)	Successful deletion of user	6	KAPM07245-I
	Failed to delete user	3	KAPM07246-E
Authorization group registration (GUI and CLI)	Successful registration of an authorization group	6	KAPM07251-I
	Failed registration of an authorization group	3	KAPM07252-E
Authorization group deletion (GUI and CLI)	Successful deletion of an authorization group	6	KAPM07253-I
	Failed deletion of an authorization group	3	KAPM07254-E
Authorization group permission change (GUI and CLI)	Successful change of an authorization group's permission	6	KAPM07255-I
	Failed change of an authorization group's permission	3	KAPM07256-E
Database backup or restore	Successful backup using the hcmdsbackups command	6	KAPM05561-I
	Failed backup using the hcmdsbackups command	3	KAPM05562-E
	Successful full restore using the hcmdsdb command	6	KAPM05563-I
	Failed full restore using the hcmdsdb command	3	KAPM05564-E
	Successful partial restore using the hcmdsdb command	6	KAPM05565-I
	Failed partial restore using the hcmdsdb command	3	KAPM05566-E
Database input/output	Successful data output using the hcmdsdbmove command	6	KAPM06543-I
	Failed data output using the hcmdsdbmove command	3	KAPM06544-E
	Successful data input using the hcmdsdbmove command	6	KAPM06545-I
	Failed data input using the hcmdsdbmove command	3	KAPM06546-E
Database area creation or deletion	Successful database area creation using the hcmdsdbsetup command	6	KAPM06348-I
	Failed database area creation using the hcmdsdbsetup command	3	KAPM06349-E
	Successful database area deletion using the hcmdsdbsetup command	6	KAPM06350-I
	Failed database area deletion using the hcmdsdbsetup command	3	KAPM06351-E

Type Description	Audit Event	Severity	Message ID
Authentication data input/output	Successful data output using the hcmdsauthmove command	6	KAPM05832-I
	Failed data output using the hcmdsauthmove command	3	KAPM05833-E
	Successful data input using the hcmdsauthmove command	6	KAPM05834-I
	Failed data input using the hcmdsauthmove command	3	KAPM05835-E
Device Manager server processing	Request reception (normal)	6	KAIC51000-I KAIC51200-I KAIC51201-I
	Request reception (common/abnormal)	3	KAIC51400-E
	Response transmission (normal)	6	KAIC51100-I KAIC51300-I KAIC51301-I KAIC51302-I
	Response transmission (abnormal)	3	KAIC51500-E KAIC51700-E KAIC51701-E
Startup of related products (launch)	Request reception (normal)	6	KAIC53000-I
	Request reception (abnormal)	3	KAIC53200-E
	Response transmission (normal)	6	KAIC53100-I
	Response transmission (abnormal)	3	KAIC53300-E
Device Manager server (via CIM) processing	Request reception (normal)	6	KAIC54000-I KAIC54200-I
	Request reception (abnormal)	3	KAIC54400-E KAIC54600-E
	Response transmission (normal)	6	KAIC54100-I KAIC54300-I
	Response transmission (abnormal)	3	KAIC54500-E KAIC54700-E
Reception of a request to the Provisioning Manager server and transmission of response	Reception of request (during normal processing)	6	KARF91000-I KARF91001-I KARF91200-I KARF91201-I KARF91202-I
	Reception of request (common, in the event of an error)	3	KARF91400-E KARF91401-E

Type Description	Audit Event	Severity	Message ID
	Transmission of response (during normal processing)	6	KARF91100-I KARF91101-I KARF91300-I KARF91301-I KARF91302-I KARF91303-I
	Transmission of response (in the event of an error)	3	KARF91500-E KARF91501-E KARF91700-E KARF91701-E KARF91702-E

#1: If an account is locked because the authentication method was changed for a user whose password is not set, this information is not recorded in the audit log.

#2: If an account is unlocked because a password was set for a user, this information is not recorded in the audit log.

For details about the output format of message text, see Message Text in Audit Log Data.

For details about the message text corresponding to each message ID, see the *Hitachi Device Manager Error Codes* or *Hitachi Provisioning Manager Error Codes*.

Editing the Audit Log Environment Settings File

To generate Device Manager audit log data, you must edit the environment settings file (`auditlog.conf`). The audit log data can be generated by setting audit event categories, in `Log.Event.Category` of the environment settings file. To apply the changes to the environment settings file for the audit log, you need to restart the Device Manager server and Common Component.

Caution: A large volume of audit log data might be output. Change the log file size and back up or archive the generated log files accordingly.

The `auditlog.conf` file is stored in the following location:

- In Windows:
  `installation-folder-for-Common-Component``\conf\sec\auditlog.conf`
- In Solaris or Linux:
  `installation-directory-for-Common-Component``/conf/sec/auditlog.conf`

Table 6-5 shows the items you can set in the `auditlog.conf` file.

Table 6-5 Items Set in auditlog.conf

Item	Description
Log.Facility	Specify (by using a number) the facility to be used when the audit log messages are output to the syslog file. Log.Facility is used, in combination with the severity levels set for each audit event (see Table 6-2 to Table 6-4), for filtering the output to the syslog file. For details about the values that can be specified for Log.Facility, see Table 6-6. For details about the correspondence between the severity levels set for audit events and those set in the syslog.conf file, see Table 6-7. Log.Facility has an effect in Solaris or Linux only. Log.Facility is ignored in Windows, even if it is specified. Also, if an invalid value or a non-numeric character is specified, the default value is used. Default value: 1
Log.Event.Category	Specify the audit event categories to be generated. When specifying multiple categories, use commas (,) to separate them. In this case, do not insert spaces between categories and commas. If Log.Event.Category is not specified, audit log data is not output. For information about the available categories, see Table 6-2 to Table 6-4. Log.Event.Category is not case-sensitive. If an invalid category name is specified, the specified file name is ignored. Default value: (not specified)
Log.Level	Specify the severity level of audit events to be generated. Events with the specified severity level or lower will be output to the event log file. For information about the audit events that are output from Device Manager and their severity levels, see Table 6-2 to Table 6-4 For details about the correspondence between the severity levels of audit events and the types of event log data, see Table 6-7. Log.Level has an effect in Windows only. Log.Level is ignored in Solaris and Linux, even if it is specified. Also, if an invalid value or a non-numeric character is specified, the default value is used. Available values: 0 to 7 (severity level) Default value: 6

Table 6-6 shows the values that can be set for Log.Facility and the corresponding values specified in the syslog.conf file.

Table 6-6 Log.Facility Values and Corresponding Values in syslog.conf

Facility	Corresponding Values in syslog.conf
1	user
2	mail#
3	daemon
4	auth#
6	lpr#
16	local0
17	local1
18	local2
19	local3

Facility	Corresponding Values in syslog.conf
20	local4
21	local5
22	local6
23	local7
#: Although you can specify this value, we do not recommend that you use it.	

Table 6-7 shows the correspondence between the severity levels of audit events, the values indicating severity that are specified in the syslog.conf file, and the types of event log data.

Table 6-7 Correspondence Between the Severity Levels of Audit Events, the Severity Levels in syslog.conf, and the Types of Event Log Data

Severity of Audit Events	Severity in syslog.conf	Type of Event Log Data
0	emerg	Error
1	alert	
2	crit	
3	err	
4	warning	Warning
5	notice	Information
6	info	
7	debug	

The following shows an example of the auditlog.conf file:

```
# Specify an integer for Facility. (specifiable range: 1-23)
Log.Facility 1

# Specify the event category.
# You can specify any of the following:
# StartStop, Failure, LinkStatus, ExternalService,
# Authentication, AccessControl, ContentAccess,
# ConfigurationAccess, Maintenance, or AnomalyEvent.
Log.Event.Category Authentication,ConfigurationAccess

# Specify an integer for Severity. (specifiable range: 0-7)
Log.Level 6
```

In this example, the audit events related to `Authentication` or `ConfigurationAccess` are output. In Windows, `Log.Level 6` outputs audit log data corresponding to the Error, Warning, and Information levels. In Solaris or Linux, `Log.Facility 1` outputs the audit log data to the `syslog` file that is defined as the `user` facility in the `syslog.conf` file.

Settings Required for Centrally Managing Storage Subsystem Alerts

In Device Manager, you can use Web Client to centrally manage alerts that were output on storage subsystems. By viewing alerts, you can check the name of the storage subsystem where an error occurred, in which part of the storage subsystem the error occurred, and the action to take for the error.

By using Device Manager, you can detect alerts output on storage subsystems in the following methods:

- Periodically monitor whether an alert has occurred on the management target storage subsystem (default).
- Receive SNMP traps output in storage subsystems (option).

  SNMP traps are useful for determining the cause of an error because they include not only the part in which an error occurred but also the location where an error occurred. You can also record the received SNMP traps in log files and notify users of the SNMP traps by email.

  SNMP traps contain information shown in the following table:

Table 6-8 Contents of SNMP Traps Received by Device Manager

Contents of SNMP Traps	Description
Notification of errors that occurred on storage subsystems	The target storage subsystems are Universal Storage Platform V/VM, Hitachi USP, Lightning 9900V, and Lightning 9900 only.
SNMP traps that were output on storage subsystems	
SNMP traps for devices other than storage subsystems	Only traps of SNMP version 1 are output.

The following sections describe the settings required to centrally manage storage subsystem alerts by using Device Manager.

Note: For details about how to notify users of output alerts by email, see Settings Required for Email Notification. For Hitachi AMS 2000, Hitachi SMS, Hitachi AMS/WMS, Thunder 9500V, or Thunder 9200, if you want to notify users who manage those storage subsystems of output alerts by email, you need to specify the settings by using the storage management software such as Storage Navigator Modular 2.

Settings for Receiving SNMP Traps

To use Device Manager to receive SNMP traps that were output on storage subsystems, you need to specify the following settings:

- In the SNMP agent settings of the storage subsystem, register the IP address of the Device Manager server in the trap notification target machines.
- Specify true for the `server.dispatcher.daemon.receiveTrap` property of the Device Manager server.

Settings for Recording the Received SNMP Traps in Log Files

By recording the received SNMP traps in the Device Manager log files, you can use integrated management software to centrally monitor the operating status of all the network resources including storage resources managed by Device Manager.

To record the received SNMP traps in log files, you need to specify the following settings:

- Specify `true` for the `customizedsnmptrap.customizedSNMPTrapEnable` property of the Device Manager server.
- Specify the data to be output to log files in the `customizedsnmptrap.customizelist` property of the Device Manager server.

Data Items to Be Output to Log Files

The following data items from among the SNMP trap data are output to the log files:

- Message ID indicating that a trap has been received
- Sender (agent)
- Enterprise ID (enterprise)
- Generic trap number (generic)
- Specific trap number (specific)

In addition, the data of the received SNMP traps are recorded in the following log files:

- Hitachi Storage Command Suite common trace log file (`hntr2`*n*`.log`)
- Device Manager trace log file (`HDvMtrace`*n*`.log`)
- Event log file or syslog file
- Trace log file (`trace.log.`*n*)
- Error log file (`error.log.`*n*)#

  #: The data is output to this file only when the severity is `Error`, `Critical`, or `Alert`. For details on the severity, see Table 6-9.

Setting the Data to Be Output to Log Files

By using the `customizedsnmptrap.customizelist` property, you can specify the severity and output format of SNMP traps to be recorded in log files.

Specify the items shown in the following table by separating them using a colon (:).

Table 6-9 Items Specified in the customizedsnmptrap.customizelist Property

Item	Format	Remarks
enterprise-ID	Specify by using dots (for example, .1.3.6.1.4.116.3.11.1.2)	Required
generic-trap-number	Numeric value, from 0 to 6	Required
specific-trap-number	Numeric value	Required
severity	Specify the severity of each trap by using one of the character strings below. You cannot use character strings other than the following: ▪ `Information` ▪ `Warning` ▪ `Error` ▪ `Critical` ▪ `Alert` ▪ `Null`	This item is optional. If you omit this item, `Null` is assumed. The severity indicators in the message IDs are output as follows: ▪ `-I` for `Information` ▪ `-W` for `Warning` ▪ `-E` for `Error`, `Critical`, and `Alert` ▪ No log data is output for `Null`

Item	Format	Remarks
message	Specify message information to be output by using the character strings (variables) below. You cannot use character strings other than the following: ▪ $a ▪ $e ▪ $g ▪ $s ▪ $*n* (where *n* indicates an integer, which is 1 or larger)	Optional. If you omit this item, the $a$e$g$s content is output. If you specify `Null` for the severity, specification for this item is disabled. Information output for each variable is as follows: ▪ $a: Agent address (dotted format) ▪ $e: Enterprise ID (dotted format) ▪ $g: Generic trap number ▪ $s: Specific trap number ▪ $*n* (where *n* indicates an integer, which is 1 or larger): The value of the *n*th variable is binding

The following shows the syntax of the `customizedsnmptrap.customizelist` property:

```
customizedsnmptrap.customizelist = \
enterprise-ID-1:generic-trap-number-1:specific-trap-number-1:
severity-1:message-1, \
enterprise-ID-2:generic-trap-number-2:specific-trap-number-2:
severity-2:message-2, \
...
enterprise-ID-n:generic-trap-number-n:specific-trap-number-n:
severity-n:message-n
```

- You can omit some items, but you cannot omit the colon delimiter.
- To specify more than one customization definition, use a comma as a delimiter, but do not enter a comma at the end of the last entry.
- To move to a new line in the customization list, enter a back slash (\) at the end of that line. The line feed following the back slash (\) is ignored.

The following shows an example of specifying the `customizedsnmptrap.customizelist` property:

```
customizedsnmptrap.customizelist = \
.1.2.3:6:1:Information:$a$e$g$s$1$2, \
.1.3.6.1.4.1.2854:6:1:Warning:$e$a$s$3$2$1$g, \
.1.3.6.1.4.1.116.3.11.4.1.1:6:1:Error:$a$s, \
.1.3.6.1.4.1.116.3.11.4.1.1:6:100:Information:$a$s
```

Settings Required for Email Notification

The email notification function notifies users, by email, of the contents of alerts that occurred in the storage subsystem and were detected by the Device Manager server. To use this function, you need to specify settings at the SMTP server, for the Device Manager users, and at the Device Manager server.

For the email notification function, the Device Manager server notifies users of an alert only once when the Device Manager server detects the alert. If the Device Manager server fails to send an email, the same email will not be sent again. Information on an alert for which the Device Manager server fails to send an email, as well as the email address of the intended destination of this email, are output to the Device Manager trace log file. For details about the Device Manager trace log file, see Obtaining Maintenance Information of Device Manager. Also, if the Device Manager server service stops before the Device Manager server sends an email about an alert, the email will not be sent. In this case, even if the Device Manager server service is started again, the Device Manager server will not send the email that has not been sent. Start the Device Manager server service, and then execute the `GetAlerts` command from the CLI or use the alert management function of Web Client, to make sure that actions have been taken for every alert.

If you set up an environment or perform maintenance for a storage subsystem that has already been registered in the Device Manager server, the storage subsystem might generate many alerts. As such, we recommend that you disable the email notification function during such tasks.

The users who receive emails need to use email software that supports Unicode (UTF-8) encoding because, when sending an email, the Device Manager server sets the character encoding of the email to Unicode (UTF-8).

Settings on the SMTP Server

Following the setup procedure for the SMTP server being used, set it up so that the Device Manager server can connect to the SMTP server. The Device Manager server supports the following SMTP authentication methods: LOGIN or PLAIN. Make sure that you specify one of these authentication methods in the SMTP server that you use.

Settings for Users Who Receive Emails by Using Web Client

When using the email notification function, use Web Client to specify the settings below for a Device Manager users who receive emails. For details on how to specify the settings, see the Device Manager online Help.

An email that contains the same contents will be sent to the users for whom the settings below are specified. Each email is addressed to one recipient, and is sent to the users individually.

- Set the Device Manager's modify permission for the user.
- Assign `All Resources` as a resource group to the user.
- Specify the user's email address by editing the profile.

Settings on the Device Manager Server

To configure the Device Manager server when using the email notification function:

1. Stop the Device Manager server service.

   For details about how to do this, see Stopping the Device Manager Server.

2. Specify the Device Manager server properties related to the email notification function. The following properties are related:
   - `server.mail.enabled`
   - `server.mail.from`
   - `server.mail.smtp.host`
   - `server.mail.smtp.port`
   - `server.mail.smtp.auth`
   - `server.mail.alert.type`
   - `server.mail.alert.status`

Note:

- When the SMTP authentication setting is enabled on the Device Manager server and there are multiple SMTP authentication methods that the SMTP server specifies, the Device Manager server selects an authentication method (LOGIN or PLAIN in that priority order), and then sends an email. If LOGIN or PLAIN is not specified, the Device Manager server will send an email without using the SMTP authentication.
- If SMTP authentication setting is disabled on the SMTP server, even if the setting is enabled on the Device Manager server, the Device Manager server will send an email without using SMTP authentication.

3. If you want to use SMTP authentication for the SMTP server, set the SMTP authentication user information.

   To set SMTP authentication user information, execute the SMTP authentication user information setting command. Even if SMTP authentication is enabled in the Device Manager server, if SMTP authentication user information is not registered, the Device Manager server will send emails without using SMTP authentication.

   For details about how to set up SMTP authentication users, see Settings for an SMTP Authentication User.

4. If necessary, edit the template file of the email used by the email notification function.

For details about how to do this, see Customizing the Template File.

5. Start the Device Manager server service.

   For details about how to do this, see Starting the Device Manager Server.

Settings for an SMTP Authentication User

To use the email notification function, you need to connect to the SMTP server. To use SMTP authentication for the SMTP server, you need to set the SMTP authentication user information on the Device Manager server.

To register or modify the SMTP authentication user information on the Device Manager server, execute the `hdvmmodmailuser` command. The settings will go into effect when you start the Device Manager server service after executing this command.

You can set only one piece of SMTP authentication user information on the Device Manager server. The set SMTP authentication user information will be updated each time you execute the command. If the currently set SMTP authentication user information is unknown, re-execute the command to set SMTP authentication user information.

Note:

- Even if the SMTP authentication setting is enabled on the Device Manager server, the Device Manager server sends an email without using SMTP authentication if the connection target SMTP server has not enabled the SMTP authentication setting.
- You cannot delete the SMTP authentication user information that you set on the Device Manager server.

To execute the `hdvmmodmailuser` command, the following conditions must be satisfied:

- The user who executes the `hdvmmodmailuser` command has the Administrator permission for Windows, or the root permission for Solaris or Linux
- The user specified when executing the `hdvmmodmailuser` command has the Admin permission of Device Manager
- The Device Manager server service is stopped.
- The Common Component services are running.

The following shows the installation location and format of the `hdvmmodmailuser` command:

In Windows:

installation-folder-for-the-Device-Manager-server\HiCommandServer\tools\hdvmmodmailuser.bat -u *Device-Manager-user-ID* -p *Device-Manager-password SMTP-authentication-user-ID* [*SMTP-authentication-password*]

The following is an example of executing the command:

```
C:\Program
Files\HiCommand\DeviceManager\HiCommandServer\tools\hdvmmodmailuser -u
dvmuser1 -p sys0305 dvmuser1_mail dvmuser1_sys
```

In Solaris or Linux:

installation-directory-for-the-Device-Manager-server/HiCommandServer/tools/hdvmmodmailuser.sh -u *Device-Manager-user-ID* -p *Device-Manager-password SMTP-authentication-user-ID* [*SMTP-authentication-password*]

The following is an example of executing the command:

```
# /opt/HiCommand/HiCommandServer/tools/hdvmmodmailuser.sh -u dvmuser1 -p sys0305
dvmuser1_mail dvmuser1_sys
```

You can specify the following options in the hdvmmodmailuser command:

- u *Device-Manager-user-ID*

  Specify a user ID that has the Admin permission of Device Manager.

- p *Device-Manager-password*

  Specify the password used to log in to Device Manager by the user *Device-Manager-user-ID* specified using the -u option.

- *SMTP-authentication-user-ID*

  Specify a user ID used for SMTP authentication.

- *SMTP-authentication-password*

  Specify the password used to log in to the SMTP server by the user.

  You can omit this option.

Customizing the Template File

The contents of the email sent to users by the email notification function are set in the template file mail-alert-detection.txt. If necessary, you can edit this file to customize the contents of the email.

The mail-alert-detection.txt file is stored in the following location:

In Windows:

installation-folder-for-the-Device-Manager-server\HiCommandServer\config

In Solaris or Linux:

installation-directory-for-the-Device-Manager-server/HiCommandServer/config

The following shows the settings of the default `mail-alert-detection.txt` file:

```
Subject:[DVM] Alert Notification

The following alert occurred.

MessageID: ${messageID}
Alert Type: ${alertType}
Source: ${source}
Status: ${status}
Component: ${component}
Description: ${description}
Recommended Action: ${recommendedAction}
Additional Info: ${additionalInfo}
Occurrence Time: ${occurrenceTime}

This message was sent automatically by the Device Manager server.
```

The `mail-alert-detection.txt` file consists of a header (by default, `Subject:[DVM] Alert Notification`) and the body of the email.

You can specify parameters for the header and body of the email. When the email is sent, the specified parameters will be replaced with the alert information collected by the Device Manager server. The following table shows the specifiable parameters:

Table 6-10 Parameters You Can be Set in the Template File

Parameter Name	Description
messageID	Alert ID
alertType	Alert type
source	Storage subsystem name
status	Severity of the alert
component	Location of the storage subsystem where the alert occurred
description	Description of the problem
recommendedAction	Action that has to be taken for the problem
additionalInfo	Supplementary information
occurrenceTime	Time at which the Device Manager server obtained alert information Display format: yyyy/mm/dd hh:mm:ss hh is displayed by using 24-hour display.

Specify the `mail-alert-detection.txt` file so that all of the conditions below are satisfied. If at least one condition is not satisfied, the Device Manager server will create an email by using the default settings instead of using the settings of the template file that you edited.

- The file name is `mail-alert-detection.txt`.
- The file is stored in the same location as when the Device Manager server was installed.

- The file size is no more than 64 KB.
- Unicode (UTF-8) can be used as the character encoding.
- Each line of the template file is no more than 1024 bytes in length, excluding the line feed character.
- In the top line, the header is specified in the following format:

  `Subject:`*`email-title`*

  Only one header is specified.
- In the second line from the top, a blank line is specified.
- In the third line from the top until the bottom line, the contents are specified.
- Parameters are specified in the following format:

  `${`*`parameter-name`*`}`

  The parameter name is case sensitive.

Note: The settings of this template file will go into effect when the Device Manager service starts.

7

Settings for CIM/WBEM

This chapter explains how to set up CIM/WBEM.

Device Manager and CIM/WBEM

Device Manager supports WBEM, which is defined by the standards-setting organization DMTF. WBEM is a standard proposed by the DMTF for managing networked devices, including hosts and storage subsystems, over the Internet. WBEM enables you to share data about devices in different environments (such as environments with different vendors, operating systems, or protocols) without considering the differences. WBEM is based on CIM, an object-oriented information model.

CIM, defined by DMTF, is a standardized approach for managing systems in network environments. CIM provides a framework for expressing the data to be managed. Applying CIM to storage subsystems enables you to use standardized methods to manage the configuration and status of storage subsystems in networks.

⚠ ***Caution:*** In Device Manager, when registering a storage subsystem that is to be managed, use the account of an administrator for the entire storage subsystem. Do not use the account of an administrator who only has permissions for part of the storage subsystem.

The CIM models provided by Device Manager conform to the SMI-S specifications (SNIA-CTP) endorsed by SNIA. The CIM models of the Device Manager server are defined in MOF (Managed Object Format) files provided by Device Manager.

CIM clients can access Device Manager by using the CIM XML/HTTP interface defined by WBEM.

The following figure shows the CIM components for Device Manager.

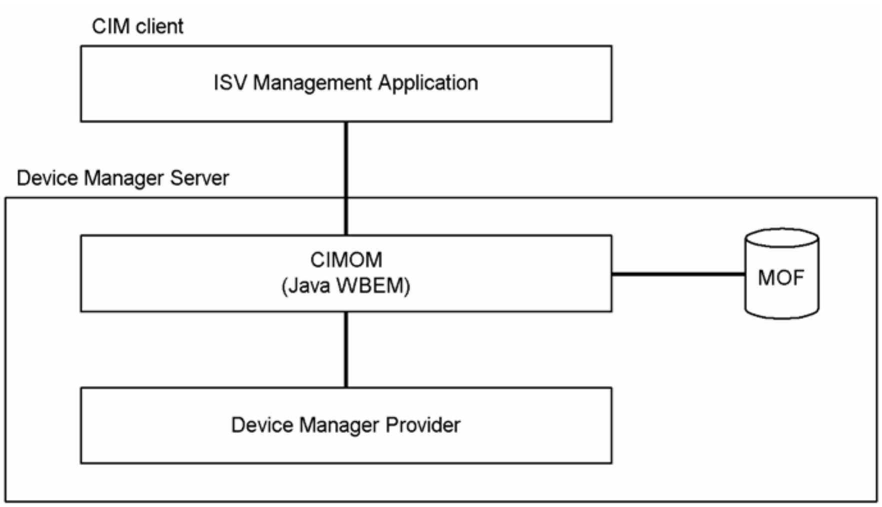


Figure 7-1 CIM Components for Device Manager

From a CIM client, you can specify a namespace by using the follow procedure:

- Specify the SMI-S version.

  Specify `root/smis/smis`*`xx`* (*xx* is an abbreviation for the version number).

  For example, to specify version 1.4.0, enter `root/smis/smis14`.

  The latest namespaces that complies with the specified SMI-S version is selected.

- Specify the condition `current`.

  Enter `root/smis/current`.

  The current namespace is selected.

- Specify `interop`.

  SMI-S 1.3.0 or a later version supports the namespace `interop`. If `interop` is specified as the namespace, the Server profile that stores the current management server information is specified.

  The namespace of each vendor is accessed via this Server profile to obtain information about the Array profile and its subprofiles.

Note: If you need to specify the namespace dm*xx* (*xx* is an abbreviation for the version number) that was supported by Device Manager 5.8 or earlier versions, contact maintenance personnel.

The following table describes the correspondence between the namespaces supported by Device Manager and SMI-S versions.

Table 7-1 Correspondence Between Namespaces and SMI-S Versions

Namespace			SMI-S
smis*XX*	**current**	**interop**	
smis10	--	--	1.0.2
smis11	--	--	1.1.0
smis12	--	--	1.2.0
smis13	--	--	1.3.0
smis14	current	interop	1.4.0

Legend: --: N/A

You can obtain information about CIM at: http://www.dmtf.org/home/

You can obtain information about SMI-S at: http://www.snia.org/smi/home/

CIM/WBEM Features of Device Manager

CIM/WBEM of Device Manager provides the four features specified in SMI-S:

- Objection operation feature
- Indication feature
- Service discovery feature
- Performance information acquisition feature

These features are described below:

Object operation feature

The SMI-S specifications, which Device Manager conforms to, define the interfaces for devices that make up a storage network, such as storage subsystems, virtual storage systems, switches, and hosts. The features that need to be provided by the management service to manage the devices are grouped in a profile for each device.

The profiles used by the CIM/WBEM features of Device Manager are the Array profile and its subprofiles. The Array profile defines the interfaces for storage subsystems.

Indication feature

The *indication* feature is the event notification feature defined by CIM. When an event occurs in a CIM server, the CIM server reports the indication instance, which shows the information about the event (such as generation or deletion of a CIM instance), to CIM clients. For a CIM client to receive indications, its location and transmission conditions for indications must be registered in the CIM server beforehand. For details on how to register them, see the SNIA website.

Device Manager reports the occurrence of the following events:

- Generation of a volume
- Deletion of a volume
- Allocation of a path
- Cancellation of a path

Service discovery feature

Device Manager provides the service discovery feature based on the Service Location Protocol (SLP).

The SLP is undergoing standardization by IETF and provides a way to discover desired services available in a network. For details on the SLP, see RFC2608.

Just by specifying the type of service, SLP clients can obtain information (such as URLs) about how to access the available services, and information about service attributes.

In Device Manager, the Device Manager server uses the SLP to report information about the WBEM Service.

Performance information acquisition feature

Using the CIM interface, Device Manager acquires information about I/Os to ports and LDEVs as performance information of the storage subsystem.

Basic Settings Required to Use the CIM/WBEM Features

The CIM/WBEM features are not available until they are enabled. When Device Manager is installed as a new installation, the CIM/WBEM features are enabled by default. If the CIM/WBEM features have been disabled, you need to enable them as described below.

To enable the CIM/WBEM features:

1. Change the setting in the Device Manager server property file.

   In the `server.properties` property file, change the `server.cim.support` property from `false` to `true`. The `server.properties` file is stored in the following location:

   – In Windows:

     `installation-folder-for-the-Device-Manager-server``\HiCommandServer\config\`

   – In Solaris or Linux:

     `installation-directory-for-the-Device-Manager-server``/HiCommandServer/config`

2. Stop any service that uses a port having a port number used by the CIM/WBEM service. Table 7-2 shows the port used by each CIM/WEB feature.

Table 7-2 Port Number Used by CIM/WBEM Features

Feature	Port Number Used
Objection operation feature	Non-SSL communication: 5988 (default). SSL communication: 5989 (default)
Service discovery feature	427

   Execute the following command to determine if any running service program is using the same port to be used by each CIM/WBEM feature:

   – In Windows: `netstat -anp TCP`

   – In Solaris: `netstat -an -P tcp`

   – In Linux: `netstat -tan`

   If any service program using the same port is running, change the port number for the service program.

   If any running service program (normally, another WBEM service program) is using the same port to be used by the object operation feature, the object operation feature is not available.

   If any service program is running (normally, another SLP service (or SLP daemon)) that uses the same port (427) to be used by the service discovery feature, attempts to start the SLP service (or SLP daemon) for Device Manager will fail.

In Solaris:

In Solaris, CIMOM is incorporated in the system during installation. If CIMOM is running, attempts to start CIM/WBEM might fail. Use the following command to stop CIMOM: `# /etc/init.d/init.wbem stop`

Also, delete CIMOM from `inittab` to prevent CIMOM from automatically starting.

3. Set up and start the SLP service (or SLP daemon).

   Set up the SLP service (or SLP daemon) to enable the service discovery feature. For details, see Settings for the Service Discovery Feature.

> ***Note:*** In the SLP service (or SLP daemon), register the port used by CIM/WBEM features by default. For the ports used by CIM/WBEM features, see Settings for Ports Used by CIM/WBEM Features.

4. Restart the Device Manager server.

   – In Windows, select **Start**, **All programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server.**

     After the Device Manager server has stopped, select **Start**, **All programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.

   – In Solaris or Linux, execute the following command:

```
installation-directory-for-the-Device-Manager-
server/suitesrvcntl -stop_hdvm
```

     After the Device Manager server has stopped, execute the following command:

```
installation-directory-for-the-Device-Manager-
server/suitesrvcntl -start_hdvm
```

     The following shows an example of executing the commands:

```
# /opt/HiCommand/suitesrvcntl -stop_hdvm
# /opt/HiCommand/suitesrvcntl -start_hdvm
```

Settings for Ports Used by CIM/WBEM Features

The following describes the settings for ports used by the CIM/WBEM features.

Opening and Closing Ports According to the Communication Type

Ports can be opened or closed according to the type of communication used by CIM/WBEM features. Security can be enhanced by closing unused ports.

When Device Manager is installed as a new installation, both the HTTP and HTTPS ports are opened (`server.cim.support.protocol=3`) by default.

To open or close the port:

1. Using the `server.cim.support.protocol` property in the property file (`server.properties`) of the Device Manager server, specify whether to open or close each port according to the type of communication.

   The setting values for `server.cim.support.protocol` are shown in the table below.

Table 7-3 Setting Values for server.cim.support.protocol

Setting Value	Port Status		Applicable Communication Type
	HTTP Port	HTTPS Port	
1	Open	Close	Non-SSL communication
2	Close	Open	SSL communication
3	Open	Open	SSL communication and non-SSL communication

2. Restart the Device Manager server.

   In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**.

   After the Device Manager server has stopped, select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.

   In Solaris or Linux:

   Execute the following command:

   installation-directory-for-the-Device-Manager-server/suitesrvcntl -stop_hdvm

   After the Device Manager server has stopped, execute the following command:

   installation-directory-for-the-Device-Manager-server/suitesrvcntl -start_hdvm

The following shows examples of executing the commands:

```
# /opt/HiCommand/suitesrvcntl -stop_hdvm
# /opt/HiCommand/suitesrvcntl -start_hdvm
```

Changing the Port Number

The following port numbers are used by the CIM/WBEM features. When Device Manager is installed in a new installation, the HTTPS port number 5989 is set as the number of the port used by the CIM/WBEM features.

- HTTP port number: 5988
- HTTPS port number: 5989

To specify the port number, follow the steps below:

1. Change the port number set in the Device Manager server property file (`server.properties`). For details on this file, see Device Manager Server Configuration Properties.

   To change the HTTP port number:

   Change the port number set in `server.cim.http.port`.

   To change the HTTPS port number:

   Change the port number set in `server.cim.https.port`.

2. Restart the Device Manager server.

   In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server.**

   After the Device Manager server has stopped, select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.

   In Solaris or Linux:

   Execute the following command:

   installation-directory-for-the-Device-Manager-server/suitesrvcntl -stop_hdvm

   After the Device Manager server has stopped, execute the following command:

   installation-directory-for-the-Device-Manager-server/suitesrvcntl -start_hdvm

   The following shows examples of executing the commands:

   ```
   # /opt/HiCommand/suitesrvcntl -stop_hdvm
   # /opt/HiCommand/suitesrvcntl -start_hdvm
   ```

Properties File Settings for Executing CIM

To execute CIM, you must first set up the properties files for the Device Manager server and restart Device Manager.

The properties files required to execute CIM include files in which the installer set values during a new installation of Device Manager and files in which the user needs to set values after installation.

Before executing CIM, make sure that the following properties in the `server.properties` file have been set.

- `server.cim.agent`
- `server.cim.support`#
- `server.cim.support.job`
- `server.cim.support.protocol`#
- `server.cim.http.port`
- `server.cim.https.port`#

  #:

  The installer sets a value for this property during a new installation of Device Manager.

For details on properties files, see Device Manager Server Configuration Properties.

Settings for the Service Discovery Feature

This section describes how to specify settings for the service discovery feature of Device Manager. To use the service discovery feature of Device Manager, the following software is required:

- **In Windows or Red Hat Enterprise Linux**:

  OpenSLP 1.0.11

  OpenSLP is provided with Device Manager. When you install Device Manager, the required file is copied. For details on OpenSLP, see the OpenSLP website (http://www.openslp.org/).

- **In Solaris**:

  SUNWslpr package and SUNWslpu package

  These packages are provided with the Solaris system. For details on the packages, see the Sun Microsystems (http://docs.sun.com/).

- **In SUSE Linux Enterprise Server**:

  OpenSLP 1.2.0

  OpenSLP is provided with the SUSE Linux Enterprise Server system. For details on OpenSLP, see the Novell website(http://www.novell.com/).

OpenSLP, the SUNWslpr package, and the SUNWslpu package need to be set up separately. For the setup procedure, see Setting Up the Service Discovery Feature.

When starting the CIM client, set the language tag (locale) for the service discovery feature to English (en).

Setting Up the Service Discovery Feature

This section describes how to specify the settings for using the service discovery feature.

In Windows

When you install Device Manager, the OpenSLP file is copied simultaneously. You do not need to specify any settings after installation, and can use the service discovery feature immediately after installation.

If the following message is displayed when Device Manager is uninstalled, release the SLP service manually from the Windows services.

```
An attempt to release the SLP service has failed. After uninstallation, release
the SLP service manually. Uninstallation continues.
```

To release the SLP service:

1. Log on as a member of the Administrator group.

2. Show the command prompt and move to the folder containing the OpenSLP executable file.
3. Release the SLP service from Windows services. Execute the following command:

```
•     slpd -remove
```

In Solaris

In Solaris, the SLP daemon is installed in the standard configuration. However, the SLP daemon does not become active with the default settings. Perform the following procedure to automatically start the SLP daemon when the system starts.

To automatically start the SLP daemon:

1. Log on as the root user.
2. Check that the SLP daemon is installed.

   Use the `pkginfo` command or the graphical user interface of Solaris to check that the SUNWslpr package and the SUNWslpu package are installed. If they are not installed, install them.
3. Change the name of the configuration file of the SLP daemon.

   Change the file name as follows:

   Before change: `/etc/inet/slp.conf.example`

   After change: `/etc/inet/slp.conf`
4. Start the SLP daemon.

   Restart Solaris or execute the following command:

```
# /etc/init.d/slpd start
```

If Device Manager is uninstalled, stop or cancel the SLP daemon, as required. You can cancel the SLP daemon by using either of the following methods:

- Delete /etc/init.d/slpd or rename it.
- Delete /etc/inet/slp.conf or rename it.

In Red Hat Enterprise Linux

When Device Manager is installed, the OpenSLP file is copied at the same time. Settings do not need to be specified after installation, and the service discovery feature can be used as is.

If the following message is displayed when Device Manager is uninstalled, release the SLP daemon manually from the Linux daemons.

```
WARNING: An attempt to release the SLP daemon has failed. After uninstallation,
release the SLP daemon manually. Uninstallation continues.
```

To release the SLP daemon:

1. Log on as the root user.
2. Stop the SLP daemon.

   Execute the following command:

   ```
   installation-directory-for-the-Device-Manager-
   server/HiCommandServer/wsi/bin/slpd.sh stop
   ```

   The following shows an example of executing the command:

   ```
   #/opt/HiCommand/HiCommandServer/wsi/bin/slpd.sh stop
   ```

3. If `/etc/init.d/slpd` exists, delete it.

   Execute the following commands:

   ```
   # chkconfig—level 01345 slpd off
   # chkconfig—del slpd
   # rm -f /etc/init.d/slpd
   ```

In SUSE Linux Enterprise Server

OpenSLP is provided with the standard configuration. No settings are required to use the service discovery feature after installing SUSE Linux Enterprise Server. You can use the service discovery feature as is.

Starting and Stopping the Service Discovery Feature

This section describes how to start and stop the SLP service.

In Windows

To manually start the SLP service, perform either of the following procedures:

- From **Administrative Tools**, select **Services** and then **Service Location Protocol** to start the SLP service.
- Show the command prompt, move to the folder containing the OpenSLP executable file, and execute the following command:
  - `slpd -start`

To stop the SLP service, perform either of the following:

- From **Administrative Tools**, select **Services** and then **Service Location Protocol**.
- Display the command prompt, move to the folder containing the OpenSLP executable file, and execute the following command:
  - `slpd -stop`

In Solaris

To manually start the SLP daemon, execute this command:

```
# /etc/init.d/slpd start
```

To stop the SLP daemon, execute this command:

```
# /etc/init.d/slpd stop
```

Note: Sometimes, the `/etc/init.d/slpd stop` command might not successfully stop the SLP daemon. In that case, perform the following procedure to stop it:

- Return the name of the `/etc/inet/slp.conf` file to `/etc/inet/slp.conf.example`.

  You must delete the `/etc/inet/slp.conf` file at this point.
- Restart Solaris.

In Red Hat Enterprise Linux

To manually start the SLP daemon, execute the following command:

```
installation-directory-for-the-Device-Manager-
server/HiCommandServer/wsi/bin/slpd.sh start
```

To stop the SLP daemon, execute the following command:

```
installation-directory-for-the-Device-Manager-
server/HiCommandServer/wsi/bin/slpd.sh stop
```

The following shows an example of executing the commands:

```
# /opt/HiCommand/HiCommandServer/wsi/bin/slpd.sh start
# /opt/HiCommand/HiCommandServer/wsi/bin/slpd.sh stop
```

In SUSE Linux Enterprise Server

To manually start or stop the SLP daemon, you need to log in to the system as the superuser.

To manually start the SLP daemon, execute the following command:

```
# /usr/sbin/rcslpd start
```

To stop the SLP daemon, execute the following command:

```
# /usr/sbin/rcslpd stop
```

Notes on Using OpenSLP

The SLP service (or SLP daemon) of OpenSLP outputs operation logs to the following file:

In Windows: `%WINDIR%slpd.log`#

#:

`%WINDIR%` is replaced by the value of the environment variable `WINDIR` in Windows. Normally, the value is `C:\WINNT\`.

In Linux: `installation-directory-for-the-Device-Manager-server/HiCommandServer/wsi/cfg/slp.log`

By default, only the start message at SLP service startup is output to the log file. Since the SLP service log output (or SLP daemon) accumulates as time elapses, if you use the SLP service (or SLP daemon) for an extended period of time, the log output might eventually use up a lot of disk space. To prevent this, you need to periodically back up the log file and clear the disk space.

The Performance Information Acquisition Feature

Device Manager can obtain performance information of a storage subsystem using the CIM interface. It acquires the following information for any or all ports (except Thunder 9200, which does not support this feature):

- Total I/O count
- Data traffic

Device Manager acquires the following information for open or mainframe volumes:

- Total I/O count
- Data traffic
- Number of read I/Os (and number of read I/Os that hit the cache)
- Number of write I/Os (and number of write I/Os that hit the cache)

System Configuration Required to Use the Performance Information Acquisition Feature

This section describes the system configuration required to acquire performance information of a storage subsystem.

Figure 7-2 shows an example system configuration when such information is collected.

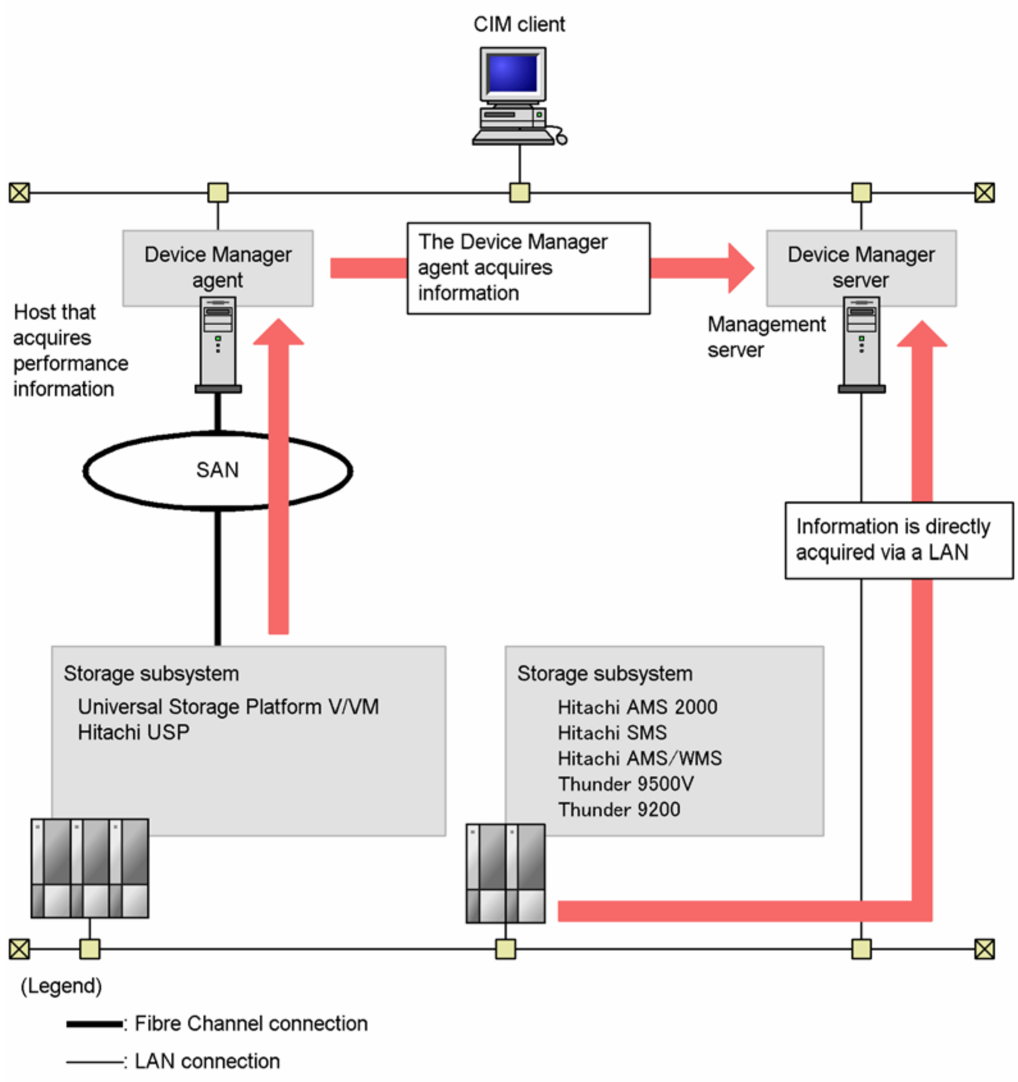


Figure 7-2 Example of a System Configuration in Which Performance Information of a Storage Subsystem Is Collected

Management server

A management server is a server in which Device Manager server version 5.9 or later is installed. You must set the management server so that CIM/WBEM can be used. For details on how to set up CIM/WBEM, see Basic Settings Required to Use the CIM/WBEM Features and Settings for Ports Used by CIM/WBEM Features.

Host that acquires performance information

This host is required when acquiring performance information of Universal Storage Platform V/VM or Hitachi USP. You must install Device Manager agent version 5.9 or later on this host.

We recommend that use the same computer for the management server and for the host to acquire performance information In this case, the OS for the host that acquires performance information must be able to support both Device Manager server and the Device Manager agent.

For example, if the OS for the management server is Windows XP, you cannot install the Device Manager agent, so you cannot use this computer as the host that acquires performance information.

Even if you use different computers for the management server and for the host to acquire performance information, the OS for the host that acquires performance information must be Windows, Solaris, or Linux. The host that acquires performance information cannot run HP-UX or AIX. For details about the OSs (Windows, Solaris, and Linux) supported by the Device Manager agent, see the *Hitachi Device Manager Agent Installation Guide*.

We recommend that you set the central management method of the Device Manager agent installed on the host that acquires performance information. For details on how to set the central management method, see the *Hitachi Device Manager Agent Installation Guide*.

Storage subsystem

This is a storage subsystem whose performance information is to be acquired. For details on the microcode versions that can use the performance information acquisition feature, see System Requirements for Storage Subsystems.

The host that acquires performance information (the Device Manager agent) acquires the information of Universal Storage Platform V/VM and Hitachi USP by using the command device within the storage subsystem, and then reports it to the Device Manager server.

In Hitachi AMS 2000, Hitachi SMS, Hitachi AMS/WMS, Thunder 9500V or Thunder 9200, the Device Manager server acquires performance information directly from a storage subsystem.

The system configuration that is required to acquire performance information of a storage subsystem differs depending on the storage subsystem model. For information on Universal Storage Platform V/VM or Hitachi USP, see Settings Required to Acquire Performance Information of Universal Storage Platform V/VM or Hitachi USP. For information on Hitachi AMS 2000, Hitachi AMS/WMS, Thunder 9500V, or Thunder 9200, see Settings Required to Acquire Performance Information of Hitachi AMS 2000, Hitachi SMS, Hitachi AMS/WMS, Thunder 9500, or Thunder 9200.

Settings Required to Acquire Performance Information of Universal Storage Platform V/VM or Hitachi USP

This section describes the settings required to acquire performance information of Universal Storage Platform V/VM or Hitachi USP.

Preparations in Storage Subsystems

Prepare a command device for each storage subsystem from which you want to acquire performance information, and then assign the path to the host that acquires performance information so that the host can recognize the command device.

Preparations in the Host That Acquires Performance Information

Configure the settings shown below for the host that acquires performance information:

To configure the settings:

1. Install the Device Manager agent.

   To acquire performance information, a CCI/LIB is necessary. If you install the Device Manager agent on a host, the necessary CCI/LIB is installed. However, if a CCI/LIB is already installed on the host, it is not overwritten. In this case, install a CCI/LIB that satisfies the following requirements:

   A CCI/LIB whose version is 01-12-03/03 or later

2. Specify settings for central management. (This is recommended.)
3. Write the command device settings into the `perf_cmddev.properties` file.

   To write the settings into the file, execute the `perf_findcmddev` command or edit the file directly. For details about the settings in the file, see Settings in the perf_cmddev.properties File. For details about the `perf_findcmddev` command, see Format of the perf_findcmddev Command.

⚠ **Note:**

- If you are using the Device Manager agent version 6.3 or earlier and you want to use a storage subsystem in an SLPR environment, directly edit the `perf_cmddev.properties` file to define command devices for SLPRs.
- If you upgrade the Device Manager agent from version 6.3 or earlier to version 6.4 or later, the settings in the `perf_cmddev.properties` file remain unchanged. If you are using a storage subsystem in an SLPR environment, after the upgrade installation finishes, refresh the information of SLPR command devices defined in the `perf_cmddev.properties` file.

Preparations in the Device Manager Server

For the Device Manager server property, specify the name of the host that acquires performance information.

Specify the name of the host on which the Device Manager agent is installed by directly editing the `server.cim.agent` property in the `server.properties` file on the Device Manager server. For details on setting this property, see server.cim.agent.

After the property is set, restart the Device Manager server.

⚠ **Note:** Verify that the host name specified for the `server.cim.agent` property matches the host name registered in Device Manager for the host that acquires performance information. If these host names are different, you cannot acquire performance information.

Settings in the perf_cmddev.properties File

Edit the `perf_cmddev.properties` file to define the command device of the target storage subsystem. The `perf_cmddev.properties` file is stored in the following location:

- In Windows:

  `installation-folder-for-the-Device-Manager-agent``\mod\hdvm\config\perf_cmddev.properties`

- In Solaris or Linux:

  `/opt/HDVM/HBaseAgent/mod/hdvm/config/perf_cmddev.properties`

Use the following format to define the command device in the `perf_cmddev.properties` file. Define one command device per line.

When using the Device Manager agent version 6.3 or earlier:

```
RAID-ID.serial-number.LDEV-number: deviceFileName
```

When using the Device Manager agent version 6.4 or later:

```
RAID-ID.serial-number.[SLPR-number.]LDEV-number: deviceFileName
```

The following table describes values to be specified in the `perf_cmddev.properties` file.

Table 7-4 Settings in the perf_cmddev.properties File

Setting Item	Value
RAID-ID	Specify one of the following depending on the type of the target storage subsystem: R600 for Universal Storage Platform V R601 for Universal Storage Platform VM R500 for Hitachi USP R501 for Hitachi NSC55
Serial-number	Specify the serial number of the storage subsystem by using a decimal (base 10) number.
SLPR-number	Specify the number of the SLPR to which the command device belongs by using a decimal (base 10) number. If no SLPR is configured, specify 0. This item is optional. If you omit this item or define this item by using the format for version 6.3 or earlier, it is assumed that no SLPR has been configured.

deviceFileName	Specify the command device identifier (the PhysicalDrive number, VolumeGUID, or device file name) that the host recognizes in the following format:[#]
	▪ In Windows:
	`\\.\PhysicalDriveX`
	`\\.\Volume{GUID}`
	▪ In Solaris:
	/dev/rdsk/c*X*t*X*d*X*s2
	▪ In Linux:
	/dev/sd*X*
	X is an integer.

LDEV-number	Specify the CU:LDEV number of the command device by using a decimal (base 10) number.

#:

- If this item is specified using the physical drive number in Windows or Linux and you then restart the OS, the physical drive number and device file name might be changed. If this occurs, you need to execute the `perf_findcmddev` command to check and update the settings. In Windows, if you specify this item using the volume GUID, the setting is not affected even if you restart the OS.
- If you are using the Device Manager agent version 6.3 or earlier and you want to acquire performance information of all SLPRs in an SLPR environment, you need to define SLPR0 command device in the `perf_cmddev.properties` file.

  To define command devices for different SLPRs that belong to the same storage subsystem, define the SLPR0 command device in the first line of the storage subsystem. The following example shows how to define `PhysicalDrive5` (whose LDEV number is 345) as the SLPR0 command device of Hitachi USP (whose serial number is 14050).

  R600.44332.456: \\.\PhysicalDrive3

  R500.14050.345: \\.\PhysicalDrive5

  R500.14050.346: \\.\PhysicalDrive6

  R500.14050.347: \\.\PhysicalDrive10

  R501.89832.780: \\.\PhysicalDrive15

Format of the perf_findcmddev Command

The `perf_findcmddev` command allows you to specify a command device in the `perf_cmddev.properties` file. To execute this command, you must have Administrator permissions (for Windows) or root permissions (for Solaris or Linux). Following is the command format:

- In Windows:

  ```
  installation-folder-for-the-Device-Manager-
  agent\bin\perf_findcmddev { view | verify | write [-file file-name] }
  ```

- In Solaris or Linux:

  ```
  installation-directory-for-the-Device-Manager-
  agent/bin/perf_findcmddev { view | verify | write [-file file-name] }
  ```

The parameters for the `perf_findcmddev` command are described below. If you specify no parameter, multiple parameters, or upper-case parameters, the method for specifying the command is displayed.

`view`

This parameter displays the settings for the command devices defined in the `perf_cmddev.properties` file. The following table describes the command device settings displayed by the `perf_findcmddev` command.

Table 7-5 Command Device Settings Displayed by the perf_findcmddev Command

Item	Description
Raid ID	Displays the RAID ID. R600 for Universal Storage Platform V R601 for Universal Storage Platform VM R500 for Hitachi USP R501 for Hitachi NSC 55
Serial#	Displays the serial number of the storage subsystem by using a decimal (base 10) number.
SLPR#	Displays the number of the SLPR to which the command device belongs by using a decimal (base 10) number. If no number is defined for the SLPR, a hyphen (-) is displayed.
LDEV#	Displays the CU:LDEV number of the command device by using a decimal (base 10) number.
Device file name	Displays the command device identifier (the physical drive number, VolumeGUID, or device file name) recognized by the host.

If an unrecognizable value is defined in the `perf_cmddev.properties` file, that value is displayed as `UNKNOWN`. On lines where the definition does not follow the proper format, all information is displayed as `UNKNOWN`. Comment lines and blank lines are not displayed. In addition, if no value is specified in the `perf_cmddev.properties` file, only the header is displayed. The following is an example of output from the command.

```
Raid ID Serial# SLPR# LDEV# Device file name
R500    14050   0     345   \\.\PhysicalDrive3
R601    44332   1     456   \\.\Volume{xxxxxxx-xxxx-xxx-xxxxxxxx}
R501    UNKNOWN -     1045  \\.\PhysicalDrive10
```

`verify`

This parameter compares the settings for the command devices defined in the file `perf_cmddev.properties` to the settings for the command devices recognized by the host. If the host recognizes multiple command devices, the execution result is output for each, regardless of whether the checked settings are valid.

- If the information of a command device defined in the `perf_cmddev.properties` file matches the information of the command device recognized by the host, the following message is displayed:

  `The definition of the command device is valid.`

- If the host does not recognize a command device defined in the `perf_cmddev.properties` file:

  The error message `KAIC28615-W` and information of the command device that is not recognized by the host are displayed.

- If a command device recognized by the host is not defined in the settings file:

  The error message `KAIC28616-W` and information of the command device that is not defined in the settings file are displayed.

Note that, if the settings for a command device are defined in the `perf_cmddev.properties` file by using the format of version 6.3 or earlier, the command device is assumed to belong to SLPR0.

`write`

This parameter outputs the settings of all command devices recognized by the host to the `perf_cmddev.properties` file. If no command device recognized by the host is detected, nothing is output to the perf_cmddev.properties file. You can use the `-file` option to specify the desired file name. To specify the file name, you can use an absolute or relative path.

If the specified file already exists, a message asking if you want to overwrite that file appears.

If you do not specify the `-file` option, the `perf_cmddev.properties` file will automatically be overwritten.

Settings Required to Acquire Performance Information of Hitachi AMS 2000, Hitachi SMS, Hitachi AMS/WMS, Thunder 9500, or Thunder 9200

This section describes the settings required to acquire performance information of Hitachi SMS, Hitachi AMS/WMS, Thunder 9500, or Thunder 9200.

Preparations in Storage Subsystems

Before you use the feature for acquiring performance information, you need to use the Physical View of Device Manager Web Client, Storage Navigator Modular, or Storage Navigator Modular 2 to specify settings for acquiring performance statistics for each relevant storage subsystem. For details, see the manuals for each storage subsystem.

Setting Up a User to Acquire Performance Information

When performance information is acquired from a storage subsystem, that storage subsystem might be locked depending on whether the Password Protection function or the Account Authentication function is enabled for it. In this case, you might be unable to acquire performance information from any storage subsystem that Device Manager, Storage Navigator Modular, or Storage Navigator Modular 2 is accessing.

- **If the Password Protection function is enabled**: The storage subsystem is always locked when you acquire performance information from it.
- **If both the Password Protection function and the Account Authentication function are disabled**: The storage subsystem is not locked when you acquire performance information from it.
- **If the Password Protection function is disabled and the Account Authentication function is enabled**: You can acquire performance information without locking the storage subsystem by creating a user account dedicated to acquiring performance information.

  To set up this account on storage subsystems and the Device Manager server:

  1. Register a user account that has only the View permission for each storage subsystem from which performance information is to be acquired.

     To acquire performance information from multiple storage subsystems, the user account registered for each of those storage subsystems must have the same user ID and password.

  2. Execute the `hdvmmodpolluser` command to register this user in Device Manager.

     For details about the `hdvmmodpolluser` command, see Format of the hdvmmodpolluser Command.

Format of the hdvmmodpolluser Command

The `hdvmmodpolluser` command is stored in the following location:

- In Windows:

  `installation-folder-for-the-Device-Manager-server``\HiCommandServer\tools\hdvmmodpolluser.bat`

- In Solaris or Linux:

installation-directory-for-the-Device-Manager-server/HiCommandServer/tools/hdvmmodpolluser.sh

The following shows the format of the `hdvmmodpolluser` command:

In Windows:

hdvmmodpolluser -u *Device-Manager-user-ID* -p *Device-Manager-password*
user-ID-for-reference password-for-reference

The following shows an example of executing the command:

```
hdvmmodpolluser -u hdvmuser -p hdvmpass hdvmperf perfpass
```

In Solaris:

hdvmmodpolluser.sh -u *Device-Manager-user-ID* -p *Device-Manager-password*
user-ID-for-reference password-for-reference

The following shows an example of executing the command:

```
hdvmmodpolluser.sh -u hdvmuser -p hdvmpass hdvmperf perfpass
```

A user you specify for the `-u` option of the `hdvmmodpolluser` command must have the Admin permission of Device Manager.

You can register only one user account in Device Manager. If you execute the `hdvmmodpolluser` command with another user account specified, the previously registered information will be overwritten.

If you want to delete user information registered in Device Manager, execute the command with the `-d` option specified.

User Permissions for Using CIM/WBEM Features

The following table lists the user permissions for using CIM/WBEM features, based on the Device Manager permissions and executable CIM methods.

Table 7-6 User Permissions for Using CIM/WBEM Features

Resource Group	Device Manager Permissions				Executable CIM Methods	
	Admin	Modify	View	Peer[#]	Service Methods	CIM Operations
All Resources	Yes	Yes	Yes	--	Permitted	Permitted
	--	Yes	Yes	--	Permitted	Permitted
	--	--	Yes	--	Not permitted	Permitted
	--	--	--	Yes	Not permitted	Permitted
User-defined resource groups	Yes	Yes	Yes	--	Not permitted	Not permitted
	--	Yes	Yes	--	Not permitted	Not permitted
	--	--	Yes	--	Not permitted	Not permitted
	--	--	--	Yes	Not permitted	Permitted

Legend:

Yes: Has corresponding Device Manager permissions

--: Does not have corresponding Device Manager permissions

Permitted: Execution of corresponding CIM methods is permitted

Not permitted: Execution of corresponding CIM methods is not permitted

#: For *Peer* Device Manager permissions, users are treated as All Resources users, even when they belong to a user-defined resource group, due to Device Manager server processing.

8

Starting and Stopping the Device Manager Server

This chapter describes how to start and stop the Device Manager server.

Before Controlling the Device Manager Server

If you start or stop the Device Manager server, the Provisioning Manager server also starts or stops. Also, when you start or stop Common Component, the following services start or stop:

- HBase Storage Mgmt Web Service
- HBase Storage Mgmt Common Service
- HiRDB

Table 8-1 describes the resident processes of the Device Manager server and Common Component in Windows.

Table 8-1 Resident Processes of the Device Manager Server and Common Component (in Windows)

Process name	Service name	Function
`HiCommandServer`	HiCommandServer	The Device Manager server
`hcmdssvctl.exe`	HBase Storage Mgmt Common Service	Hitachi Storage Command Suite servlet service. If the Device Manager server and other Hitachi Storage Command Suite products are installed on the same computer, a process of a service other than HBase Storage Mgmt Common Service might be started by using the name `hcmdssvctl.exe`.
`httpsd.exe`	HBase Storage Mgmt Web Service	Hitachi Storage Command Suite common web service. Multiple instances of this process might be running.
`hntr2mon.exe`	Hitachi Network Objectplaza Trace Monitor 2	Hitachi Storage Command Suite common trace information collection (Integrated trace information is collected.)
`hntr2srv.exe`		Hitachi Storage Command Suite common trace service (This service processes events from the Services window.)

Table 8-2 describes the resident processes of the Device Manager server and Common Component in Solaris or Linux.

Table 8-2 Resident Processes of the Device Manager Server and Common Component (in Solaris or Linux)

Process name	Function
`hicmdserver`	The Device Manager server In Solaris: `/bin/sh` *`installation-directory-for-the-Device-Manager-server`*`/HiCommandServer/hicmdserver` In Linux: *`installation-directory-for-the-Device-Manager-server`*`/HiCommandServer/hicmdserver`

Process name	Function
`webcont.sh`	Hitachi Storage Command Suite servlet service In Solaris: */bin/sh installation-directory-for-Common-Component*/CC/web/containers/HiCommand/webcont.sh In Linux: *installation-directory-for-Common-Component*/CC/web/containers/HiCommand/webcont.sh
installation-directory-for-Common-Component/httpsd/sbin/httpsd	Hitachi Storage Command Suite common web service Multiple instances of this process might be running.
/opt/hitachi/HNTRLib2/bin/hntr2mon	Hitachi Storage Command Suite common trace information collection (Integrated trace information is collected.)

WARNING:

- If a Device Manager client (such as Web Client, Device Manager CLI, or the Device Manager agent) is accessing the Device Manager server on a computer when that computer is shut down, the client processing will terminate because the Device Manager server will stop. Make sure that clients are not accessing the server before shutting down a computer on which the Device Manager server is running.
- If the management server OS is Windows, HiRDB/EmbeddedEdition _HD0 must be always running. If it is not running, start it from the Services panel.
- Do not execute the `hicommand`, `hcmdssrv`, or `suitesrvcntl` command while the `suitesrvcntl` command is executing. If you do so, the `suitesrvcntl` command might not execute correctly. If you accidentally execute one of these commands, re-execute the `suitesrvcntl` command. Also, do not execute the `suitesrvcntl` command while the `hicommand` or `hcmdssrv` command is executing.

Starting the Device Manager Server

To start the Device Manager server:

In Windows:

Log in as a user with Administrator permissions, and then start the Device Manager server in either of the following ways:

By using Windows functions:

Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Start Server**.

By using the following command:

```
installation-folder-for-the-Device-Manager-server\suitesrvcntl
/start_hdvm
```

In Solaris or Linux:

Log in as a root user, and then execute the following command:

```
installation-directory-for-the-Device-Manager-server/suitesrvcntl -
start_hdvm
```

Stopping the Device Manager Server

To stop the Device Manager server:

In Windows:

Log in as a user with Administrator permissions, and then stop the Device Manager server in either of the following ways:

By using Windows functions:

Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Stop Server**.

By using the following command:

```
installation-folder-for-the-Device-Manager-server\suitesrvcntl
/stop_hdvm
```

In Solaris or Linux:

Log in as a root user, and then execute the following command:

```
installation-directory-for-the-Device-Manager-server/suitesrvcntl -
stop_hdvm
```

Checking the Operating Status of the Device Manager Server

To check the operating status of the Device Manager server:

In Windows:

Log in as a user with Administrator permissions, and then check the operating status of the Device Manager server in either of the following ways:

By using Windows functions:

Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Server Status**.

By using the following command:

```
installation-folder-for-the-Device-Manager-server\suitesrvcntl
/status_hdvm
```

In Solaris or Linux:

Log in as a root user, and then execute the following command:

```
installation-directory-for-the-Device-Manager-server/suitesrvcntl -
status_hdvm
```

Starting the Device Manager Server and Common Component

To start the Device Manager server and Common Component:

In Windows:

Log in as a user with Administrator permissions, and then start the Device Manager server and Common Component in either of the following ways:

By using Windows functions:

Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Start Server with Common Services**.

By using the following command:

```
installation-folder-for-Common-Component\bin\hcmdssrv /start
```

In Solaris or Linux:

Log in as a root user, and then execute the following command:

```
installation-directory-for-Common-Component/bin/hcmdssrv -start
```

⚠ ***Caution:*** Services of other Hitachi Storage Command Suite products whose versions are 5.7 or later are started at the same time.

- If you start the Device Manager server and Common Component at the same time, services of other Hitachi Storage Command Suite products whose versions are 5.7 or later also start. For details about how to start services of HiCommand Suite products whose versions are earlier than 5.7, see the manual for your product version.
- If the Common Component services are already running when you use the above methods, the Device Manager server and the Tiered Storage Manager server will not start. In this case, start the Device Manager server or the Tiered Storage Manager server independently of Common Component.

Stopping the Device Manager Server and Common Component

To stop the Device Manager server and Common Component:

In Windows:

Log in as a user with Administrator permissions, and then stop the Device Manager server and Common Component in either of the following ways:

By using Windows functions:

Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Stop Server with Common Services**.

By using the following command:

```
installation-folder-for-Common-Component\bin\hcmdssrv /stop
```

In Solaris or Linux:

Log in as a root user, and then execute the following command:

```
installation-directory-for-Common-Component/bin/hcmdssrv -stop
```

Caution:

- Services of other Hitachi Storage Command Suite products whose versions are 5.7 or later stop at the same time. If you stop the Device Manager server and Common Component at the same time, services of other Hitachi Storage Command Suite products whose versions are 5.7 or later also stop. For details about how to stop services of HiCommand Suite products whose versions are earlier than 5.7, see the manual for your product version.
- In Solaris or Linux, do not stop Common Component before it has completed startup. If you do so, the service status might indicate that the service has stopped even though a resident process for the service is running, or you might be unable to stop the service. In such cases, restart the computer.

Checking the Operating Status of the Device Manager Server and Common Component

To check the operating status of the Device Manager server and Common Component:

In Windows:

Log in as a user with Administrator permissions, and then check the operating status of the Device Manager server and Common Component in either of the following ways:

By using Windows functions:

Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Server and Common Services Status**.

By using the following command:

```
installation-folder-for-Common-Component\bin\hcmdssrv /statusall
```

In Solaris or Linux:

Log in as a root user, and then execute the following command:

```
installation-directory-for-Common-Component/bin/hcmdssrv -statusall
```

9

Managing the Database

This chapter describes how to back up or restore the Device Manager server database.

Before Managing the Database

This section describes how to perform the following operations for the Device Manager server database:

- Backing up
- Restoring the backed-up data
- Migrating the database (exporting and importing)
- Initializing the database

Because Provisioning Manager uses the Device Manager server database, Provisioning Manager data will also be backed up or restored when you back up or restore the Device Manager server database. To back up or restore Provisioning Manager data, you perform the operations on the Device Manager server database.

Table 9-1 describes backing up and restoring, as opposed to exporting and importing.

Table 9-1 Backing Up and Restoring as Opposed to Exporting and Importing

Item	Backing Up and Restoring	Exporting and Importing
Restrictions on Hitachi Storage Command Suite product versions	No restrictions	Version 5.5 or later of Hitachi Storage Command Suite products must be installed on the server to which data is imported or from which data is exported.
Main purpose	To restore the current operating environment if a failure occurs on the server	To migrate the server data from the current environment to a different environment (such as a server that has a different OS)
Target data	▪ Databases for Hitachi Storage Command Suite products ▪ The Common Component database	▪ Databases for Hitachi Storage Command Suite products ▪ User information in the Common Component database
Conditions for the server to which data is restored or imported	The following conditions must be the same for the server from which data is backed up and the server to which the backed-up data is restored: ▪ Which Hitachi Storage Command Suite products are installed, and their versions and revisions ▪ Installation locations for Hitachi Storage Command Suite products, Common Component, and their databases ▪ The IP address and host name of the host	▪ The Hitachi Storage Command Suite products whose databases are to be imported must be installed. ▪ The versions of the installed Hitachi Storage Command Suite products must be the same as or later than the ones on the host from which data is exported.

The following sections describe the procedure for each operation separately.

Backing Up the Database

To back up the Device Manager database, a directory for storing the backup files is required. This directory requires the following space, including the space required for the temporary files created by the backup command.

Required space:

(*total-size-of-the-databases-for-Hitachi-Storage-Command-Suite-products-to-be-backed-up* x 2) + 20 MB

For example, if Device Manager and Provisioning Manager are installed on the same server, estimate the required space by totaling the sizes of the following directories:

- The directory of the Device Manager database
- The directory of the Common Component database

If other Hitachi Storage Command Suite products are installed, add the sizes of their directories to your estimate.

Caution: If Tuning Manager is remotely connected, stop the Tuning Manager services on the computer where the Tuning Manager server is installed. After the database is backed up, restart the Tuning Manager services. For details about how to start and stop the Tuning Manager services, see the manual for the installed version of Tuning Manager.

To back up a database:

1. If HiCommand Suite products whose versions are earlier than 5.7 are installed, stop their services.

   For details about how to stop these services, see the manual for your product version.

2. Execute the `hcmdsbackups` command to back up the database.

   In Windows:

   ```
   installation-folder-for-Common-Component\bin\hcmdsbackups /dir
   folder-for-storing-backup-files /auto
   ```

   In Solaris or Linux:

   ```
   installation-directory-for-Common-Component/bin/hcmdsbackups -
   dir directory-for-storing-backup-files -auto
   ```

   The following options can be specified for the `hcmdsbackups` command:

   `dir`

   Specify the absolute path of the directory on the local disk that stores the backup files of the Device Manager server database. In Solaris or Linux, do not specify a path that includes a space.

Caution: Make sure that no files or subdirectories are in the directory specified for the `dir` option. If any are, the backup will be aborted. In this case, delete the files or subdirectories in that directory, and then re-execute the `hcmdsbackups` command.

`auto`

This option automatically changes the Hitachi Storage Command Suite product services and the HiRDB service that are on the same computer to the statuses required for backing up the database. After the command finishes, the Hitachi Storage Command Suite product services and the HiRDB service will be active.

When you execute the `hcmdsbackups` command, the directory `database` will be created in the directory for storing backup files, specified with the `dir` option, and these files will be combined and stored as the file `backup.hdb`.

Note: The setting files for Hitachi Storage Command Suite products are backed up in locations other than the `database` directory created in the directory for storing backup files, specified with the `dir` option. If an error occurs in the management server and you need to re-install Hitachi Storage Command Suite products, you can use the backed up setting files to check the previous settings.

3. If HiCommand Suite products whose versions are earlier than 5.7 are installed, start their services as needed.

For details about how to start these services, see the manual for your product version.

Restoring the Database

Before restoring the database, make sure that the items below are the same on the server from which the Device Manager server database was backed up and on the server to which the backed-up database is to be restored. If the following differ, the database cannot be restored:

- The installed Hitachi Storage Command Suite products, and their versions and revisions
- Installation locations for Hitachi Storage Command Suite products, Common Component, and their databases
- The IP address and host name of the host

Caution:

- The `hcmdsdb` command, which is used in the procedure below, creates temporary files during execution. Make sure that you have write permission for the directory that contains backup files, and that the directory has enough space. The required space can be estimated as follows:
  total-size-of-the-databases-for-Hitachi-Storage-Command-Suite-products-to-be-backed-up + 20 MB
- If Tuning Manager is remotely connected, stop the Tuning Manager services on the computer where the Tuning Manager server is installed. After the database is restored, restart the Tuning Manager services. For details about how to start and stop the Tuning Manager services, see the manual for the installed version of Tuning Manager.

To restore a database:

1. If HiCommand Suite products whose versions are earlier than 5.7 are installed, stop their services.

   For details about how to stop these services, see the manual for your product version.

2. Execute the `hcmdsdb` command to restore the database.

   In Windows:

   ```
   installation-folder-for-Common-Component\bin\hcmdsdb.bat
   /restore backup-file /type name-of-the-Hitachi-Storage-Command-
   Suite-product-to-be-restored /auto
   ```

   In Solaris or Linux:

   ```
   installation-directory-for-Common-Component/bin/hcmdsdb -restore
   backup-file -type name-of-the-Hitachi-Storage-Command-Suite-
   product-to-be-restored -auto
   ```

   You can specify the following options for the `hcmdsdb` command:

   `restore`

Specify the absolute path to the Device Manager server database backup file (backup.hdb) created by using the hcmdsbackups command. In Solaris or Linux, do not specify a path that includes a space.

type

Specify the name of the Hitachi Storage Command Suite product to be restored.

To restore only the Device Manager database, specify DeviceManager.

To restore all the Hitachi Storage Command Suite product databases at once, specify ALL.

If you uninstalled all the Hitachi Storage Command Suite products and then reinstalled them, specify ALL to restore their databases.

WARNING: If you do not want to restore the databases for Hitachi Storage Command Suite products other than Device Manager, specify DeviceManager.

auto

This option automatically changes the Hitachi Storage Command Suite product services and the HiRDB service that are on the same computer to the statuses required for restoring the database. After the command finishes, the Hitachi Storage Command Suite product services and the HiRDB service will remain stopped.

3. If DeviceManager is specified for the type option, specify true for the server.base.initialsynchro property in the server.properties file.

   For details about this property, see server.base.initialsynchro.

4. To remotely connect to Tuning Manager, execute the htmsetup command. For details, see htmsetup Command.

5. Start the services of Hitachi Storage Command Suite products and Common Component as follows.

   In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Start Server with Common Services**.

   In Solaris or Linux, execute the following command:

   ```
   installation-directory-for-Common-Component/bin/hcmdssrv -start
   ```

Caution: The services of HiCommand Suite products whose versions are earlier than 5.7 do not start automatically. If such products are installed, start their services manually as needed. For details about how to start these services, see the manual for your product version.

6. Change the value of the server.base.initialsynchro property in the server.properties file back to false.

Migrating the Databases

If you use Hitachi Storage Command Suite products for an extended period of time, you might need a higher performance computer to run an upgraded product or to handle an increased number of managed objects. In such a case, you have to migrate the current databases to your new computer. You can migrate Hitachi Storage Command Suite product databases by using the `hcmdsdbtrans` command. This command migrates both the data stored in the databases of Hitachi Storage Command Suite products and the user information managed by Common Component.

You can also use the `hcmdsdbtrans` command to migrate the Device Manager database to a server whose environment differs from the current one in any of the following ways:

- Migration to a server of a different platform
- Migration to a server on which installation locations for Hitachi Storage Command Suite products differ from the ones on the migration source server
- Migration to a server on which versions of Hitachi Storage Command Suite products are later than the ones on the migration source server

Notes on Migrating Databases

The following are notes on the databases, product types, versions, and user information of Hitachi Storage Command Suite products on the migration source and destination servers.

Notes on databases, product types, and versions of Hitachi Storage Command Suite products:

- – Databases of Hitachi Storage Command Suite products that do not exist on the migration destination server cannot be migrated. Install necessary products on the migration destination server before migration.
- – If a storage subsystem that is not supported on the migration destination server is registered in the Device Manager database on the migration source server, delete that storage subsystem from the database before migration.
- – If any of the versions of the Hitachi Storage Command Suite products installed on the migration destination server are earlier than the ones on the migration source server, no databases can be migrated. On the migration destination server, install Hitachi Storage Command Suite products whose versions are the same as or later than the ones on the migration source server.
- – If you want to migrate the database of Replication Monitor 4.2 or earlier, upgrade Replication Monitor on the migration source and

destination servers to version 5.0 or later in advance. If you cannot upgrade Replication Monitor to version 5.0 or later, or the Replication Monitor database does not need to be migrated, use the type option to specify all products other than Replication Monitor when you execute the command.

- If you want to migrate the data in the Replication Monitor database to a Replication Manager database, upgrade Replication Monitor on the migration source server to Replication Manager, and then migrate the database.
- The following restrictions apply when migrating the Tuning Manager database.

  If the version of Tuning Manager is earlier than 6.0, first upgrade Tuning Manager to version 6.0 or later on both the migration source and destination servers.

  Specify the same capacity for the Tuning Manager database on these servers. For details about how to change the capacity of the database, see the *Hitachi Tuning Manager Server Administration Guide*.

  The database can be migrated if the database configuration (Small or Medium) is the same on both the migration source and destination servers, or if the database configuration on the migration destination server is larger than that on the source server.

  On the migration source server, if the number of managed resources exceeds 70% of the number of manageable resources, the database data cannot be migrated to a database that has the same configuration.

Notes on user information:

- If there is user information on the migration destination server, this user information will be replaced with the user information from the migration source server. Therefore, do not perform a migration to a server on which user information for Hitachi Storage Command Suite products already exists.
- Do not migrate the databases of Hitachi Storage Command Suite products that were running on different management servers to one management server because user information will be overwritten.

Procedure for Migrating Databases

To migrate databases:

1. On the migration destination server, install the Hitachi Storage Command Suite products whose databases will be migrated.
2. Export the databases from the migration source server by using the `hcmdsdbtrans` command.
3. Transfer the archive file from the source server to the destination server.
4. Import the databases into the destination server by using the `hcmdsdbtrans` command.

The following sections describe each step.

On the Migration Destination Server, Install the Hitachi Storage Command Suite Products

On the migration source server, install the Hitachi Storage Command Suite products whose databases will be migrated. The versions of the Hitachi Storage Command Suite products installed on the migration destination server must be the same as or later than the ones on the migration source server.

Exporting the Databases from the Migration Source Server

To export the Device Manager database, a directory for temporarily storing the database data and a directory for storing the archive file are required. These directories require as much capacity as the total size of the following two directories:

- The directory of the Device Manager database
- The directory of the Common Component database (other than the `SYS` directory and its subdirectories)

The above estimate applies if only Device Manager is installed. If other Hitachi Storage Command Suite products are installed, add the capacities of their databases to your estimate.

Caution:

- Databases are exported as archive files. If the total capacity of databases exceeds 2 GB, creation of the archive file fails when the database data is exported. In this case, instead of using the archive file, transfer the exported database data to the migration destination.
- If Tuning Manager is remotely connected, stop the Tuning Manager services on the computer where the Tuning Manager server is installed. After the database is exported, restart the Tuning Manager services. For details about how to start and stop the Tuning Manager services, see the manual for the installed version of Tuning Manager.

To export the databases from the migration source server:

1. If HiCommand Suite products whose versions are earlier than 5.7 are installed, stop their services.

   For details about how to stop these services, see the manual for your product version.

2. Execute the `hcmdsdbtrans` command to export the databases.

   In Windows:

   ```
   installation-folder-for-Common-Component\bin\hcmdsdbtrans
   /export /workpath working-folder /file archive-file /auto
   ```

   In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsdbtrans -
export -workpath working-directory -file archive-file -auto
```

The following options can be specified for the hcmdsdbtrans command:

workpath

Specify the absolute path to the working directory where you want to temporarily store database data. In Solaris or Linux, do not specify a path that includes a space. Specify a directory on your local disk.

> ***Caution:*** Make sure that no files or subdirectories are in the directory specified for the workpath option. If any are, the export will be aborted. In this case, delete the files and subdirectories in that directory, and then re-execute the hcmdsdbtrans command.

file

Using an absolute path, specify the name of the archive file to be output. In Solaris or Linux, do not include a space in this path.

auto

This option automatically changes the Hitachi Storage Command Suite product services and the HiRDB service that are on the same computer to the statuses required for exporting the databases. After the command finishes, the Hitachi Storage Command Suite product services and the HiRDB service will be active.

3. Transfer the exported files to the migration destination server.

   If the archive file cannot be created, transfer all the files created in the directory specified by the workpath option. In this case, do not change the structure of the files.

Importing the Databases to the Migration Destination Server

To import the databases to the migration destination server:

> ***Caution:*** If Tuning Manager is remotely connected, stop the Tuning Manager services on the computer where the Tuning Manager server is installed. After the database is imported, restart the Tuning Manager services. For details about how to start and stop the Tuning Manager services, see the manual for the installed version of Tuning Manager.

1. If HiCommand Suite products whose versions are earlier than 5.7 are installed, stop their services.

   For details about how to stop these services, see the manual for your product version.

2. Execute the hcmdsdbtrans command to import the databases.

   In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsdbtrans
/import /workpath working-folder [/file archive-file] /type
{ALL|Hitachi-Storage-Command-Suite-products-whose-databases-
will-be-migrated} /auto
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsdbtrans -
import -workpath working-directory [-file archive-file] -type
{ALL|Hitachi- Storage-Command-Suite-products-whose-databases-
will-be-migrated} -auto
```

The following options can be specified for the `hcmdsdbtrans` command:

`workpath`

When using the archive file for the import:

Specify the absolute path to the directory used to extract the archive file. In Solaris or Linux, do not specify a path that includes a space. Specify a directory on your local disk. If you want to use the archive file, the `file` option must be specified.

Caution: Make sure that no files or subdirectories are in the directory specified for the `workpath` option. If any are, the import will be aborted. In this case, delete the files or subdirectories in that directory, and then re-execute the `hcmdsdbtrans` command.

When not using the archive file for the import:

Specify the directory that stores the database data files transferred from the migration source server. Do not change the structure of those files in the transferred directory. Also, do not specify the `file` option.

`file`

Specify the absolute path to the archive file of the databases transferred from the migration source server. In Solaris or Linux, do not specify a path that includes a space. If the database data files transferred from the migration source server are stored in the directory specified by `workpath`, you do not need to specify this option.

`type`

Specify the names of the Hitachi Storage Command Suite products whose databases will be migrated. Only the databases of the specified products will be migrated.

To migrate the Device Manager database, specify `DeviceManager`. For details about the names to specify when you migrate databases of other products, see the manuals for those products. If you specify multiple product names, use a comma to separate the names.

To migrate the databases of all the installed Hitachi Storage Command Suite products at once, specify `ALL`. The databases of the Hitachi Storage Command Suite products installed on the migration destination server are automatically migrated.

You can use the type option to migrate databases only if the database data of all the specified products is contained in the archive file or in the directory specified by the workpath option, and all the specified products exist on the migration destination server. If any of the products do not meet the above conditions, data cannot be migrated.

auto

This option automatically changes the Hitachi Storage Command Suite product services and the HiRDB service that are on the same computer to the statuses required for importing the databases. After the command finishes, the Hitachi Storage Command Suite product services and the HiRDB service will remain stopped.

3. Synchronize the repository information with the imported Device Manager database data.

   Specify true for the server.base.initialsynchro property in the server.properties file.

   Because, other than user information, the hcmdsdbtrans command does not migrate the Common Component repository, you need to synchronize the repository information with the imported Device Manager database data.

   For details about the server.base.initialsynchro property, see server.base.initialsynchro.

4. To remotely connect to Tuning Manager, execute the htmsetup command. For details, see htmsetup Command.

5. Start the services of the Hitachi Storage Command Suite products and Common Component on the migration destination server as follows.

   In Windows:

   Select **Start, All Programs, Hitachi Storage Command Suite, Device Manager**, and then **Start Server with Common Services**.

   In Solaris or Linux, execute the following command:

   ```
   installation-directory-for-Common-Component/bin/hcmdssrv -start
   ```

⚠ ***Caution:*** The services of HiCommand Suite products whose versions are earlier than 5.7 do not start automatically. If such products are installed, start their services manually as needed. For details about how to start these services, see the manual for your product version.

6. Change the value of the server.base.initialsynchro property in the server.properties file back to false.

Initializing the Database

By initializing the Device Manager server database, you can restore it to the state it was in immediately after a new installation of Device Manager. The existing user account settings remain unchanged because the Common Component database is not initialized.

To initialize the Device Manager server database:

1. Make sure that the Common Component services are running as follows.

   In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Server and Common Services Status**.

   Make sure that the following messages, which indicate that the Common Component services are running, appear:

   ```
   The Device Manager server started.
   ```

   ```
   The common services started.
   ```

   In Solaris or Linux, execute the following command:

   ```
   installation-directory-for-Common-Component/bin/hcmdssrv -status
   ```

   Make sure that the following messages, which indicate that the Common Component services are running, appear:

   ```
   KAPM06440-I The HiRDB service has already started.
   ```

   ```
   KAPM05007-I Already started service. service-name=HBase Storage
   Mgmt Web Service
   ```

   ```
   KAPM05007-I Already started service. service-name=HBase Storage
   Mgmt Common Service
   ```

   If the Common Component services are not running, execute the following command.

   In Windows:

   ```
   installation-folder-for-Common-Component\bin\hcmdssrv /start
   ```

   In Solaris or Linux:

   ```
   installation-directory-for-Common-Component/bin/hcmdssrv -start
   ```

2. Stop the Device Manager server as follows.

   In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Stop Server**.

   In Solaris or Linux, execute the following command:

   ```
   installation-directory-for-the-Device-Manager-
   server/suitesrvcntl -stop_hdvm
   ```

3. Execute the `database` command to initialize the database.

   In Windows:

```
installation-folder-for-the-Device-Manager-server\database.bat
initialize
```

In Solaris or Linux:

```
installation-directory-for-the-Device-Manager-server/database.sh
initialize
```

4. Specify `true` for the `server.base.initialsynchro` property in the `server.properties` file.

   For details about this property, see server.base.initialsynchro.

5. Start the Device Manager server as follows.

   In Windows:

   Select **Start**, **All Programs**, **Hitachi Storage Command Suite, Device Manager**, and then **Start Server**.

   In Solaris or Linux, execute the following command:

   ```
   installation-directory-for-the-Device-Manager-
   server/suitesrvcntl -start_hdvm
   ```

6. Change the value of the `server.base.initialsynchro` property in the `server.properties` file back to `false`.

10

Troubleshooting

This chapter describes how to resolve problems that can occur during Device Manager operation and how to read the contents of log files.

Common Problems and Solutions

The following table lists the most common problems that occur on the Device Manager server, and describes how to resolve them.

For details on Device Manager error codes, see the *Hitachi Device Manager Error Codes*.

Table 10-1 Common Problems and Solutions

Problem and Cause	Solution
PROBLEM: Inconsistencies in LUNs and logical group information. LUNs disappear or logical group information is inconsistent between the Device Manager servers. CAUSE: Multiple Device Manager servers are managing the storage subsystems	SOLUTION: Never have more than one active Device Manager server managing a single storage array at a time. Device Manager was designed to manage multiple storage subsystems, but not to cooperate with other Device Manager servers to manage the same storage array. More than one active Device Manager client is not a problem.

Problem and Cause	Solution
PROBLEM: In Windows, reports are not displayed when the **HTML** button is clicked in the Storage Utilization by Host - Reports subwindow or Storage Utilization by Logical Group - Reports subwindow in Web Client. CAUSE: Either too many storage subsystems have been selected, or the size of the memory heap used by the Device Manager server is too small.	SOLUTION: Decrease the number of storage subsystems selected in the Storage Utilization by Host - Reports subwindow or Storage Utilization by Logical Group - Reports subwindow, and then display a report. Alternatively, increase the size of the memory heap used by the Device Manager server to allow reports to be displayed. The size of the memory heap can be changed as follows. 1. Edit the `Server.ini` file, which is in the following folder, to change the memory heap size: *installation-folder-for-the-Device-Manager-server*\HiCommandServer 2. Open the `Server.ini` file in a text editor, and then change the value of JVM_XOPT_HEAP_MAX to the value calculated below, in MB. The default value is 256 MB. If the result of the following formula is already smaller than 256 MB, then no changes are needed. The format is as follows: JVM_XOPT_HEAP_MAX=-Xmx*setting-value*m *setting-value* = (0.0145 x *number-of-LUNs-displayed* + 0.00165 x *number-of-WWNs-displayed*) x N *number-of-LUNs-displayed*: Total number of LUNs displayed per host (not the number of LUNs set for the storage subsystem) *number-of-WWNs-displayed*: Total number of WWNs displayed per LUN *number-of-users*: Number of users using the report feature concurrently. 3. After you change the `Server.ini` file, restart the Device Manager server as follows: Select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Stop Server**. After the Device Manager server has been stopped, select **Start**, **All Programs**, **Hitachi Storage Command Suite**, **Device Manager**, and then **Start Server**.

Problem and Cause	Solution
PROBLEM: In Solaris or Linux, reports are not displayed when the **HTML** button is clicked in the Storage Utilization by Host - Reports subwindow or the Storage Utilization by Logical Group - Reports subwindow in Web Client. CAUSE: Either too many storage subsystems have been selected, or the size of the memory heap used by the Device Manager server is too small.	SOLUTION: Decrease the number of storage subsystems selected in the Storage Utilization by Host - Reports subwindow or Storage Utilization by Logical Group - Reports subwindow, and then display a report. Alternatively, increase the size of the memory heap used by the Device Manager server to allow reports to be displayed. The size of the memory heap can be changed as follows. 1. Use a text editor to open the following file: *installation-directory-for-the-Device-Manager-server*/hicommand.sh 2. Change the value of the -Xmx option of the java command specified in the start option script to the value calculated below, in MB. The default value is 256 MB. If the result of the following formula is already smaller than 256 MB, then no changes are needed. (0.0145 x *number-of-LUNs-displayed* + 0.00165 x *number-of-WWNs-displayed*) x *number-of-users* *number-of-LUNs-displayed*: Total number of LUNs displayed per host (not the number of LUNs set for the storage subsystem) *number-of-WWNs-displayed*: Total number of WWNs displayed per LUN *number-of-users*: Number of users using the report feature concurrently. The following shows how to change the value for a value of 512 MB as calculated above. Before: `java -Xmx256m -classpath ...` After: `java -Xmx512m -classpath ...` 3. After the hicommand.sh file is changed, perform the following to restart the Device Manager server. Execute the following command: *installation-directory-for-the-Device-Manager-server*/suitesrvcntl -stop_hdvm After the Device Manager server has been stopped, execute the following command: *installation-directory-for-the-Device-Manager-server*/suitesrvcntl -start_hdvm

Problem and Cause	Solution
PROBLEM: Log in to Web Client is impossible. CAUSE: The user account might have been locked.	SOLUTION: For a user without Admin (user management) permission: Ask a user with Admin (user management) permission to unlock the account. For a user with Admin (user management) permission: Ask another user with Admin (user management) permission to unlock the account. Alternatively, execute the hcmdsunlockaccount command to unlock your own account. To unlock the account by using the hcmdsunlockaccount command: 1. Execute the following command to confirm that the Common Component services are running: In Windows: *installation-folder-for-Common-Component*\bin\hcmdssrv/status In Solaris or Linux: *installation-directory-for-Common-Component*/bin/hcmdssrv -status If the Common Component services are not running, execute the following command: In Windows: *installation-folder-for-Common-Component*\bin\hcmdssrv /start In Solaris or Linux: *installation-directory-for-Common-Component*/bin/hcmdssrv -start 2. Execute the hcmdsunlockaccount command to unlock the account. In Windows: *installation-folder-for-Common-Component*\bin\hcmdsunlockaccount /user *user-ID* /pass *password* In Solaris or Linux: *installation-directory-for-Common-Component*/bin/hcmdsunlockaccount -user *user-ID* -pass *password* For *user-ID*, specify the user ID of the user whose account you want to unlock. For *password*, specify the password of the user whose account you want to unlock.

Problem and Cause	Solution
	Note: If the following symbols are included in the user ID or password, you need to escape the symbol on the command line: ▪ In Windows: If the user ID or password ends with a backslash (\), use another backslash (\) to escape that backslash (\).Also, if the user ID or password includes an ampersand (&), vertical bar (|), or caret (^), enclose each character with a double quotation mark ("), or use a caret (^) to escape the symbols.· ▪ In Solaris or Linux: Use a backslash (\) to escape each character. Note that, if a password is not set for the target user, you cannot unlock the account by using the `hcmdsunlockaccount` command.
PROBLEM: The services of Common Component or the Device Manager server cannot be started. CAUSE: The desktop heap might be insufficient.	SOLUTION: Edit the registry to change the area of the desktop heap. For details, see the Microsoft homepage.

Obtaining Maintenance Information of Device Manager

Table 10-2 describes the maintenance information kept by Device Manager.

Table 10-2 Device Manager Maintenance Information

Log Type	Log Name	Description	Location (Windows)	Location (Solaris, Linux)
Common trace log file	`hntr2`*`n`*`.log`	Integrated trace log information produced by Common Component. The *n* in the file name indicates the backup generation number of the file. For details on specifying the number and size of files, see Settings for Integrated Logs. The characters below will be output after being converted as follows if they are contained in a message whose error code is in the range from `KAIC00000` to `KAIC09999`: ▪ Line feed character: Converted to an at mark (`@`). ▪ At mark (`@`): Converted to `\@`.	*`program-files-folder`*`\Hitachi\HNTRLib2\spool`	`/var/opt/hitachi/HNTRLib2/spool`
Event log/syslog file	Event log	Windows event log (includes audit log data). For details on audit log data, see Checking Audit Log Data.	Event viewer	N/A
	syslog	Solaris or Linux system log (includes audit log data). For details on audit log data, see Checking Audit Log Data.	N/A	Defined by `/etc/syslog.conf`
Device Manager log file	version	Version information about the operating environment of the Device Manager server (the Device Manager server, Java VM, and operating system)	*installation-folder-for-the-Device-Manager-server*`\HiCommandS`	*`installation-directory-for-the-Device-Manager-server`*`/HiCommand`

Log Type	Log Name	Description	Location (Windows)	Location (Solaris, Linux)
Device Manager trace log file (Common Component)	HDvMtrace*n*.log	Trace log information output by Common Component and used by the Device Manager server. The *n* in the file name indicates the backup generation number of the file. The characters below will be output after being converted as follows if they are contained in a message whose error code is in the range from KAIC00000 to KAIC09999: ▪ Line feed character: Converted to an at mark (@). ▪ At mark (@): Converted to \@.	erver\logs	Server/logs

Maintenance information can be obtained by executing one of the commands shown below. When you execute the command, maintenance information (log files and database files) is acquired, and four archive files (`.jar`, `.hdb.jar`, `.db.jar`, and `.csv.jar`) are created.

In Windows:

```
installation-folder-for-Common-Component\bin\hcmdsgetlogs /dir
folder-name [/types Hitachi-Storage-Command-Suite-product-name[
Hitachi-Storage-Command-Suite-product-name ...]] [/arc archive-
file-name] [/logtypes log-file-type[ log-file-type ...]]
```

In Solaris or Linux:

```
installation-directory-for-Common-Component/bin/hcmdsgetlogs -dir
directory-name [-types Hitachi-Storage-Command-Suite-product-name[
Hitachi-Storage-Command-Suite-product-name ...]] [-arc archive-
file-name] [-logtypes log-file-type[ log-file-type ...]]
```

Note:

- In Windows, log on as a member of the Administrators group. In Solaris or Linux, log in as root.
- Do not execute more than one `hcmdsgetlogs` command simultaneously.
- If the KAPM05318-I or KAPM05319-E message is not output after the `hcmdsgetlogs` command is executed, the command did not complete because sufficient free space was not available for the directory specified in the `dir` option. Free up sufficient space in the directory, and then re-execute the `hcmdsgetlogs` command.

You can specify the following options for the `hcmdsgetlogs` command:

dir

- Specify the name of the directory on a local disk that stores maintenance information. If the directory has already been created, empty the directory.

  The maximum length of a path name that can be specified is 41 bytes. For details about the maximum length of a path name when an application name other than `DeviceManager` is specified in the `type` option, see the manual for each product.

You can specify any printable ASCII character excluding certain special characters. You cannot specify the following characters:

`\ / : , ; * ? “ < > | $ % & ‘ ‘`

However, you can specify backslashes (`\`), colons (`:`), and slashes (`/`) in Windows, or slashes (`/`) in Solaris or Linux as a path delimiter. Do not specify a path delimiter at the end of a path name.

In Windows, to specify a space character in a path name, enclose the path name in double quotation marks (“). In Solaris or Linux, you cannot specify a space character in a path name.

types

If you want to obtain only maintenance information for specific Hitachi Storage Command Suite products for a reason such as a failure, specify the name of the products from which you want to obtain maintenance information. To obtain maintenance information for Device Manager, specify `DeviceManager`. To obtain maintenance information for Provisioning Manager, specify `ProvisioningManager`. For details on the other Hitachi Storage Command Suite product names, see the documentation for each product. To specify multiple product names, separate them by a space.

When specifying this option, also specify the log file type `log` for the `logtypes` option.

If you omit the `types` option, maintenance information for all Hitachi Storage Command Suite products installed on the management server is obtained.

arc

Specify the name of the archive files to be created. If you do not specify this option, the default file name is `HiCommand_log`. When the archive files are output, each of them will have an extension corresponding to the type of each archive file (`.jar`, `.hdb.jar`, `.db.jar`, or `.csv.jar`). The archive files are output under the directory specified in the dir option.

For the file name, you can specify any printable ASCII character excluding certain special characters. You cannot specify the following characters:

`\ / : , ; * ? “ < > | $ % & ‘ ‘`

In Solaris or Linux, you cannot specify a space character in a file name.

`logtypes`

If you want to obtain only specific log files for a reason such as a failure, specify the type of log files that you want to obtain.

`log`: Specify this to obtain `.jar` files and `.hdb.jar` files only.

`db`: Specify this to obtain `.db.jar` files only.

`csv`: Specify this to obtain `.csv.jar` files only.

To specify multiple types, separate them by a space.

If you omit this option, all log files will be obtained.

Return values

`0`: Normal termination

`1`: Parameter error

`2`: Abnormal termination

An example of obtaining maintenance information for Hitachi Storage Command Suite products is shown below. In this example, the archive file named `hicmd_log` is created under the `logs_work` directory.

In Windows:

```
C:\Program Files\HiCommand\Base\bin\hcmdsgetlogs /dir C:\logs_work
/arc hicmd_log
```

In Solaris or Linux:

```
# /opt/HiCommand/Base/bin/hcmdsgetlogs -dir /opt/logs_work -arc
hicmd_log
```

⚠ ***Note:*** If virtualization servers are managed by Device Manager, you also need to collect the log files for the virtualization software, vMA, and VMware vCenter Server. For details about how to collect the log files, see the VMware documentation.

Obtaining the Java VM Thread Dump

If the following problem occurs, obtain a Java VM thread dump to locate the cause of the problem.

- The Device Manager logon window is not displayed when you start Web Client.
- The Device Manager main window is not displayed after logging on to Device Manager.
- The Device Manager main window is not displayed when you start a Device Manager server from Tuning Manager.

Obtaining the Java VM Thread Dump in a Windows Environment

To obtain a Java VM thread dump:

1. In *`installation-folder-for-Common-Component`*`\CC\web\containers\HiCommand`, create a file called **dump**.
2. Access the Windows Services window.
3. Stop the HBase Storage Mgmt Common Service.

   The `javacore`*`xxx.xxxx`*`.txt` file is output to *`installation-folder-for-Common-Component`*`\CC\web\containers\HiCommand`.
4. From the **Services** window, start the HBase Storage Mgmt Common Service.

Obtaining the Java VM Thread Dump in a Solaris or Linux Environment

To obtain a Java VM thread dump:

1. Execute the following command: `# kill -3` *`PID`*

   `PID` is a process ID written in the *`installation-directory-for-Common-Component`*`/CC/web/containers/HiCommand/logs/cjstdout.log` file.

   The `javacore`*`xxx.xxxx`*`.txt` file is output to *`installation-directory-for-Common-Component`*`/CC/web/containers/HiCommand`.
2. Execute the following command to stop the HBase Storage Mgmt Common Service and the Device Manager server:

   `installation-directory-for-Common-Component``/bin/hcmdssrv -stop`
3. Execute the following command to start the HBase Storage Mgmt Common Service and the Device Manager server:

   `installation-directory-for-Common-Component``/bin/hcmdssrv -start`

Checking Audit Log Data

Audit log data has the following format.

In Windows:

When you open an event by selecting **Event Viewer** and then **Application**, the following is displayed in the **Description** area in **Event Properties**.

```
program-name [process-ID]:message-portion
```

In Solaris or Linux:

The contents of a `syslog` file:

```
date-time server-name (or IP-address) program-name[process-ID]:message-
portion
```

The format and contents of *`message-portion`* are described below.

> ***Note:*** In *`message-portion`*, a maximum of 953 single-byte characters can be displayed in a `syslog` file.

The format of *`message-portion`* is as follows:

uniform-identifier,unified-specification-revision-number,
serial-number,message-ID,date-and-time,detected-entity,detected-location,audit-event-type,
audit-event-result,audit-event-result-subject-identification-information,
hardware-identification-information,location-information,location-identification-information,
FQDN,redundancy-identification-information,agent-information,request-source-host,
request-source-port-number,request-destination-host,request-destination-port-number,
batch-operation-identifier,log- data-type-information,application-identification-information,
reserved-area,message-text

Table 10-3 Information in message-portion

Item[#]	Description
uniform-identifier	Fixed to CELFSS.
unified-specification-revision-number	Fixed to 1.1.
serial-number	Serial number of audit log messages.
message-ID	Message ID. For details, see Audit Events and Categories of Information Output to Audit Logs.
date-and-time	The date and time when the message was output. This item is output in the format of yyyy-mm-ddThh:mm:ss.s*time-zone*.
detected-entity	Component or process name.
detected-location	Host name.

Item[#]	Description
audit-event-type	Event type.
audit-event-result	Event result.
audit-event-result-subject-identification-information	Account ID, process ID, or IP address corresponding to the event.
hardware- identification-information	Hardware model or serial number.
location-information	Identification information for the hardware component.
location-identification-information	Location identification information.
FQDN	Fully qualified domain name.
redundancy-identification-information	Redundancy identification information.
agent-information	Agent information.
request-source-host	Host name of the request sender.
request-source-port-number	Port number of the request sender.
request-destination-host	Host name of the request destination.
request-destination-port-number	Port number of the request destination.
batch-operation-identifier	Serial number of operations through the program.
log- data-type-information	Fixed to BasicLog.
application-identification-information	Program identification information.
reserved-area	Not output. This is a reserved space.
message-text	The contents vary according to the audit events. Characters that cannot be displayed are output as asterisks (*). For details, see Message Text in Audit Log Data.
#: Some items are not output for some audit events.	

Example of *message-portion* output for Login audit event:

```
CELFSS,1.1,0,KAPM01124-I,2006-05-15T14:08:23.1+09:00,HBase-SSO,management-
host,Authentication,Success,uid=system,,,,,,,,,,,,BasicLog,,"The login process
has completed properly."
```

Example of *message-portion* output for a request-received audit event of the Device Manager server:

```
CELFSS,1.1,10,KAIC51000-I,2006-03-17T12:45:00.0+09:00,DvM_Srv, TestServer,
ConfigurationAccess,Success,uid=system,,,,,,,from=12.228.23.124,,,,,BasicLog,DvM_GUI,,
“123456789 ModPort<SA info=’R500-14000’><Port info=’0,0,,,1,,’></Port></SA>”
```

Example of *message-portion* output for a request-received audit event of the Provisioning Manager server:

```
CELFSS,1.1,0,KARF91200-I,2006-11-10T18:21:17.9+09:00,PvM,CZA92G,Configuration
Access,Success,uid=System,,,,,,,from=10.208.64.128,,,,,BasicLog,PvM,,
“PvM123456789 GetSPoolSum info=’All Resources’ CID=Pv1163150475209G”
```

Message Text in Audit Log Data

The format of message text in output audit log data varies from one audit event to another. This section describes the format of the message for each audit event. The item enclosed by square brackets ([ ]) in the format might not be output.

Message Text Output for Common Component Processing

Information about the audit event that occurred is output in a character string. For more information on the message text, see *Hitachi Device Manager Error Codes*. The following example shows output message text.

Example of message text output as audit log data when a user logs in:

```
“The login process has completed properly.”
```

Message Text Output for Device Manager Server Processing

When the Device Manager server receives a request for Device Manager server processing (for example, a request to change the configuration to obtain information) or sends a response for the request, message text about the request or response is output as audit log data. The following explains the format of, and information in, the message text.

Format of message text when the Device Manager server receives a request to perform server processing (if no error occurred):

```
unique-ID detail-message
```

Format of message text when the Device Manager server sends a response (if no error occurred):

```
unique-ID[ status] [ request-operation-start-unique-ID]
```

Format of message text when the Device Manager server receives a request to perform server processing or sends a response (if an error occurred):

```
unique-ID error-message-ID
```

Table 10-4 Information in Message Text When the Device Manager Server Receives a Request or Sends a Response (for Server Processing)

Item	Description
unique-ID	A unique request identifier. For response transmission, the unique ID of the request is output. For processing via the SVP, this ID is also output as audit log data on the SVP.
detail-message	Detailed information on the request. For details, see Detail Message Output for a Request to a Device Manager Server.

Item	Description
status	If the request and the operation are asynchronous, one of the following character strings that indicate the result of polling is output: ▪ COMPLETED: The operation was successful. ▪ PROCESSING: Now operating ▪ FAILED: The operation failed.
request-operation-start-unique-ID	A unique ID that indicates which response (the result of polling the server about the requested operation) corresponds to which request, when a request and the operation are performed asynchronously. This ID corresponds to the message ID that is output as an attribute of the `RequestStatus` element of `GetRequestStatus` (command: `Get`, target: `RequestStatus`). This message ID is output to the detail message when a request is received. For details on detail messages, see Detail Message Output for a Request to a Device Manager Server.
error-message-ID	The ID of the error message. For more information on message IDs, see *Hitachi Device Manager Error Codes*.

The following examples show output message text.

Example of message text output when the Device Manager server receives a request for server processing (if no error occurred):

```
“123456789 AddLUN<SA info=’D700-75010421’><Path info=’,,0,4,15,0,’><LDEV
info=’D700-75010421-31,,’/><LDEV info=’D700-75010421-34,,’/></Path><Path
info=’,,1,1,15,0,31’/><Path info=’,,16,6,15,0,31’/><Path
info=’,,0,4,15,1,35’/></SA>”
```

Example of message text output when the Device Manager server sends a response to a request for server processing (if an error occurred):

```
“123456789 KAIC01014-E”
```

Message Text Output for Launches of Related Products

When the Device Manager server receives a related product or sends a response for a request, message text about the request or response is output as audit log data. The following explains the format of, and information in, the message text.

Format of message text output when the Device Manager server receives a request to launch a related product (if no error occurred):

```
unique-ID[ launch-session-ID][ launch-target-identifier]
```

Format of message text output when the Device Manager server sends a response to a request to launch a related product (if no error occurred):

```
unique-ID[ launch-session-ID]
```

Format of message text output when the Device Manager server receives a request to launch a related product or sends a response (if an error occurred):

```
unique-ID[ launch-session-ID] error-message-ID
```

Table 10-5 Information In Message Text Output When the Device Manager Server Receives a Request or Sends a Response (for Launching a Product)

Item	Description
unique-ID	A unique request identifier. For response transmission, the unique ID of the request is output. For processing via the SVP, this identifier is also output as audit log data on the SVP.
launch-session-ID	Format: `lsessionID=...` The launch session ID is output. This information is output when a specific application is launched under the condition that request-response exchange between the Web Client and the Device Manager server is performed more than once. For information on the applications for which the launch session ID is output, see Table 10-6. This item is not output when the subsystem to be launched is Universal Storage Platform V/VM.
launch-target-identifier	Format: `loid=...` Information that identifies the launch target is output. This information is output only when the first request is received. The information contained in the launch identifier varies depending on the application to be launched. For details, see Table 10-6.
error-message-ID	The ID of the error message. For more information on message IDs, see *Hitachi Device Manager Error Codes*.

Table 10-6 indicates the relationship between the presence of a launch session ID and the information contained in the launch target identifier for each type of the application to be launched.

Table 10-6 Relationship between a Launch Session ID and Data Contained in the Launch Identifier

Application Type	Presence of Session ID	Information in Launch Identifier
Storage Navigator	Present	Information that identifies the subsystem to be launched. The value is the same as an element identifier[#1] in the `StorageArray` element. For more information, see the attribute value output sequence for the `StorageArray` element in Table 10-14.[#2]
DAMP	Present	
Storage Navigator Modular	Present	
Storage Navigator Modular 2	Present	
Physical View	Not present	
Resource group assignment	Not present	An ID that indicates the dialog box is used to manage resource groups of the user or used to assign a resource group to the user.launched. Format: ▪ Resource group assignment: `loid=`*UV* ▪ Resource group management: `loid=`*UGV*
Resource group management	Not present	
Dynamic Link Manager	Not present	Information that identifies the host computer to be launched. The value is the same as an element identifier[#1] in the `Host` element. For more information, see the attribute value output sequence for the `Host` element in Table 10-14.
Protection Manager	Not present	

Application Type	Presence of Session ID	Information in Launch Identifier
#1: An element identifier is an attribute value that uniquely identifies the element. #2: The IP address is displayed only when Lightning 9900V is launched from Physical View (output example: `loid=10.208.110.110`).		

The following examples show output message text.

Example of message text output when the Device Manager server receives a launch request (if no error occurred):

```
“123456789 lsessionID=a7e770671b8 loid=R500-14000”
```

Example of message text output when the Device Manager server sends a response to a launch request (if no error occurred):

```
“123456789 lsessionID=a7e770671b8”
```

Message Text Output for Device Manager Server Processing via CIM

When the Device Manager server receives a request for processing via a CIM service method or sends a response for a request, message text about the request or response is output as audit log data. The following explains the format of, and information in, the message text.

Format of message text output when the Device Manager server receives a request to perform processing via a CIM service method (if no error occurred):

```
unique-ID method-name input-parameter object-path
```

Format of message text output when the Device Manager server sends a response (if an error occurred or if no error occurred):

```
unique-ID return-code output-parameter
```

Format of message text output when the Device Manager server sends a response (if a job is created through asynchronous processing):

```
unique-ID return=4096 object-path
```

⚠ ***Caution:*** If a job is created through asynchronous processing, no completion notification is output as audit log data.

Table 10-7 Information in Message Text Output When the Device Manager Server Receives a Request or Sends a Response (for Processing via CIM)

Item	Description
unique-ID	A unique request identifier. For response transmission, the unique ID of the request is output. For processing via the SVP, this identifier is also output as audit log data on the SVP.
method-name	The name of the requested method.
input-parameters	Format: `inParams={...}` The input parameters passed to the requested method are output.
object-path	Format: `objectPath=...` The object path passed to the requested method is output.
return-code	Format: `return=...` The return code that indicates the execution result of the requested method is output.
output-parameters	Format: `outParams={...}` The output parameters passed as the execution result of the requested method are output.

The following examples show output message text.

Example of message text output when the Device Manager server receives a server receives a request for Device Manager server processing (via CIM, if no error occurred):

```
“123456789 GetSupportedSizeRange
inParams={ElementType=3,Goal=//192.168.0.1/root/smis/current:HITACHI_StorageSetting.
InstanceID=’RAID5’}
objectPath=/root/smis/current:HITACHI_StoragePool.InstanceID=’AMS500.75010421’”
```

Example of message text output when the Device Manager server sends a response to a request for server processing (via CIM, if no error occurred):

```
“123456789 return=0
outParams={MinimumVolumeSize=1024,MaximumVolumeSize=248139692,VolumeSizeDivisor=1024
}”
```

Message Text Output for Provisioning Manager Server Processing

When the Provisioning Manager server receives a request or sends a response, message text about the request or response is output as audit log data. The following explains the format of, and information in, the message text.

Format of message text output when the Provisioning Manager receives a request (if no error occurred):

```
unique-ID details-of-request parameter command-ID
```

Format of message text output when the Provisioning Manager receives a request (if an error occurred):

```
unique-ID  details-of-request  parameter  command-ID  error-code
```

Format of message text output as audit log data when the Provisioning Manager sends a response (if no error occurred during a view or setting operation, or when either of those operations was suspended):

```
unique-ID  command-ID  operation-ID
```

Format of message text output when the Provisioning Manager sends a response (if an error occurred during a view or setting operation):

```
unique-ID  command-ID  error-code
```

Format of message text output when the Provisioning Manager sends a response (if no error occurred during polling):

```
unique-ID  command-ID  status  operation-ID
```

Format of message text output when the Provisioning Manager sends a response (if an error occurred during polling):

```
unique-ID  command-ID  error-code  operation-ID
```

Table 10-8 Information in Message Text Output When the Provisioning Manager Server Receives a Request or Sends a Response

Item	Description
unique-ID	Displays a unique value as the ID that identifies a request or response.
details-of-request	Displays a character string as the details of a request to the Provisioning Manager server. For the meaning of the character string displayed as the details of a request, see Requests and Parameters Output as Provisioning Manager Audit Log Data.
parameter	Displays the parameter information for identifying the target resource, from among the parameters that are passed when a request is issued. If there are no parameters, this information is not displayed. For details about the parameters that are displayed, see Requests and Parameters Output as Provisioning Manager Audit Log Data. The format for output parameters is as follows: ▪ A parameter is displayed in the format: `info=’...’`. If there are multiple parameters, each parameter is separated by a comma (`,`). Such as: `info=’`*X*`,`*Y*`,`*Z*`’`. ▪ If a parameter is an array, each value in the array is separated by a space and the entire array is enclosed in square brackets, such as: `[`*a1 a2 a3*`]`. ▪ If a parameter value contains a single quotation mark (‘), comma (`,`), or square brackets ([]), the relevant symbol is replaced with a question mark (?).
command-ID	Displays the ID that is assigned to an operation so that the logs related to the operation can be identified. The format for output command-IDs is as follows: ▪ A command ID is displayed in the format `CID=....` ▪ A command ID is not displayed when you register or view a license. ▪ Except for the above case, if a command ID cannot be obtained, the character string `Unknown` is displayed.

Item	Description
status	Displays a character string that indicates the polling results. Some Provisioning Manager operations take a long time to finish after a request is issued. In this case, the processing status is checked by a polling operation. One of the following character strings is displayed: ▪ COMPLETED: The processing was completed. ▪ FAILED: The processing failed. ▪ SUSPENDED: The processing was suspended.
error-code	Displays the message ID.
operation-ID	Output character string that shows that the log before the operation was interrupted is related to the log after the operation resumes. This item is displayed in the following situations: ▪ When a response for a setting operation is sent (during normal processing) ▪ When a response for polling is sent (during normal processing) ▪ When a response for polling is sent (during abnormal processing)

The following examples show output message text.

Example of message text output when Provisioning Manager receives a request (if no error occurred):

```
"PvM123456789 GetAlloc info='32' CID=Pv243488034G"
```

Example of message text output when Provisioning Manager sends a response (if an error occurred):

```
"PvM123456789 CID=Pv243488034G KARF15000-E"
```

Detail Message Output for a Request to a Device Manager Server

This section describes the format of, and information in, a detail message that is output when the Device Manager server receives a request. The item enclosed by square brackets ([ ]) in the output format might not be output.

Format of an output detail message:

```
command target[ option][ parameter]
```

Table 10-9 Information Output in Detail Messages

Item	Description
command	A character string (3 characters) that indicates the operation (for example, addition, deletion, modification, or reference) to be performed on the resource. For the meaning of the output character string, see Table 10-11.
target	Information that identifies the operation to be performed. For information on the target to be output in the message text, see Table 10-12. However, Table 10-12 might not contain some displayed characters.

Item	Description
option	Format: [...] Information that identifies the operation to be performed. This information is output only when one or more options are specified. For more information on the meanings of output options, see Table 10-13. If two or more options are specified, a semicolon (;) is used as a separator.
parameters	Information that identifies the operation to be performed and the resource on which the operation is to be performed. (This information is output only when it is specified by request.) This information is output in tagged format.

The format and content of the parameters (parameter, above) output in detail messages are described below.

Parameter format 1 (nested):

```
<element attribute>[parameter-1 parameter-2...parameter-n]</element>
```

The parameters that depend on the element are output between the start and end tags of *element*. If no relevant parameters exist, no parameters are output.

Parameter format 2 (non-nested):

```
<element attribute/>
```

Table 10-10 Information Output in Detail Message Parameters

Item	Description
element	A character string that indicates the element name. For information on the elements that are output and their meanings, see Table 10-14. However, Table 10-14 might not contain some displayed characters.
attributes	Format: info='...' Attribute values specified for the element are output. When two or more attribute values are output, they are separated by a comma (,). Each attribute value is output as a character string or a numeric value. If no corresponding attribute was specified or nothing was specified for the attribute value, no attribute value is output. If no attribute was specified or nothing was specified for attribute values, this item is not output. If an attribute value contains a single-quotation mark (') or comma (,), the quotation mark or comma is replaced with a question mark (?). For details on the sequence in which attribute values are output, see Table 10-14.

The table below lists the commands that can be output in detail messages.

Table 10-11 Commands Output in Detail Messages

Output Character String	Full Name	Operation
Add	Add	Addition
Del	Delete	Deletion
Get	Get	Acquisition

Output Character String	Full Name	Operation
Ivk	Invoke	General operation for an SMI-S Enabled subsystem
Mod	Modify	Modification
Set	Set	Setting

The table below provides information on the targets that can be output in detail messages.

Table 10-12 Targets Output in Detail Messages

Output Character String	Full Name	Operation
Alerts	Alerts	Alert information reference or deletion
ArrGrp	ArrayGroup	Array group configuration change
ArrRsrv	ArrayReservation	Subsystem reservation setting or information acquisition
CFForRep	ConfigFileForReplication	CCI configuration file creation
COMEFSP	CreateOrModifyElementFromStoragePool	Volume creation in an SMI-S Enabled subsystem
ConfChange	ConfigurationChange	Configuration change notification to the Device Manager server
DataRetentions	DataRetentions	Data retention information setting or acquisition
DebugLevel	DebugLevel	Debug level change or reference
ExpPaths	ExposePaths	Paths set in an SMI-S Enabled subsystem
ExtArrGrp	ExternalArrayGroup	External array group setting
Host	Host	Host setting or reference
HostI	HostInfo	Host (agent) configuration change or reference
HostModeOpt	HostModeOption	Host mode option reference
HostRef	HostRefresh	HostInfo update
HostScan	HostScan	Automatic host setup
HostVol	HostVolume	Host volume information notification to the Device Manager server
HSD	HostStorageDomain	Host storage domain configuration change
ISCSIForHSD	ISCSINameForHostStorageDomain	Configuration change of iSCSIName belonging to the host storage domain
JrnlPool	JournalPool	Pool configuration change
LDEVForVolMig	LDEVForVolumeMigration	LDEV VolumeMigration attribute setting or information acquisition
LGrp	LogicalGroup	Logical group setting or reference
ListView	ListView	Listing of information held by the Device Manager server
LogF	LogFile	Log file information acquisition

Output Character String	Full Name	Operation
LU	LogicalUnit	Logical unit configuration change
LUFormat	LogicalUnitFormat	Formats of all LDEVs in the logical unit
LUN	LUN	Path configuration change
LUNGrp	LUNGroup	LUN group configuration change
LunScan	LunScan	Assignment of LUNs that do not belong to a logical group
LUSE	LUSE	Expanded LDEV configuration change
Msgs	Messages	Message
ObjForLGrp	ObjectForLogicalGroup	Change to configuration of objects belonging to a logical group
ObjLabel	ObjectLabel	LDEV label setting or deletion
ObjName	ObjectName	Name assignment to objects used in Device Manager
Port	Port	Port configuration change
PortCtrl	PortController	Port controller configuration change
Rep	Replication	Pair configuration change
RepCtrlPair	ReplicationControllerPair	Pair configuration information reference and change
ReqStatus	RequestStatus	Return of command status
Rule	Rule	ACL rule setting or reference
SA	StorageArray	Storage subsystem addition, deletion, and information acquisition
SpareDrive	SpareDrive	Spare drive configuration change
SrcHost	SourceHost	Migration source host information acquisition
SrvI	ServerInfo	Device Manager server information acquisition
Subscrbr	Subscriber	Event listener addition or deletion
UGrp	UserGroup	User group (resource group) setting or reference
URLLink	URLLink	URL Link information configuration change
User	User	User setting or reference
VolMig	VolumeMigration	Migration plan setting or information acquisition
VolShred	VolumeShredding	Shredding function execution requests or information acquisition
VVol	VirtualVolume	Virtual volume setting
WWN	WorldWideName	WWN deletion
WWNForHSD	WWNForHostStorageDomain	Change in the configuration of WWNs belonging to a host storage domain
WWNForLUN	WWNForLUN	LUN WWN configuration change
WWNForLUNGrp	WWNForLUNGroup	LUNGroup WWN configuration change

Output Character String	Full Name	Operation
WWNGrp	WWNGroup	WWN group configuration change
ZPRVol	ZeroPageReclaimVolume	Information acquisition about the progress of a zero data discard task for the target HDP volume

The table below provides the contents of options that can be output in detail messages.

Table 10-13 List of Options in Detail Messages

Output Character String	Operation
add	Adds a logical path to an existing RCU.
all	▪ If the target is StorageArray Also obtains information on an SMI-S Enabled subsystem. ▪ If the target is URLLink Also obtains the URL of the management server for an SMI-S Enabled subsystem.
auto	Automatically select a PDEV when an HDP pool is created or expanded.
assign	Associates a pool with a virtual volume.
bulk	Creates the specified number of volumes or multiple volumes of the specified size.
Datastore	Updates only the information about the data store capacity on the virtualization server.
delete	Deletes a logical path from an existing RCU.
dividebycap	Creates multiple volumes of the specified size.
dividebynum	Creates the specified number of volumes.
exist	Creates a virtual volume in an existing virtual volume group.
force	If the target is LUSE Creates an LUSE in the logical unit that already has paths. If the target is Virtual Volume The virtual volume associated with a pool is disassociated from the pool and deleted.
lusekeep	Keeps the LUSE.
merge	Merges the WWNs or iSCSI names assigned to multiple hosts into one host.
noformat	Creates a logical unit without formatting.
nolabelbefore	Assumes an error if a label has already been set.
numOfLUs:*n*	Specifies the number of volumes or virtual volumes to be created (indicated by *n*).
numOfPDEVs:*n*	Specifies the number of PDEVs that make up an HDP pool.
overwrite	Deletes the current label and then sets a new label.

Output Character String	Operation
quickformat	If the target is LogicalUnit Creates and quick-formats a logical unit. If the target is LogicalUnitFormat Quick-formats a logical unit.
remainMigraion	Leaves the plan status of the completed plan in the subsystem (SVP).
restore	Copies the data of the secondary volume to the primary volume.
resync	Copies the data of the primary volume to the secondary volume.
smi-s	▪ If the target is ObjectName Makes the name of the SMI-S Enabled subsystem the target. ▪ If the target is StorageArray Makes only the SMI-S Enabled subsystem the target. ▪ If the target is URLLink Makes only the URL of the management server for the SMI-S Enabled subsystem the target.
split	Splits the pair.
suspend	Creates a 3DC pair by using Universal Replicator.
unassign	Disassociates a virtual volume from a pool.
validate:false	Does not validate HORCM files when modifying a pair.
validate:true	Validates HORCM files when modifying a pair.
waitingViewSynchro	Returns a completion response after the database is updated.
ZeroPageReclaim	Performs zero data discard to release unused space.

The table below shows the sequence in which attribute values are output for each element.

Table 10-14 Sequence in Which Attributes Values Are Output for Each Element in a Detail Message

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
Alert	Alert (Information about the error that occurred in Device Manager or the storage subsystem)	alert number
		number
Alerts	Alerts (A group of Alert elements)	--

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
ArrGrp	ArrayGroup (Information about the array group of the storage subsystem)	<model name[#2] - serial number - chassis number - array group number>, number of chassis containing the array group, array group number, array group RAID level, CLPR number, emulation mode, optional information for external array group, type
		<model[#2] - serialnum - chassis - number>, chassis, number, raidType, clprNumber, emulation, volumeType, type
ArrRsrv	ArrayReservation (Lock information of the storage subsystem)	<model name[#2] - serial number>, <model name[#2] - serial number>
		<model[#2] - serialnum>, <model[#2] - serialnum>
ArrV	ArrayValue(Element for specifying a value if the type of the parameter specified in Param is array)	Value specified in ArrayValue
		value
ChangedItem	ChangedItem (Information about the data changed in Device Manager)	--
ChangeI	ChangeInfo (Version information of the storage subsystem configuration)	LDEV information version, port information version, LU information version, LUSE information version, LUN information version, host mode information version, DCR information version, CVS information version, SSID information version, CHA information version
		versionOfLDEV, versionOfPort, versionOfLogicalUnit, versionOfLUSE, versionOfLUNSecurity, versionOfHostMode, versionOfDCR, versionOfCVS, versionOfSSID, versionOfCHA
CIMIvk	CIMInvoker(Element for identifying the CIM instance)	Object path for service class whose method is executed
		objectPath
CommandComplete	CommandComplete (Information required by clients when the Get Request Status command is issued)	--
CommParas	CommParameters (Information about how to access the storage subsystem)	--
Comp	Component (Information about the storage subsystem configuration)	--

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
Cond	Condition (Limits the results of the Get command by using the Filter elements at the same time)	LU type, element identifier of LDEV, LDEV type, host storage status, Alert source, host type, CLPR number of journal volume, element identifier of host, journal pool identifier, HDP pool volume ID, volume accessible from the specified WWN, type of LDEV (whether it is an internal volume or an assigned volume), object ID of target storage subsystem, MCU model, serial number of MCU
		type, childID, volumeKind, host, source, hostType, clprNumber, assocID, poolFunction, dpPoolID, accessibleWWN, substance, targetArray, masterArrayType, masterSerialNumber
ConfChange	ConfigurationChange (Reports information about the configuration changes of the storage subsystem to the Device Manager server)	user ID, notification type, serial number, product name[#2], occurrence date and time, IP address
		user, type, serialNumber, arrayType[#2], date, ipAddress
ConfigChange	ConfigChange (Information about the data changed in the Device Manager server)	--
ConfigF	ConfigFile (Information about the CCI configuration file)	<host ID - HORCM instance number>
		<hostID - instanceNumber>
DataRetention	DataRetention (Data retention information)	--
DataRetentions	DataRetentions (LDEV data retention information)	--
DebugLevel	DebugLevel (Information about the current debug level of the Device Manager server)	debug level
		value
DS	Datastore (Data store information)	--
ErrI	ErrorInfo (Information about the error that occurred in the storage subsystem)	error code of the error detected in the storage subsystem, date and time of the error detected
		errorCode, date

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
ErrList	ErrorList (A list including the ErrorInfo elements)	number of ErrorInfo elements
		errorCount
ExtPathI	ExternalPathInfo (Access information of the external subsystem)	<model name[#2] - serial number - chassis number - array group number - WWN of port for external subsystem - LUN number of external LU - port ID of external port - priority>[#3] WWN of the port in the external storage subsystem, LUN of the external volume in the external storage subsystem, ID of the path group
		<model[#2] - serialnum - chassis - number - externalWWN - externalLun - portID - priority>[#3], externalWWN, externalLun, portID, pathGroupID
ExtS	ExternalStorage	--
F	File (Information about the log file name)	Log file name
		name
Filt	Filter (Limits the results of the Get command)	--
FreeLUN	FreeLUN (Information about availability of the LUN in the host storage domain)	--
FreeSpace	FreeSpace (Information about the free space in the array group of the storage subsystem)	<model name[#2] - serial number - chassis number - array group number - free space index number within array group>
		<model[#2] - serialnum - chassis - number - fsControlIndex>
FSys	FileSystem (File system information obtained from the Device Manager agent)	device file name, mount point, file system type, file system size,, file system usage, , , whether the file system can be deleted, whether the file system can be expanded, , , ,
		deviceFileName, mountPoint, type, size, , percentUsed, , , deletable, expandable, , , , ,
FSys	FileSystem (File system information obtained from the file server)	, , , file system size, amount of used space in the file system, file system usage, amount of free space in the file system, percentage of free space in the file system, , , EVS name related to the file system, file system status, file system label, number of mount points, label of the storage pool to which the file system belongs
		, , , size, usedSize, percentUsed, freeSize, percentFree, , , evs, status, label, numberOfMountPoints, storagePool

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
`Host`	Host (Host information used by the logical volume)	<host ID>, host name, host IP address, host IP address for IPv6, host type, operation target host name
		<hostID>, name, ipAddress, ipv6Address, hostType, targetName
`HostI`	HostInfo (Information about accesses between the LU and host)	<host name - host SCSI bus number - target ID - LU number of volume on host>, type (model[#2]) of storage subsystem connected with host, serial number of storage subsystem connected with host, displayed name of HostInfo object, host IP address, host IP address for IPv6, LUN mount point, port ID, domain ID of host storage domain, device number of logical unit[#4], port WWN on HBA, type of file system to be mounted, file system name, LUN capacity, LUN usage, iSCSI name of host (iSCSI initiator)
		<name - osScsiBus - osScsiID - osLun>, arrayType[#2], serialNumber, name, ipAddress, ipv6Address, mountPoint, portID, domainID, devNum[#4], portWWN, fileSystemType, fileSystemName, sizeInMB, percentUsed, portISCSIName
`HostVol`	HostVolume (Volume information obtained from the Device Manager agent)	device file name, vendor name, model name[#2], serial number, port number, device number[#4], identification number, host name,, IP address, host IP address for IPv6, mount point, SCSI bus number, SCSI bus connection identification number, LU number, WWN of HBA node, WWN of HBA port, WWN of storage subsystem port, file system type, file system name, volume size, volume usage, LU pair type, device file name managed by Dynamic Link Manager, number of paths managed by Dynamic Link Manager, LU pair type (Universal Replicator), number of paths managed by path management software other than Dynamic Link Manager, device file name managed by path management software other than Dynamic Link Manager, iSCSI name of iSCSI initiator, inquiry's host group ID (0 to 254)
		deviceFileName, vendorID, model[#2], serialNumber, port, devNum[#4], hsDeviceID, name, , ipAddress, ipv6Address, mountPoint, OSscsiBus, OSscsiID, OSlun, hbaWWN, portWWN, subsystemPortWWN, fileSystemType, fileSystemName, sizeInMB, percentUsed, pairType, dlmPathName, numberOfDlmPath, pairTypeTCMirror, numberOfPath, relatedPathName, portISCSIName, hostGroupID,

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
HostVol	HostVolume (Volume information obtained from the file server)	, vendor name, model name[#2], serial number, port number, device number[#4], identification number, host name, cluster name, IP address, host IP address for IPv6,, SCSI bus number, SCSI bus connection identification number, LU number,, WWN of HBA node, WWN of storage subsystem port, , , volume size, volume usage, , , , , , , iSCSI name of iSCSI initiator, inquiry's host group ID (0 to 254), host type
		, vendorID, model[#2], serialNumber, port, devNum[#4], hsDeviceID, name, cluster, ipAddress, ipv6Address, , OSscsiBus, OSscsiID, OSlun, , portWWN, subsystemPortWWN, , , sizeInMB, percentUsed, , , , , , , portISCSIName, hostGroupID, hostType
HSD	HostStorageDomain (Information about the host storage domain)	<model name[#2] - serial number - port ID - domain ID>, port ID, domain ID, new host connection mode for host storage domain, list of new host connection modes, host connection mode options, host storage domain name, nickname of host storage domain, operation target host storage domain name, operation target host storage domain port ID, domain type of host storage domain, iSCSI name of host storage domain (iSCSI target)
		<model[#2] - serialnum - portID - domainID>, portID, domainID, hostMode, hostMode2, hostModeOption, name, nickname, targetNickname, targetPortID, domainType, iSCSIName
IPAddress	IPAddress (The IP address of the port controller)	--
ISCSIName	ISCSIName (iSCSI name information)	iSCSI name of iSCSI initiator, iSCSI nickname of iSCSI target, operation target iSCSI nickname
		iscsiname, nickname, targetNickname
JrnlPool	JournalPool (Journal group information)	<model name[#2] - serial number - journal pool identifier - pool ID>, journal pool identifier, pool ID, HDP pool threshold1, HDP pool threshold2, journal volume inflow limit, data overflow monitoring interval (second), unit of path monitoring interval, path monitoring interval, transfer of path monitoring interval, use of cache, line speed, handling at delta resync failure, RAID level, over provisioning warning threshold, over provisioning limit threshold, whether to generate a warning for the over-provisioning percent
		<model[#2] - serialnum - poolFunction - poolID>, poolFunction, poolID, threshold, threshold2, inflowControl, dataOverflowWatch, unitOfPathWatchTime, pathWatchTime, forwardPathWatchTime, useOfCache, speedOfLine, deltaResyncFailure, raidLevel, overProvisioningWarning, overProvisioningLimit, volumeThresholdFlag

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
LDEV	LDEV (Information about the LDEV)	<model name[#2] - serial number - LDEV device number[#4]>, LBA of the LDEV, CLPR number, stripe size
		<model[#2] - serialnum - devnum[#4]>, lba, clprNumber, stripeSizeInKB
LDKC	LogicalDKC (Logical DKC of the storage subsystem)	--
LGrp	LogicalGroup (Groups hosts, host storage domains, or other logical groups)	<logical group ID>, name, description, icon file name, <element identifier of logical group of parent group>, operation target logical group name, parent logical group name
		<groupID>, name, description, icon, <parentID>, targetLogicalPath, parentLogicalPath
LicenseKey	LicenseKey (Key code required to make the program available)	<model name[#2] - serial number - LicenseKeyID>
		<model[#2] - serialnum - PPID>
ListView	ListView (Displays a list of information that the Device Manager server keeps)	grouping unit, name of column to be obtained, name of column to be obtained as unique attribute
		groupBy, requiredAttribute, requiredUniqueAttribute
LU	LogicalUnit (Information that represents the LU)	<model name[#2] - serial number - logical device number[#4]>, number of LDEV contained in a logical unit[#4], volume size, emulation mode, default number of port controllers, whether the LU is used as a command device, whether command device security is set, HDP pool volume ID, HDP pool threshold, whether the LU is a Differential Management LU
		<model[#2] - serialnum - devnum[#4]>, devNum[#4], capacityInKB, emulation, defaultPortController, commandDevice, commandDeviceSecurity, dpPoolID, threshold, differentialManagement
LUNGrp	LUNGroup (Groups LUNs or ports)	<model name[#2] - serial - port ID - nickname>, nickname, name
		<model[#2] - serialnum - portID - nickname>, nickname, name
LVol	LogicalVolume (Logical volume information)	name, size, whether the logical volume can be deleted, whether the logical volume can be expanded, logical volume type
		name, size, deletable, expandable, type

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
MFRepI	MFReplicationInfo(Information about replication of mainframe volumes)	<PVOL serial number - PVOL LDEV number[#4] - SVOL serial number - SVOL LDEV number[#4]>, P-VOL storage subsystem type[#2], serial number of the storage subsystem to which P-VOL belongs, P-VOL device number[#4], port number in the HORCM configuration file that manages P-VOL paths, S-VOL storage subsystem type[#2], serial number of the storage subsystem to which S-VOL belongs, S-VOL device number[#4], port number in the HORCM configuration file that manages S-VOL paths, pool ID to which S-VOL belongs, copy type[#5], P-VOL MU number, P-VOL fence level
		<pvolSerialNumber - pvolDevNum[#4] - svolSerialNumber - svolDevNum[#4]>, pvolArrayType[#2], pvolSerialNumber, pvolDevNum[#4], pvolPortID, svolArrayType[#2], svolSerialNumber, svolDevNum[#4],svolPortID, svolPoolID, replicationFunction[#5], muNumber, fenceLevel
MFVolI	MFVolumeInfo (Access information between the main frame host and LDEV)	--
MountPoint	MountPoint (Mount point information)	name, protocol, path
		name, protocol, path
Msg	Message (Asynchronous message)	--
Msgs	Messages (Groups the Message elements)	Wait time (seconds)
		timeToWait
ObjLabel	ObjectLabel (Sets the object label of the Device Manager server)	Object ID, label to give to the object
		targetID, label
ObjName	ObjectName (Sets the object name of the Device Manager server)	<target element name - target element identifier>, name ***Caution:*** <target element name> and <target element identifier> indicate the element name and element identifier other than those specified for the ObjectName attribute. For information on the component corresponding to the element identifier, see the attribute value output sequence for <target element name>.
		<target element name - target element identifier>, name
PairedJrnlPool	PairedJournalPool (The journal pool paired with the journal pool of Universal Replicator)	--

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
PairedPortController	PairedPortController (CHIP paired on the NAS configuration)	--
PairedVol	PairedVolume (Information about the volume that is paired with HostVolume)	Replication operation type[#5], volume type, serial number of volume device, model of volume device[#2], logical device number of volume[#4], pair status, fence level, MU number of P-VOL corresponding to paired S-VOL
		replicationFunction[#5], otherPairType, otherPairSerialNumber, otherPairArrayType[#2], otherPairDevNum[#4], status, fenceLevel, muNumber
Para	Parameter (A pair of the name and value)	parameter name, parameter value[#2]
		name, value[#2]
Part	Partition (Partition information)	name, volume group name, capacity of the partition
		name, volumeGroupName, sizeInMB
Path	Path (Information about the path)	<model name[#2] - serial name - port ID - domain ID - logical device number[#4]>, name, port ID, domain ID of host storage domain, name of operation target host storage domain, SCSI ID, LUN assigned to path, device number for logical unit identification[#4], port ID of operation target host storage domain, domain ID of operation target host storage domain, nickname of operation target host storage domain, operation target device number
		<model[#2] - serialnum - portID - domainID - devnum[#4]>, name, portID, domainID, domainNickname, scsiID, lun, devNum[#4], targetPortID, targetDomainID, targetDomainNickname, targetDevNum
PDEV	PDEV (Information about PDEV)	<model name[#2] - serial number - PDEV ID>, disk type, disk size
		<model[#2] - serialnum - PDEVID>, diskType, diskModelSize
Port	Port (Information about the port)	<model name[#2] - serial number - port ID>, Fibre port address, Fibre topology, whether LUN security is enabled or disabled for the iSCSI port, iSCSI port options, channel speed, iSCSI port IP address, port subnet mask, iSCSI port gateway IP address, iSCSI port number, keep alive time, iSCSI port attribute
		<model[#2] - serialnum - portID>, fibreAddress, topology, lunSecurityEnabled, portOption, channelSpeed, ipAddress, subnetMask, gateway, portNumber, keepAliveTime, portRole
PortCtrl	PortController (Information about the port controller of the storage subsystem)	<model-name[#2] - serial number - port controller ID>, mode
		<model[#2] - serialnum - controllerID>, mode

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
Prm	Param(Element for specifying the parameter for the method specified by CIMInvoker)	Name of the parameter for the method to be executed, the type of the value specified by this parameter, the value specified by the parameter
		name, type, value
RDArrGrp	RelatedDistributedArrayGroup	--
RepCon	ReplicationConnection (Information about communication between the MCU and RCU)	MCU-side port name, RCU-side port name
		masterPortDisplayName, remotePortDisplayName
RepCtrlPair	ReplicationControllerPair (Information about MCU and RCU)	<MCU model - serial number of MCU model - CU number of MCU - ArrayFamily of RCU - serial number of RCU device - SSID of RCU, path group ID of RCU>, MCU model, serial number of MCU, CU number of MCU, RCU model, serial number of RCU, SSID of RCU, CU number of RCU, pair type, path group ID of RCU, line bandwidth
		<masterArrayType - masterSerialNumber - masterControllerID - -remoteArrayFamily-remoteSerialNumber - remoteSSID - remotePathGroupID>, masterArrayType, masterSerialNumber, masterControllerID, remoteArrayFamily, remoteSerialNumber, remoteSSID, remoteControllerID, pairType, remotePathGroupID, bandwidth
RepGrp	ReplicationGroup (Information about the HORCM instance group)	<replication group ID>, name of copy group used by CCI, host ID of host that recognizes P-VOL, instance number of HORCM instance that manages P-VOL, port number of HORCM instance that manages P-VOL, host ID of host that identifies S-VOL, instance number of HORCM instance that manages S-VOL, port number of HORCM instance that manages S-VOL, copy type[#5], P-VOL fence level, copy pace
		<replicationGroupID>, groupName, pvolHostID, pvolInstanceNumber, pvolPortNumber, svolHostID, svolInstanceNumber, svolPortNumber, replicationFunction[#5], fenceLevel, copyTrackSize

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
`RepI`	ReplicationInfo (Information about replication)	<PVOL serial number - PVOLLDEV number[#4] - SVOL serial number - SVOLLDEV number[#4]>, name of copy pair used by CCI, type of P-VOL storage subsystem[#2], serial number of storage subsystem containing P-VOL, P-VOL device number[#4], port number in the HORCM configuration file that manages P-VOL paths, ID of pool that contains P-VOL, type of S-VOL storage subsystem[#2], serial number of storage subsystem containing S-VOL, S-VOL device number[#4], port number in the HORCM configuration file that manages S-VOL paths, ID of pool that contains S-VOL, copy type [#5], MU number of P-VOL, P-VOL fence level, copy pace
		<pvolSerialNumber - pvolDevNum[#4] - svolSerialNumber - svolDevNum[#4]>, pairName, pvolArrayType[#2], pvolSerialNumber, pvolDevNum[#4], pvolPortID, pvolPoolID, svolArrayType[#2], svolSerialNumber, svolDevNum[#4], svolPortID, svolPoolID, replicationFunction[#5], muNumber, fenceLevel, copyTrackSize
`ReqStatus`	RequestStatus (Returns the status of the preceding request)	message ID
		messageID
`RPort`	RelatedPort (Port whose attribute is changed when the attribute of another port is changed)	--
`RSIMI`	RSIMInfo (RSIM information of the storage subsystem)	RSIM ID of RSIM information
		RSIMID
`RsltObj`	ResultObject (A single row in a list displayed by the ListView elements)	--
`Rule`	Rule (ACL rule of the Device Manager server)	rule ID, rule group name, user logon ID, operation, <LogicalGroup, element identifier of the Host or LDEV element>, type, description
		ruleID, groupName, logonID, operation, <target>, ruleType, description
`SA`	StorageArray (Storage subsystem information)	<model name[#2] - serial number>
		<model[#2] - serialnum>
`SIMI`	SIMInfo (SIM information of the storage subsystem)	SIM ID of SIM information
		SIMID

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
SizeCond	SizeCondition (Conditions for specifying the number within SearchCondition)	number of records to be skipped from the beginning, number of records to be obtained offset, size
SlctCond	SelectCondition (Element for which the SelectItem elements were collected)	conditional operator used to concatenate conditions represented by subordinate SelectItem elements operator
SlctItem	SelectItem (Filtering conditions within SearchCondition)	filtering condition key value, operator indicating relationship between key attribute and value attribute, filtering condition value[#2] key, operator, value[#2]
SrcHost	SourceHost (Information about the migration source host)	host ID, host name <hostID>, name
SortCond	SortCondition (Element for which SortItems were collected)	--
SortItem	SortItem (Sorting conditions within SearchCondition)	column name used as sort key, sort order, sort priority key, order, priority
SrchCond	SearchCondition (Search conditions for obtaining ListView)	--
SrvI	ServerInfo (Information about the Device Manager server)	--
SPool	StoragePool (Storage pool information)	label, storage pool capacity, amount of used space in the storage pool, storage pool usage, amount of free space in the storage pool, percentage of free space in the storage pool, number of system drives that belong to the storage pool, storage pool status label, size, usedSize, percentUsed, freeSize, percentFree, numberOfSystemDrives, status
Subscrbr	Subscriber (Report plan topic)	--
SysDrv	SystemDrive (System drive information)	system drive identification number, system drive label, whether the system drive can be accessed, system drive status, location to which the system drive is mirrored, status of the location to which the system drive is mirrored, label of the storage pool to which the system drive belongs id, label, access, status, mirrorTo, mirrorStatus, storagePool

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
Timestamp	Timestamp (Time when the message was created in the Device Manager server)	--
Topic	Topic (Name of the message topic)	report information
		name
UGrp	UserGroup (Groups users according to their permissions)	name, description
		name, description
URLLink	URLLink (Links between a Hitachi Storage Command Suite object and an application)	<related element identifier - ID>, URL required to launch application or Web page, application name, <linked related element identifier - link ID>, description
		<linkedID - nameID>, url, name, <linkedID - nameID>, description
User	User (Account information of a single user of Device Manager)	user ID, name of group to which the user belongs, permission, user name, description
		loginID, groupName, role, fullName, description
VD	VirtualDisk (Virtual disk information)	-
VM	VM (Virtual machine information)	-
VolCon[#3]	VolumeConnection (Information about the assigned LDEV and the corresponding external LU)	<model name of assigned LU[#2] - device serial number of assigned LU - device number of assigned LU[#4]>
		<mappedArrayType[#2] - mappedSerialNumber - mappedDevNum[#4]>
VolGrp	VolumeGroup (Volume group information)	type, name, volume group capacity, number of disks that belong to the volume group
		type, name, size, numberOfDisk
VolMig	VolumeMigration (Information about the migration plan)	<model name[#2] - serial number - source LDEV number[#4] - target LDEV number[#4]>, owner ID of the user who performs migration, source device number[#4], target device number[#4]
		<model[#2] - serialnum - sourceDevNum[#4] - targetDevNum[#4]>, ownerID, sourceDevNum[#4], targetDevNum[#4]
VolShred	VolumeShredding (Information about the shredding function)	shredding owner ID
		ownerID

Output Character String	Full Name and Content	Sequence in Which Attribute Values Are Output[#1]
`WritingPattern`	WritingPattern (Writing pattern information for a single writing)	writing pattern used when shredding is specified pattern
`WritingPatterns`	WritingPatterns (All writing pattern information of a single VolumeShredding)	--
`WWN`	WorldWideName (Host HBA information)	WorldWideName, nickname, operation target host storage domain name wwn, nickname, targetNickname
`WWNGrp`	WWNGroup (Groups WWNs)	<model name[#2] - serial number - port ID - nickname of WWN group>, nickname, name <model[#2] - serialnum - portID - nickname>, nickname, name

Legend:

--: No attribute value is output

<...>: An element identifier that represents an attribute. If the contents include multiple elements, they are concatenated by a hyphen (**-**).

#1: The lower field of each element indicates the output order represented with the names used within Device Manager.

#2: This information is output as the storage subsystem model, and is the common output name indicated in Table 10-15. Device Manager versions 5.7 and later do not support T3. However, if a T3 is already registered as a management target of Device Manager in earlier versions and you perform an operation for that T3, this information might be output.

#3: This information is output as the ObjectName element <target element identifier>. The attribute value is not output as a rule.

#4: For Universal Storage Platform V/VM, a numerical value that combines the LDKC number, CU number, and LDEV number (= *LDKC* x 65536 + *CU* x 256 + *LDEV*) is output. For Lightning 9900, Lightning 9900V, or Hitachi USP, a numerical value that combines the CU and LDEV numbers (= *CU* x 256 + *LDEV*) is output. For Thunder 9200, Thunder 9500V, or Hitachi AMS/WMS, the LU number is output.

#5: The replication operation type attribute is represented by the common output name indicated in Table 10-16 when it is output.

Table 10-15 Common Output Names for Storage Subsystem Models

Common Output Name	Applicable Storage Subsystem Model
D500	Thunder 9200
D600	Thunder 9500V
D700	Hitachi AMS/WMS
D800	Hitachi AMS 2000
R400	Lightning 9900
R450	Lightning 9900V
R500	Hitachi USP
R600	Universal Storage Platform V/VM

Common Output Name	Applicable Storage Subsystem Model
S800	Hitachi SMS
T3	T3

Table 10-16 Common Output Names for Replication Operation Type Attributes

Common Output Name	Applicable Product
Local Copy	ShadowImage
Remote Copy (Async)	TrueCopy Async
Remote Copy (Jrnl)	Universal Replicator
Remote Copy (Sync)	TrueCopy Sync
SnapShot	QuickShadow Copy-on-Write Snapshot

Requests and Parameters Output as Provisioning Manager Audit Log Data

The following table lists and describes the requests and parameters output as Provisioning Manager audit log data.

Table 10-17 Details of Requests and Parameters Output as Provisioning Manager Server Audit Log Data

Request	Description	Output Parameter
AddLicense	Adds a license by using a single license key.	Fixed to *****
	Adds a license by using a license key file.	Size of the license key file
CreateAllocPl	Creates a new allocation plan.	Information about the allocation plan[#1]
DelAllocPl	Deletes an allocation plan.	Resource identifier of the allocation plan that is to be deleted[#2]
GetAllocPl	Acquires the allocation plan that has the specified resource identifier.	Resource identifier of the allocation plan[#2]
GetAllocPlByName	Acquires the allocation plan that has the specified name.	Allocation plan name
GetAllocPls	Acquires all allocation plans that can be referenced by the logon user.	--

Request	Description	Output Parameter
GetAllocVolInfos	Acquires a list of volumes to be displayed in the list of allocated LDEVs, and additional information that indicates the non-conforming status of the storage subsystem.	▪ Names of the resource groups in a storage pool from which the volumes are acquired ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2 ▪ Information about the allocation plan (if specified)#1
GetAllocVols	Acquires a list of volumes to be displayed in the list of allocated LDEVs.	▪ Names of the resource groups in a storage pool from which the volumes are acquired ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2 ▪ Information about the allocation plan (if specified)#1
GetConPortInfoByDevF	Acquires the port connection information that has been set between the specified device file and the volume.	▪ Resource identifier of the volume#2 ▪ Resource identifier of the device file#2
GetConPortInfoByHost	Acquires the port connection information that has been set between the specified host and the volume	▪ Resource identifier of the volume#2 ▪ Resource identifier of the host#2
GetDevF	Acquires the device file that has the specified resource identifier.	Resource identifier of the device file#2
GetDevFByName	Acquires the device file that has the specified name.	▪ Resource identifier of the host#2 ▪ Device file name
GetDevFHost	Acquires the device file of the specified host.	Resource identifier of the host#2
GetDevFsSumByHost	Acquires the device file of the specified host.	Resource identifier of the host#2
GetDevOprLogDtl	Acquires the details of the device operation log information that has the specified device operation log ID.	Log ID
GetDevOprLogs	Acquires device operation log information.	--
GetFiltSPoolDtl	Acquires storage pool information for the specified resource group and the resource groups immediately below it.	▪ Target resource group name ▪ Information about the allocation plan (if specified)#1

Request	Description	Output Parameter
GetFiltSPoolSum	Acquires the storage pool information for the specified resource group	▪ Target resource group name ▪ Information about the allocation plan (if specified)[#1]
GetFSys	Acquires the file system that has the specified resource identifier.	Resource identifier of the file system[#2]
GetFSysByHost	Acquires the file system of the specified host.	Resource identifier of the host[#2]
GetFSysMP	Acquires, on the specified host, the file system at the mount point.	▪ Resource identifier of the host[#2] ▪ Mount point
GetFSysSumHost	Acquires the file system of the specified host.	Resource identifier of the host[#2]
GetHost	Acquires the host information that has the specified resource identifier.	Resource identifier of the host[#2]
GetHostByIPAddress	Acquires the host information that has the specified IP address.	IP address
GetHostByName	Acquires the host information that has the specified name.	Host name
GetHosts	If no parameters are specified: Acquires information about all managed hosts. If a parameter is specified: Acquires information about hosts of the specified type.	If no parameters are specified: None If a parameter is specified: Host type
GetHostSum	If no parameters are specified: Acquires information about all managed hosts. If a parameter is specified: Acquires information about hosts of the specified type.	If no parameters are specified: None If a parameter is specified: Host type
GetLicenseInfo	Acquires the license information.	--
GetLogLevel	Dynamically acquires the log output level.	--
GetNFSys	Acquires file system information that has the specified resource identifier on the file server.	Resource identifier of the file system[#2]
GetNFSysByHost	Acquires file system information on the specified file server.	Resource identifier of the host[#2]
GetNFSysSumByHost	Acquires file system information on the specified file server.	Resource identifier of the host[#2]

Request	Description	Output Parameter
GetNPool	Acquires storage pool information on the file server that has the specified resource identifier.	Resource identifier of the storage pool on the file server
GetNPoolByHost	Acquires storage pool information on the specified file server	Resource identifier of the host[#2]
GetNPoolSumHost	Acquires storage pool information on the specified file server.	Resource identifier of the host[#2]
GetOprEvent	Acquires a host setting event.	Operation ID of the host setting processing that was acquired as the return value of the host setting operation API
GetProvInfo	Acquires provisioning settings.	Operation ID of the host setting processing that was acquired as the return value of the host setting operation API
GetSA	Acquires storage subsystem information that has the specified resource identifier.	Resource identifier of the storage subsystem to which the acquired volumes belong[#2]
GetSAByName	Acquires storage subsystem information that has the specified name.	Storage subsystem name
GetSAByTypeSrlNum	Acquires storage subsystem information specified by the model and serial number.	▪ Model name of the storage subsystem ▪ Serial number of the storage subsystem
GetSAs	Acquires storage subsystem information for all management targets.	--
GetSPoolDispArrFamDtl	Acquires an array whose elements are the storage pool information for the specified resource group and the resource groups immediately below it.	Target resource group name
GetSPoolDispArrFamSum	Acquires storage pool information for the specified resource group for each series.	Target resource group name
GetSPoolDispArrTypeDtl	Acquires an array whose elements are the storage pool information for the specified resource group and the resource groups immediately below it.	Target resource group name
GetSPoolDispArrTypeSum	Acquires storage pool information for the specified resource group for each model.	Target resource group name

Request	Description	Output Parameter
GetSPoolDtl	Acquires an array whose elements are the storage pool information for the specified resource group and the resource groups immediately below it.	Target resource group name
GetSPoolRaidTypeDtl	Acquires an array whose elements are the storage pool information for the specified resource group and the resource groups immediately below it.	Target resource group name
GetSPoolRaidTypeSum	Acquires storage pool information for the specified resource group for each RAID type.	Target resource group name
GetSPoolSANameDtl	Acquires an array whose elements are the storage pool information for the specified resource group and the resource groups immediately below it.	▪ Target resource group name ▪ Information about the allocation plan[#1]
GetSPoolSANameSum	Acquires storage pool information for the specified resource group for each device.	▪ Target resource group name ▪ Information about the allocation plan[#1]
GetSPoolSum	Acquires storage pool information for the specified resource group.	Target resource group name
GetSprtSAFams	Acquires a list of supported series.	--
GetSprtSATypes	Acquires a list of supported models.	--
GetUGrp	Acquires the resource group to which the logon user belongs.	--
GetUGrpByName	Acquires the resource group that has the specified name.	Resource group name
GetUGrpForVol	Acquires an array of resource groups to which the specified volume belongs.	Array of the resource identifiers of the volume[#2]
GetUGrps	Acquires an array that indicates the parent-child relationship of the resource groups to which the logon user belongs and the resource groups immediately below it.	--

Request	Description	Output Parameter
`GetUnAllocVolInfos`	Acquires a list of volumes to be displayed in the list of unallocated LDEVs, and additional information that indicates the non-conforming status of the storage subsystem.	▪ Names of the resource groups in a storage pool from which the volumes are acquired ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2 ▪ Information about the allocation plan#1
`GetUnAllocVols`	Acquires a list of volumes to be displayed in the list of unallocated LDEVs.	▪ Names of the resource groups in a storage pool from which the volumes are acquired ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2 ▪ Information about the allocation plan#1
`GetVer`	Acquires the version information.	--
`GetVolForAddDevF`	Acquires a list of volumes for creating a device file.	▪ Resource identifier of the target host to which the volumes being acquired are to be allocated#2 ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2
`GetVolForAddFSys`	Acquires a list of volumes for creating a file system.	▪ Resource identifier of the target host to which the volumes being acquired are to be allocated#2 ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2
`GetVolForExpFSys`	Acquires a list of volumes for expanding a file system.	▪ Resource identifier of the file system to be expanded#2 ▪ Resource identifier of the target host to which the volumes being acquired are to be allocated#2 ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2

Request	Description	Output Parameter
GetVolForModPool	Acquires a list of volumes for displaying the storage pool change window.	▪ Names of the resource groups in a storage pool from which the volumes are acquired ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2 ▪ Information about the allocation plan#1
GetVolInfosForAddDevF	Acquires a list of volumes for creating a device file, and additional information that indicates the non-conforming status of the storage subsystem.	▪ Resource identifier of the target host to which the volumes being acquired are to be allocated#2 ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2
GetVolInfosForAddFSys	Acquires a list of volumes for creating a file system, and additional information that indicates the non-conforming status of the storage subsystem.	▪ Resource identifier of the target host to which the volumes being acquired are to be allocated#2 ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2
GetVolInfosForExpFSys	Acquires a list of volumes for expanding a file system, and additional information that indicates the non-conforming status of the storage subsystem.	▪ Resource identifier of the file system to be expanded#2 ▪ Resource identifier of the target host to which the volumes being acquired are to be allocated#2 ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2
GetVolSA	Acquires the volume in the specified storage subsystem.	▪ Resource identifier of the storage subsystem#2
GetVolSADevNum	Acquires the volume in the specified storage subsystem and device number.	▪ Resource identifier of the storage subsystem#2 ▪ Device number
GetVolSumForAllocPool	Acquires summary information for volumes to display a list of allocated LDEVs.	▪ Names of the resource groups in a storage pool from which the volumes are acquired ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2 ▪ Information about the allocation plan#1

Request	Description	Output Parameter
GetVolSumForModPool	Acquires summary information for volumes to display the storage pool change window.	▪ Names of the resource groups in a storage pool from which the volumes are acquired ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2 ▪ Information about the allocation plan#1
GetVolSumForUnAllocPool	Acquires summary information for volumes to display a list of unallocated LDEVs.	▪ Names of the resource groups in a storage pool from which the volumes are acquired ▪ Resource identifier of the storage subsystem to which the acquired volumes belong#2 ▪ Information about the allocation plan#1
IsUsedLogicVolName	Checks whether the logical volume name is already in use.	▪ Resource identifier of the host#2 ▪ Logical volume name
IsUsedVolGrpName	Checks whether the volume group name is already in use.	▪ Resource identifier of the host#2 ▪ Volume group name
ModAllocPl	Edits an existing allocation plan.	Information about the allocation plan#1
ModPool	Changes the storage pool that owns the specified volume as OWN.	▪ Resource group name to which the volume belonged before the move ▪ Resource group name after the move ▪ Array of the resource identifiers of the volume to be moved#2
RefreshHostInfo	Refreshes host information.	Resource identifier of the host to be refreshed#2
ResumeOpr	Restarts the host setting operation that has been suspended.	Operation ID acquired as the return value of the host setting operation API when the host setting operation was suspended
SetLogLevel	Dynamically changes the log output level.	Log output level
SetStatus	Changes the status (public or private) of the provisioning plan.	▪ Resource identifier of the provisioning plan#2 ▪ Status after change (public or private)

Request	Description	Output Parameter
`StartAddDevF`	Creates a device file.	▪ Resource identifier of the target host#2 ▪ Resource identifier of the target volume#2 ▪ Type of the volume manager to be used ▪ Volume group name ▪ Logical volume name ***Caution****:* The volume group name and logical volume name are displayed only when they are specified.
`StartAddFSys`	Creates a file system.	▪ Resource identifier of the target host#2 ▪ Resource identifier of the target volume#2 ▪ Type of the file system to be created ▪ Mount point of the file system to be created ▪ Type of the volume manager to be used ▪ Volume group name ▪ Logical volume name ***Caution****:* The volume group name and logical volume name are displayed only when they are specified.
`StartDelDevF`	Deletes a specified device file.	Resource identifier of the device file to be deleted#2
`StartDelFSys`	Deletes a specified file system.	Resource identifier of the file system to be deleted#2
`StartExpandFSys`	Expands a file system.	▪ Resource identifier of the file system to be expanded#2 ▪ Resource identifier of the target volume#2

#1: For details about the parameters output as information about the allocation plan, see Table 10-18. The allocation plan information is displayed enclosed in square brackets (`[]`), and values are separated by a semicolon (`;`).

#2: The resource identifier consists of several elements. For details about the elements of each resource identifier, see Table 10-19. The elements of each resource identifier are output, separated by a hyphen (`-`).

Table 10-18 Parameters Output as Information About the Allocation Plan

Information About the Allocation Plan	Output	
	ModAllocPl	Other Than ModAllocPl
Plan name	Y	Y
Model name of storage subsystem	Y	Y
RAID level	Y	Y
Plan creation date	Y	--
Plan owner resource group	Y	--
User who created the plan	Y	--
Plan creation resource group	Y	--
Plan update date and time	Y	--
User who updated the plan	Y	--
Plan update resource group	Y	--
Plan status (public or private)	Y	--

Legend: Y: Output, --: Not output

Table 10-19 Elements of the Resource Identifier

Resource Type	Element of Resource Identifier
File system	File system ID, host ID
Device file	Device file ID, host ID
Plan	Plan ID
Volume	Model name of storage subsystem, serial number, LDEV number
Storage subsystem	Model name of storage subsystem, serial number
Host	Host ID
Storage pool on the file server	ID of the storage pool on the file server, host ID

For the correspondence between the storage subsystem name displayed in audit log data and the actual model name, see Table 10-20. Note that Device Manager versions 5.7 or later do not support T3. However, if a T3 is already registered as a management target of Device Manager in earlier versions and you perform an operation for that storage subsystem, information about T3 might be output as audit log data.

Table 10-20 Correspondence Between the Storage Subsystem Name Displayed in Audit Log Data and the Actual Model Name

Name Output as Audit Log Data	Model
D500	Thunder 9200
D600	Thunder 9500V
D700	Hitachi AMS/WMS
D800	Hitachi AMS 2000

Name Output as Audit Log Data	Model
R400	Lightning 2000
R450	Lightning 9900V
R500	Hitachi USP
R600	Universal Storage Platform V/VM
S800	Hitachi SMS
T3	Sun StorEdge T3

Contacting the Hitachi Data Systems Support Center

If you need to contact the Hitachi Data Systems Support Center, make sure that you provide as much information as possible about the problem, including the circumstances surrounding the error or failure, and the exact content of any error messages.

The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, please call:

- United States:

  (800) 446-0744

- Outside the United States:

  (858) 547-4526

A

Overview and Setup of VDS

This chapter provides an overview of Device Manager VDS Provider, and explains the setup procedure.

Overview and Functions of Device Manager VDS Provider

This section describes the functions of Device Manager VDS Provider. It also describes functions that are available in Storage Manager for SANs for Windows Server 2003 R2.

Overview of Device Manager VDS Provider

Windows Server 2003 provides Virtual Disk Service (VDS), which is a virtual disk system designed to manage storage subsystem devices via standardized interfaces.

Device Manager VDS Provider is a Device Manager software product that provides and configures storage subsystem information for VDS. Device Manager VDS Provider supports the following OSs:

- Windows Server 2003 SP2 (x86)
- Windows Server 2003 SP2 (x64)
- Windows Server 2003 R2 SP2 (x86)
- Windows Server 2003 R2 SP2 (x64)

Functions of Device Manager VDS Provider

Device Manager VDS Provider is a hardware provider that is resident on a Windows host and replies to VDS requests. It provides functions for:

- Obtaining the following storage subsystem related configuration information:
  - Subsystem
  - LUN
  - LUN replication information
  - Path information
  - Port information

  If you specify a user assigned to a user-defined resource group as a user account used by VDS Provider, only the resources that have been defined in the resource group can be displayed when configuration information is acquired. This is called the *filtering function*.
- Performing the following storage subsystem related configuration tasks:
  - Creating LUNs
  - Expanding LUNs
  - Deleting LUNs
  - Mapping LUNs
  - Masking LUNs

Before you can use the DISKRAID command provided by Microsoft, you must perform the following installation tasks:

- Install Device Manager VDS Provider.

⚠ ***Note:*** To use Device Manager VDS Provider, you need to change the value of the Device Manager server property server.cim.support to true in the server.properties file, and then restart the Device Manager server.

- If your host computer OS is not Windows Server 2003 R2, download VDS SDK from the Microsoft web site (http://www.microsoftstoragepartners.com) and then install it.

Available Functions in Storage Manager for SANs for Windows Server 2003 R2

When using Storage Manager for SANs provided by Windows Server 2003 R2, you can perform storage subsystem operations via the VDS Provider function of Device Manager.

Functionality the following functions are available:

- Creating LUNs
- Deleting LUNs
- Extending LUNs
- Renaming LUNs
- Assigning LUNs
- Unassigning LUNs
- Managing server connections
- Renaming storage subsystems
- Refreshing

Functionality for the following is not available:

- Blinking of drive lights
- Managing iSCSI targets
- Managing iSCSI security
- Logging on to iSCSI targets

Installing Device Manager VDS Provider

The following describes how to install Device Manager VDS Provider:

- New installation

  Use this installation method to install Device Manager VDS Provider in a host in which Device Manager VDS Provider does not exist.

- Upgrade installation (to update an earlier version)

  Use this installation method to install Device Manager VDS Provider on a host in which an older version of Device Manager VDS Provider has been installed.

- Re-installation (to correct the same version)

  Use this installation method to install Device Manager VDS Provider on a host in which the same version of Device Manager VDS Provider has been installed.

You can obtain the version of an installed Device Manager VDS Provider by executing the following command:

```
installation-folder-for-Device-Manager-VDS-Provider\bin\hdvminfo.exe
```

The following shows an example of executing the command:

```
C:\Program Files\HITACHI\HDvM_VDS\bin\hdvminfo.exe
```

Notes: Note the following when installing Device Manager VDS Provider:

- At least 5 MB of free space is required on the hard disk. Also, an additional 5 MB of free space is required on the system drive to create temporary files during installation.
- Before starting the installation, cancel any programs that might be running.
- After installation, you will need to set up access permission for the Device Manager VDS Provider installation folder. Since access permission cannot be set for FAT or FAT32 formatted drives, be sure to install Device Manager VDS Provider installation on an NTFS formatted drive.
- Do not execute the `DISKRAID` command provided by Microsoft or the `hdvmconfig` command during an upgrade installation of Device Manager VDS Provider. In addition, do not install Device Manager VDS Provider when the `DISKRAID` or `hdvmconfig` command is being executed. If you execute the above command during an upgrade installation, the installation might end before completion. Make sure that you restart the system after installation
- Version 4.1 or earlier of Device Manager VDS Provider is automatically installed or uninstalled when Device Manager Agent is installed. If you want to use version 4.1 or earlier of Device Manager VDS Provider, install Device Manager Agent. For details on how to install Device Manager Agent, see the manual for the installed version of Device Manager Agent.
- Version 4.1 or earlier of Device Manager VDS Provider cannot be used at the same time as version 4.2 or later. Stop the service of the version that will not be unused. For details, see Starting and Stopping Device Manager VDS Provider. The service names are:
  - In version 4.1 or earlier: **Hitachi RAID Provider**
  - In version 4.2 or later: **Device Manager VDS Provider**
- If the Hitachi RAID Provider service is running, version 4.3 or later of Device Manager VDS Provider cannot be installed. If you attempt to install it, the following message appears.

  ```
  Hitachi RAID Provider is running. Re-install after stopping this
  service.
  ```
- Overwrite installation (an update installation or a fixed version) might fail, in which case cancellation of the overwrite installation is reported. Overwrite installation (update or fixed) might also fail when the startup status of the Device Manager VDS Provider service is disabled. In this case, reboot the system, and then perform installation again.

New Installation

Note: Before starting the installation, cancel any programs that might be running.

To perform a new installation:

1. Log on to Windows using an Administrators-group user ID.
2. Insert the Device Manager VDS Provider CD-ROM.
3. Select **Start**, and then **Run**. In the displayed window, click **Browse**. In the displayed tree view, select `setup.exe` (in the \VDS folder on the CD-ROM). Then, click **OK**.

   The Welcome to the InstallShield® Wizard for Device Manager VDS Provider window appears.
4. Click the **Next** button.

   The Device Manager VDS Provider License Agreement window appears.
5. Click the **Next** button.

   The Choose Destination Location window appears.
6. Specify the installation folder of Device Manager VDS Provider, and then click the **Next** button.

   The installation folder displayed by default differs for x86 and x64.

   – For x86

     `Windows-system-drive``\Program Files\HITACHI\HDvM_VDS`

   – For x64

     `Windows-system-drive``\Program Files (x86)\HITACHI\HDvM_VDS`

Caution: Do not select the installation folder for Device Manager VDS Provider version 4.1 or earlier.

The IP Address of the Device Manager server window appears.

7. Specify the IP address of the Device Manager server, and then click the **Next** button.

Caution: Device Manager VDS Provider only supports IPv4 (IPv6 is not supported).

The Installation Confirmation window appears.

8. Click the **Install** button.

   The Progress window appears. When installation is complete, a window indicating the completion of installation appears.
9. Click the **Finish** button.
10. Set up access permissions for the Device Manager VDS Provider installation folder.

    Using the appropriate OS function, set up read/write access permissions for the Administrators group and SYSTEM group. Do not set up access permissions for groups other than the Administrators group and SYSTEM group.

If your installation has ended normally, specify your user ID and password for connection to the Device Manager server. For details on how to specify your user ID and password, see Setting up Device Manager VDS Provider.

Upgrade Installation (to Update an Earlier Version)

Note: Before starting the installation, cancel any programs that might be running.

To perform an upgrade installation:

1. Log on to Windows using an Administrators-group user ID.
2. Insert the Device Manager VDS Provider CD-ROM.
3. Select **Start**, and then **Run**. In the displayed window, click **Browse**. In the displayed tree view, select `setup.exe` (in the `\VDS` folder on the CD-ROM). The Welcome to the InstallShield Wizard for Device Manager VDS Provider window appears.
4. Click the **Next** button.

   The Progress window appears. When installation is complete, a window indicating the completion of installation appears.
5. Click the **Finish** button.
6. Set up access permissions for the Device Manager VDS Provider installation folder.

   Using the appropriate OS function, set up read/write access permissions for the Administrators group and SYSTEM group. Do not set up access permissions for groups other than the Administrators group and SYSTEM group.

Note: Upgrade installation relies on the already specified Device Manager server IP address, user ID, and password as they are inherited from the original system. To change the IP address, user ID, or password, see Setting up Device Manager VDS Provider.

Re-installation (to Correct the Same Version)

To perform an upgrade installation:

1. Log on to Windows using an Administrators-group user ID.
2. Insert the Device Manager VDS Provider CD-ROM, and then select **Start**, **Run**. In the displayed window, click **Browse**. In the displayed tree view, select `setup.exe` (in the `\VDS` folder on the CD-ROM), and then click **OK**.

   The Welcome window appears.

Note: You can also perform the above operation by selecting **Start**, **Settings**, **Control Panel**, and then **Add or Remove Programs**. In the displayed window, select **Device Manager - VDS Provider** and then click the **Change/Remove** button.

3. Select **Repair**, and then click the **Next** button.

   The Welcome to the InstallShield Wizard for Device Manager VDS Provider window appears.

4. Click the **Next** button.

   A dialog box indicating that preparations for setup have finished is displayed.

Note: Up until this step, you can select **Cancel** to cancel installation of Device Manager VDS Provider.

5. Click the **Next** button.

   A dialog box appears, indicating that Device Manager VDS Provider is being installed, and then a window indicating the completion of installation appears.

6. Click the **Finish** button.

7. Set up access permissions for the Device Manager VDS Provider installation folder.

   Using the appropriate OS function, set up the read/write access permissions for the Administrators group and SYSTEM group.

   Do not set up access permissions for groups other than the Administrators group and SYSTEM group.

Uninstalling Device Manager VDS Provider

This section describes how to uninstall Device Manager VDS Provider.

Uninstalling Device Manager VDS Provider stops service programs and deletes all the folders, files, and registry information that were registered during installation. The system returns to the status before installation.

Note: When you perform an uninstallation when the following conditions are satisfied, a message prompting you to restart the OS is displayed after the uninstallation. Even though this message appears, you do not have to restart the OS. Take the appropriate action by following the relevant instructions.

- If the exe file or bat file corresponding to Device Manager VDS Provider is being executed:

  Stop the exe file or bat file (or both) that is being executed.

- If the command prompt window is open and its current folder is the same as the installation folder for Device Manager VDS Provider:

  Close the command prompt window.

To uninstall Device Manager VDS Provider (method 1):

1. Select **Start**, **Settings**, **Control Panel**, and then **Add or Remove Programs**.
2. Click the **Remove** button for Device Manager VDS Provider.

To uninstall Device Manager VDS Provider (method 2):

1. Select **Start**, **Settings**, **Control Panel**, and then **Add or Remove Programs**.
2. Click the **Change** button for Device Manager VDS Provider.

   The Device Manager - VDS Provider maintenance menu is displayed.
3. Click the **Remove** button.

Caution: When changes or deletions are performed from **Add or Remove Programs**, an error might occur, in which case the following message is displayed. If an error occurs, use `setup.exe` in the `\VDS` folder on the CD-ROM to perform any changes or deletions.

```
An error occurred during reading C:\Program Files\Common
Files\InstallShield\Professional\RunTime\10\50\Intel32\Ctor.dll. The specified module
cannot be found.
```

Starting and Stopping Device Manager VDS Provider

The following describes how to start and stop Device Manager VDS Provider.

Starting the Service

Open the Services window by selecting **Start**, **Settings**, **Control Panel**, **Administrative Tools**, and then **Services**. Then, start the **Device Manager VDS Provider** service.

Note: After the service starts, the message `KAIC24804-I` is output to the log file:

```
KAIC24804-I Acquiring storage subsystem information from the Device
Manager server has finished.
```

The log file is stored in the following path:

```
installation-folder-for-Device-Manager-VDS-Provider\logs\hdvmcomm.log
```

Caution: Do not connect from the VDS client to the VDS Provider until the Device Manager VDS Provider service starts.

Stopping the Service

Open the Services window by selecting **Start**, **Settings**, **Control Panel**, **Administrative Tools**, and then **Services**. Then, stop the **Device Manager VDS Provider** service.

Notes on Starting and Stopping the Service

After stopping or restarting Device Manager VDS Provider while the DISKRAID command is running, if the subcommand of the DISKRAID command is executed, an error occurs. In this case, finish the DISKRAID command by executing the `QUIT` command, and then restart the DISKRAID command.

Device Manager VDS Provider acquires information about the storage subsystems from the Device Manager server when Device Manager VDS Provider starts, or the `REFRESH` subcommand of the DISKRAID command is executed.

It might take a long time to acquire this information, so follow the directions below:

- Restarting Device Manager VDS Provider

  Until Device Manager VDS Provider completes processing to acquire configuration information about the storage subsystems, note that:

  – If you execute a DISKRAID command to display information about the storage subsystems, the information is not displayed.

  - If you execute the REFRESH subcommand of the DISKRAID command, an error occurs.

- Executing the REFRESH subcommand of the DISKRAID command

  Until Device Manager VDS Provider completes processing to acquire configuration information about the storage subsystem, note that:

  - If you execute a DISKRAID command to display information about the storage subsystems, the information before the refresh operation is displayed.
  - If you re-execute the REFRESH subcommand of the DISKRAID command, an error occurs.

Caution: If the REFRESH subcommand is executed, while the storage subsystem deleted from the Device Manager server is selected by executing the SELECT subcommand, the LIST subcommand might display incorrect information. In such a case, select another storage subsystem by executing the SELECT subcommand, and then re-execute the REFRESH subcommand, or restart the DISKRAID command.

Device Manager VDS Provider Property Files

Device Manager VDS Provider uses two property files:

- `vds.properties` file

  This file is used to configure the Device Manager VDS Provider environment.

- `logger.properties` file

  This file is used to configure the Device Manager VDS Provider logging function.

These files are stored in the following locations:

`vds.properties` file:

`installation-folder-for-Device-Manager-VDS-Provider``\config\vds.properties`

`logger.properties` file:

`installation-folder-for-Device-Manager-VDS-Provider``\config\logger.properties`

Caution: If you change the contents of the Device Manager VDS Provider property files (`vds.properties` and `logger.properties`), you must restart the service.

vds.properties File

The `vds.properties` file contains the following information:

- IP address of the Device Manager server
- Port number of the Device Manager server
- Account (user name and password) used for Device Manager VDS Provider
- Device Manager VDS Provider account (user name and password) used for the filtering function

Note:

- This information will be specified in the `vds.properties` file only when the filtering function is used.
- Because the data of the Device Manager VDS Provider user account is encrypted, execute the `hdvmconfig` command to edit the data.

You can change the above information after installing Device Manager VDS Provider. For details on how to change the information, see Setting up Device Manager VDS Provider.

logger.properties File

The logger.properties file is used to configure the logging function of Device Manager VDS Provider. The following table describes the logging function properties of Device Manager VDS Provider.

Table A-1 logger.properties File

Property	Description
logger.loglevel	Specifies the log level for data that Device Manager VDS Provider outputs to the files hdvmcomm.log.*n* and hdvmprov.log.*n* (the *n* in the file name indicates the backup generation number of the file). Log levels: DEBUG, INFO, WARN, ERROR, and FATAL. If you use the default value, entries of INFO, WARN, ERROR, and FATAL are output to the log files, but the entries of DEBUG are not output. Default: INFO
logger.MaxBackupIndex	Specifies the maximum number of backup log files for the data that Device Manager VDS Provider outputs to the files hdvmcomm.log.*n* and hdvmprov.log.*n* (the *n* in the file name indicates the backup generation number of the file). If more log files are generated than specified, Device Manager VDS Provider writes over the oldest one. If a log file reaches the maximum size, the file is renamed by adding a counter (which represents the version) to the file name. For example, hdvmcomm.log becomes hdvmcomm.log.1. If additional backup log files are created, the counter increases until the specified number of backup log files is generated (for example, hdvmcomm.log.1 becomes hdvmcomm.log.2). After the specified number of backup log files are created, each time a new backup file is created, the oldest backup file is deleted. Specifiable range: 1 through 20. Default: 10
logger.MaxFileSize	Specifies the maximum size of each log file for the data that Device Manager VDS Provider outputs to the files hdvmcomm.log.*n* and hdvmprov.log.*n* (the *n* in the file name indicates the backup generation number of the file). If a log file becomes larger than the specified maximum, Device Manager VDS Provider creates a new file and writes logs to it. Unless KB is specified for kilobytes or MB for megabytes, a specified size is interpreted to mean bytes. Specifiable range: from 512KB to 32MB Default: 1 MB

Caution: If you changed the logger.properties file, restart Device Manager VDS Provider.

Setting up Device Manager VDS Provider

To set up Device Manager VDS Provider, use Web Client to create a user account for Device Manager VDS Provider, and then execute the `hdvmconfig` command.

Creating a User Account Used by Device Manager VDS Provider

Create a user account that Device Manager VDS Provider uses to access the Device Manager server. Both user accounts must have the Admin permission.

- A user to which All Resources is assigned

  This user is required for creating or deleting a volume.

- A user to which a user-defined resource group is assigned

  This user is required for using the filtering function. Assign the resource to be acquired for Device Manager VDS Provider to the resource group. For details on how to create a user ID and how to assign a resource group, see the Device Manager online Help.

Specifying Information in the vds.properties File

Use the `hdvmconfig` command to change the information about Device Manager VDS Provider specified in the `vds.properties` file.

This command enables you to interactively specify each property stored in the `vds.properties` file. To execute this command, you must have Windows Administrator privileges. If you execute this command without these privileges, an error message will be output.

The `hdvmconfig` command is stored in the following location:
installation-folder-for-Device-Manager-VDS-Provider`\bin\hdvmconfig.exe`

To specify information in the `vds.properties` file:

1. Execute the `hdvmconfig` command:

   The following shows an example of executing the command:

   ```
   C:\Program Files\HITACHI\HDvM_VDS\bin\hdvmconfig.exe
   ```

2. A message asking if you want to change the settings appears.

   Enter `y` to change the settings, or `n` to leave the settings unchanged.

3. Enter the IP address of the Device Manager server.

   Enter the IP address of the Device Manager server in dotted decimal format. The specified IP address is assigned to `server.ipaddress` in the property file.

Caution: Device Manager VDS Provider only supports IPv4 (IPv6 is not supported).

4. Enter the port number of the Device Manager server.

   If you do not enter a port number, the default 5988 is specified. The specified port number is assigned to `server.port` in the property file.

Caution: Specify the port number assigned to `server.cim.http.port` in the `server.properties` file used by the Device Manager server.

5. Enter the type of user to be registered.

   When `1` is entered:

   > You need to specify a user to which All Resources is assigned. This user acquires configuration information of all resources. This user can create and delete a volume.

   When `2` is entered:

   > You need to specify a user to which a user-defined resource group is assigned. This user acquires configuration information within the resource group that is assigned to this user. This user cannot create or delete a volume.

   When `3` is entered:

   > This user acquires configuration information within the resource group that is assigned to this user. This user can create and delete a volume.

   To use the filtering function, enter `2` or `3`.

6. By following the selection in step 5, enter the user ID and password.

   You can use the following characters for the user ID:

   a to z A to Z 0 to 9 ! # $ % & ( ) * + - . = @ \ ^ _ | ‘

Note: For overwrite installations, if you do not enter a user ID, the currently set user ID will be inherited.

   You can use the following characters for the password:

   a to z A to Z 0 to 9 ! # $ % & ( ) * + - . = @ \ ^ _ | ‘

   The user ID and password are encrypted by the `hdvmconfig` command and assigned to `server.authorization` and `server.authorizationforresourcegroup` in the property file.

7. A message appears asking if you want to save the entered information into the `vds.properties` file.

   Enter `y` to save the information, or `n` to leave the information unchanged.

8. Restart Device Manager VDS Provider.

Device Manager VDS Provider Log Files

Problems that occur during Device Manager VDS Provider installation, uninstallation, or execution of its services are recorded in log files.

The following table describes the log file names, locations, and descriptions.

Table A-2 Log Files

Log File Name and Location	Description
installation-folder-for-Device-Manager-VDS-Provider\logs\hdvmcomm.log.*n*	This file records information about communication between Device Manager VDS Provider and the Device Manager server. The *n* in the file name indicates the backup generation number of the file.
installation-folder-for-Device-Manager-VDS-Provider\logs\hdvmprov.log.*n*	This file records information about the starting and stopping of Device Manager VDS Provider. The *n* in the file name indicates the backup generation number of the file.
Windows-system-drive:\DeviceManager_6_3_VDS_Install.log	This file records information about the installation execution for Device Manager VDS Provider.
Windows-system-drive:\DeviceManager_VDS_UninstallLog.log	This file records information about the uninstallation execution for Device Manager VDS Provider.

If a problem occurs in Device Manager VDS Provider, you can use the error information batch collection tool (`hdvmgetlogs.bat`). This tool collects the log files and property files required for error analysis from the Device Manager VDS Provider environment in a single operation. To execute this tool, you must have Windows Administrator privileges.

The following shows where the `hdvmgetlogs` command is stored and the command format.

```
installation-folder-for-Device-Manager-VDS-Provider\bin\hdvmgetlogs.bat
```

The following shows an example of executing the command:

```
C:\Program Files\HITACHI\HDvM_VDS\bin\hdvmgetlogs
```

When you execute the `hdvmgetlogs` command, a `resultDir` folder is created under *installation-folder-for-Device-Manager-VDS-Provider*. This folder stores the collected log files and property files.

Caution: If the `resultDir` folder already exists, the following confirmation message appears:

```
Output Directory “resultDir” already exists.
This program will delete “resultDir” before working. continue?
(Y)es or (N)o :
```

If you enter `y`, the command deletes the `resultDir` folder, and stores the acquired error information files in a new `resultDir` folder. If you enter `n`, processing is cancelled.

B

Specifying Properties

This Chapter describes the property files of a Device Manager server and Provisioning Manager server.

Properties Overview

Table 12-1 describes the contents of properties of a Device Manager server and Provisioning Manager server.

Table 12-1 Property Files of a Device Manager Server and Provisioning Manager Server

Property File	Description
`server.properties` : Contains Device Manager server configuration properties	This file includes the HTTP listener IP address and port, along with performance tuning settings such as the size of the input/output buffers, various TCP/IP stack and socket settings, server cache parameters, connection thread priorities, and also properties related to the email notification function. ***Warning:*** Do not attempt to optimize these attributes unless you are an expert, because even minor changes could severely impact the performance of the Device Manager server.
`database.properties` : Contains Device Manager database properties	This file includes DBMS parameters, such as drivers and logon IDs. ***Warning:*** Do not attempt to optimize these attributes unless you are an expert, because even minor changes could severely impact the performance of the Device Manager server.
`logger.properties` : Contains Device Manager logger properties	This file includes directives that configure the Device Manager server logging module, including the names, locations and output levels of various operations and error log files.
`dispatcher.properties` : Contains Device Manager dispatcher properties	This file includes properties that allow you to fine-tune various background processes (daemons) and optimize the thread-priority for service agents.
`mime.properties` : Contains Device Manager MIME properties	This file includes the translation/lookup table for all Multipurpose Internet Mail Extensions (MIME) file types recognized by the Device Manager server.
`client.properties`: Contains Device Manager Web Client properties	This file includes properties related to Web Client display and operation.
`server.properties` and `security.properties` : Contains Device Manager server security properties	These files includes the properties that specify whether secure-socket encryption is being utilized, the location and passwords for the server certificate truststore, a list of permitted client IP addresses, and properties that help strengthen the Device Manager server against denial-of-service attacks. ***Warning:*** Do not use a text editor to edit the security properties. For more information on changing the security properties, see Security Settings Related to Communication.
`customizedsnmptrap.properties` : Contains Device Manager SNMP trap log output function properties	This file includes the properties that specify whether to output SNMP traps to log files and the output format.
`launchapp.properties` : Contains Device Manager launch applications properties	This file includes the installation-target server information necessary for launching applications.
`host.properties` : Contains Device Manager mainframe host agent properties	This file includes the settings for communication between the Device Manager server and mainframe hosts.

Property File	Description
`DvMReport.properties` : Contains Device Manager report function properties	This file includes the properties that you must set to use the report functionality.
`server.properties` : Contains Provisioning Manager server configuration properties	This file includes the HTTP listener IP address and port, along with performance tuning settings such as the size of the input/output buffers, various TCP/IP stack and socket settings, server cache parameters, connection thread priorities, and also properties related to the email notification function. ***Warning:*** Do not attempt to optimize these attributes unless you are an expert, because even minor changes could severely impact the performance of the Provisioning Manager server.
`logger.properties` : Contains Provisioning Manager logger properties	This file includes directives that configure the Provisioning Manager server logging module, including the names, locations and output levels of various operations and error log files.
`client.properties`: Contains Provisioning Manager Web Client properties	This file includes properties related to Web Client display and operation.

Caution:

- For ordinary use, you do not need to change the values set in the property files of a Device Manager server or Provisioning Manager server.

  Use extreme caution when you are modifying the values, because you can cause the server to fail or to function incorrectly. Do not modify the values unless you have sufficient expertise.
- The default values are set during a new installation.

  If you perform an overwrite or upgrade installation, values set in the property files of a Device Manager server and Provisioning Manager server before the installation are inherited.
- If two or more entries in a property file have the same property name, the last entry will take effect.
- If you modify a property file for the Device Manager server or Provisioning Manager server, that change will not take effect until the Device Manager server is rebooted. In addition, if you modify values in the following property files, to enable that changes, you must restart the Common Component services, as well as the Device Manager server:
  - The `client.properties` file of Device Manager
  - The `logger.properties` file of Provisioning Manager
  - The `client.properties` file of Provisioning Manager

The property files for the Device Manager server and Provisioning Manager server are in Java property file format, and can be edited by using a text editor. Each property directive consists of a name-value pair separated by the equal sign (for example, foo.bar=12345). The appropriate end-of-line terminator, as defined by the operating system, delineates individual properties.

Comments in Device Manager or Provisioning Manager property files are tagged using a hash mark (#) at the start of a line. Literals (text strings or numeric values) do not need to be quoted. Boolean values can be either true or false (case-insensitive). Any other setting (for example, yes) is interpreted as false.

The backslash (\) is a reserved character in Java property files, and is used for escaping various control characters such as tabs, line-feeds, etc. On Windows platforms, absolute pathnames typically contain backslash characters, and must be backslash-escaped. For example, the file pathname c:\HiCommand\docroot\foo.bar should be entered as c:\\HiCommand\\docroot\\foo.bar. There is generally no need to backslash-escape any other characters in the property directives.

Device Manager Server Configuration Properties

The `server.properties` file contains properties related to the server configuration.

- In Windows:

  installation-folder-for-the-Device-Manager-server`\HiCommandServer\config\server.properties`

- In Solaris or Linux:

  installation-directory-for-the-Device-Manager-server`/HiCommandServer/config/server.properties`

server.http.host

This property designates either the host name or IP address for the host on which the web server function of Device Manager operates. To specify the IP address, use one of the following formats:

IPv4 format:

x.*x*.*x*.*x* (*x*: integer from 0 to 255)

IPv6 format:

Specify hexadecimal numbers by using colons (:). You can also use a short format. You can only use global IPv6 addresses.

- If you specify a host name, make sure to use a value that a DNS can resolve on the Web Client, CLI, and the subsystem.
- If you specify an IP address, specify a value to which Web Client, CLI, and the subsystem can connect.
- In a cluster environment, specify the IP address of the cluster manager.
- If multiple NICs are installed on the server computer on which Device Manager is installed, specify the IP address of the NIC that belongs to the network to which the clients (Web Client, CLI, and storage subsystems) connect. Do not specify the host name.
- If you have changed the value of the `server.http.host` property and wish to specify settings for an SMI-S Enabled subsystem from Tiered Storage Manager, you first need to refresh the target SMI-S Enabled subsystem.

Default: The host name or IP address of the management server specified during installation (if an error occurs when registering the URL, `localhost` is set).

server.http.port

This property assigns the port used for the Device Manager HTTP (Web) server. The conventional port number used for a standard web server is 80, but there might already be an intranet server running on this port. Moreover, you should avoid low-numbered ports because these could conflict with other services installed on the server. As a general rule, you can pick any port between 1024 and 49151.

⚠ ***Caution:*** Use 80 for the port number when this property is set to a space character.

Default: 2001

server.https.port

This property assigns the port used for the Device Manager secure HTTP web server. The conventional port number for a secure web server is 443, but there might already be a secure intranet server running on this port. As noted above, it is better practice to utilize a port number between 1024 and 49151 for a specialized (middleware) HTTP server. Make sure that it has a different value than the port designated for the HTTP listener.

Default: 2443

server.http.default

If the Device Manager web server receives an HTTP request in which only a directory name is specified but not a file name, the server searches within the directory for the file name specified in this property. Under normal conditions, you do not need to change the default value of this property.

Default: index.html

server.http.request.timeout

This property sets the read-blocking timeout of the HTTP socket connection (in milliseconds). It can be used to enable or disable the `SO_TIMEOUT` setting for client-connection sockets. Reading from the input stream associated with a socket will block for only this amount of time before the socket expires. Its default value is `5000` (5 seconds). A value of `0` is interpreted as an infinite timeout, meaning that `SO_TIMEOUT` is disabled for client connections. You should only modify this property if you are an expert system administrator seeking to fine-tune the server's performance.

Default: `5000` (5 seconds)

server.http.connection.priority

This property sets the priority for all client-connection threads spawned by HTTP requests made against the Device Manager server. Valid values are from `1` to `10` (`1` = minimum priority; `5` = normal priority; `10` = maximum priority). You should only modify this property if you are an expert system administrator seeking to fine-tune the server's performance. Recommended values are from `5` to `8`.

⚠ ***Note:*** If the connection thread priority is set to `10` (maximum), any simultaneous request connections are queued for sequential processing, which defeats the purpose of a multi-threaded server. This setting would actually adversely affect server performance, particularly when you are loading complex HTML pages (for example, those containing many images).

Default: `7`

server.http.connection.bufSize

This property sets the size in bytes for all of the server's input/output (I/O) buffers. Increased buffer size might improve request/response network performance for high-volume connections, while decreasing it can help reduce the backlog of incoming data. Do not set the default value smaller than 1024 bytes, or it can cause failure. You should only modify this property if you are an expert system administrator seeking to fine-tune the server's performance.

Default: `8192` bytes

server.http.socket.backlog

This property assigns the maximum queue length for incoming connection indications (a request to connect), such as setting the `SO_MAX_CONN` attribute of the server socket. If a connection indication arrives when the queue is already full, the Device Manager server will refuse the new connection. You should only modify this property if you are an expert system administrator seeking to fine-tune the server's performance.

Default: `50`

server.http.socket.maxThreads

When a request has been issued and is being processed on the Device Manager server, a client has an active connection on the server. This property specifies the number of active requests that can be processed at one time on Device Manager server, not the maximum number of clients. Once this limit is reached, the next request will be dropped. You should only modify this property if you are an expert system administrator seeking to fine-tune the server's performance.

Default: `50`

server.http.socket.linger

This property determines whether the `SO_LINGER` socket attribute is enabled for client connections with the Device Manager server. Setting this flag to its default value means a linger-On-close timeout of 60 seconds is applied to socket connections. You should only modify this property if you are an expert system administrator seeking to fine-tune the server's performance.

Default: `true`

server.http.socket.noDelay

This property determines whether the `TCP_NODELAY` socket attribute is enabled for connections to the Device Manager server. Setting this flag at its default value disables the Nagle algorithm for TCP/IP packets. If the Nagle algorithm is disabled, packets will be sent without delay. You should only modify this property if you are an expert system administrator seeking to fine-tune the server's performance.

Default: `true`

server.http.headers.maxNumber

This property sets the maximum number of HTTP headers permitted for any request submitted to the Device Manager web server, and helps prevent certain types of denial of service and attempted buffer overflow attacks by restricting the effect of malicious requests containing a large number of headers. Under normal conditions, you do not need to change the default value of this property. The Device Manager server silently ignores any HTTP headers in excess of this number. Runtime errors are not automatically generated under such circumstances.

Default: `20`

server.http.headers.maxLength

This property sets the maximum length permitted for any HTTP header in bytes. Under normal conditions, you do not need to change the default value of this property. It helps prevent certain types of denial of service and attempted buffer-overflow attacks by restricting the effect of malicious requests that contain unusually large header fields. Headers longer than the specified length will be truncated by the Device Manager server without automatically generating runtime errors.

Default: `1024`

server.http.entity.maxLength

This property sets the maximum length of an HTTP request entity in bytes. Under normal conditions, you do not need to change the default value of this property. It helps prevent certain types of denial of service and attempted buffer overflow attacks by restricting the effect of malicious requests that contain unusually large payload entities. If the server detects a posted request longer than this value, it sends an error response to the client and logs details of the attempted request.

Default: `1310720`

⚠ ***Note:*** If you register a file server that has many file systems and storage pools into Device Manager, information sent from the file server might not be applied to Device Manager properly. In this case, change the property value to a value greater than the default.

server.http.log.reverseDNS

This property determines whether the Device Manager server performs reverse-DNS (Domain Name Server) lookup for its access logging. If this property is set to `true`, the host name is determined from a given IP address. If DNS can find the name of the host associated with the IP address, the host name is also written into the access log. If DNS cannot find the name or this property is set to `false`, the IP address is written into the access log.

⚠ ***Note:*** While translation of the IP address to a domain name can assist analysis of the server's access logs, reverse-DNS lookups are expensive in terms of resources, and this feature may significantly degrade the server's performance, especially on a slow network. You should keep the setting at the default value for better performance.

Default: `false`

server.http.cache.size

This property sets the upper-limit size of the Device Manager server's internal file cache in bytes. A value of `0` turns file caching off, which may adversely affect server performance when delivering complex static files (HTML pages containing images, etc).

This setting can be increased on a host computer with sufficient RAM installed. However, since the number of static files being served by Device Manager is only in the order of a few pages, performance gains would most likely be quite trivial. Under normal conditions, you do not need to change the default value of this property.

Default: `10000000` bytes

server.http.cache.maxFileSize

This property specifies the maximum size (in bytes) of a file to be stored in the Device Manager internal cache. If a file larger than the specified size is requested, the Device Manager server reads the data from disk without using the cache. If this property is set to `0`, performance might be degraded because the cache is not used. Under normal conditions, you do not need to change the default value of this property.

Default: `100000` bytes

server.http.fileTypes.noLog

This property specifies the file types that are not logged in log files. If you specify multiple types, separate them with commas. Spaces are ignored. This property prevents the access log from overflow with entries related to files such as graphic files, JavaScripts, or cascading style sheets (CSS). If you specify the default value for this property, only the HTML pages requested by a browser or other clients are logged. If you specify nothing for this property, all files are logged.

Default: `gif, jpg, jpeg, png, css, js`

server.http.mode

This property sets whether the server is running in real mode or simulation mode. This property is only used for development of the application that is connected to Device Manager. Under normal conditions, you do not need to change the default value of this property.

Default: real

server.installTime

This property contains the Device Manager installation date.

Format : *dd/mm/yyyy*:*HH*:*MM*:*SS ZZZZ* (*dd*: day, *mm*: month, *yyyy*: year, *HH*: hour, *MM*: minute, *SS*: second, *ZZZZ*: time zone)

Default: install date

server.base.home

This property contains the installation directory of Common Component, which is set by the Device Manager installer. Under normal conditions, you do not need to change the default value of this property.

Default: Value set by the installer

server.horcmconfigfile.hostname

This property allows you to specify whether to use the host name (hostname) or the IP address (ipaddress) when Device Manager edits the configuration definition file.

⚠ ***Caution:***

- Changing a host name or an IP address that was specified when a copy pair was created disables operations on the copy pair. In such a case, refresh the subsystem information.
- The setting for this property is ignored in Replication Manager. If you edit the configuration definition file in Replication Manager, the host name is always used.

Default: ipaddress

server.base.initialsynchro

This property allows you to specify whether to synchronize the management information database and the displayed information (Hitachi Storage Command Suite Common Repository) when you start Device Manager. A setting of `true` will synchronize the information. A setting of `false` will not synchronize the information.

⚠ ***Caution:*** If this property is set to `true`, synchronization of the information will take several minutes. If you change the property and then log in to Device Manager right away, an error might occur. If that occurs, wait until the synchronization has finished, and then log in.

Default: `false`

server.cim.agent

This property allows you to specify the name of the host on which the Device Manager agent is installed when the function for collecting storage subsystem performance information is used.

Performance information can be collected only when this property is specified.

Default: None

server.cim.support

This property determines whether CIM support is enabled. If you want to use a VDS service provider or execute CIM, you must set this property to `true`.

This property is set to `true` during a new installation of Device Manager.

Default: `true`

server.cim.support.job

This property specifies whether a method for creating or deleting a volume, setting or releasing a path, setting or cancelling security for a LUN, or creating or deleting a LUSE volume is executed asynchronously or synchronously. If you set this property to `true`, the method is executed asynchronously. If you set this property to `false`, the method is executed synchronously. If the CIM client does not support the job control subprofile, specify `false`.

If you specify any values other than `true` or `false`, or if this property does not exist, the method is executed asynchronously.

Default: `true`

server.cim.support.protocol

This property sets whether to open or close the ports used by the CIM function. A value of `1` to `3` can be specified. When `1` is specified, the port for non-SSL transmission is opened and the port for SSL transmission is closed. When `2` is specified, the port for non-SSL transmission is closed and the port for SSL transmission is opened. When `3` is specified, both ports are opened.

This property is set to `3` during a new installation of Device Manager.

Default: `3`

server.cim.http.port

This property specifies the port for non- SSL transmission for the CIM function.

Default: `5988`

server.cim.https.port

This property specifies the port for SSL transmission, for the CIM function.

Default: 5989

server.configchange.enabled

This property specifies whether to automatically update (refresh) storage subsystem information in the database when the configuration of storage subsystems is changed by a storage management tool (Storage Navigator, Storage Navigator Modular 2, or Storage Navigator Modular (for Web)) launched from Web Client.

For Universal Storage Platform V/VM, Hitachi USP, Lightning 9900V, or Lightning 9900, if you specify `true`, storage subsystem information in the database is automatically refreshed immediately after the configuration change. For Hitachi AMS 2000, Hitachi SMS, Hitachi AMS/WMS, Thunder 9500V, or Thunder 9200, if you specify `true`, whether the configuration has been changed is checked at the interval specified in the following properties, and storage subsystem information in the database is automatically refreshed if the configuration has been changed:

For Hitachi AMS 2000 or Hitachi SMS

`server.dispatcher.snm2.configchange.pollingPeriod` property

For Hitachi AMS/WMS, Thunder 9500V, or Thunder 9200

`server.dispatcher.configchange.pollingPeriod` property

If you specify `false`, storage subsystem information in the database is not automatically refreshed.

Default: `true`

server.configchange.autorefresh.lastrefreshed

This property specifies whether the time of the last refresh is to be updated when storage subsystem information in the database is automatically refreshed (that is, when storage subsystems are automatically refreshed). If you specify `true` for this property, the time of the last refresh is also updated when the database is automatically refreshed. If you specify `false`, it is not updated even if the database is automatically refreshed (from Web Client and CLI, you will be unable to check whether an automatic refresh is performed).

If a storage subsystem is manually refreshed, the time of the last refresh is updated regardless of the value specified for this property.

Under normal conditions, you do not need to change the default values in this file.

Default: `true`

server.mail.enabled

This property determines whether to report an alert that has occurred in a storage subsystem to the user by email. To enable the email notification function, set this property to `true`.

Default: `true`

server.mail.from

This property changes the mail address of the notification source (sender). If no value is specified or the specified value is invalid, the default value is set.

Default: `hdvmserver`

server.mail.smtp.host

This property specifies the host name or IP address of the SMTP server to be accessed when an email is sent by the email notification function of the Device Manager server. The IP address can be specified in IPv4 or IPv6 format. You must specify this property.

⚠ ***Caution:*** If you do not specify this property, the email notification function will not be enabled even if you specify `true` for the `server.mail.enabled` property.

Default: None

server.mail.smtp.port

This property specifies the port number of the SMTP server to be accessed when an email is sent by the email notification function of the Device Manager server. You must specify this property.

Specifiable range: `0` to `65535`.

Default: `25`

server.mail.smtp.auth

This property specifies whether to use SMTP authentication when an email is sent by the email notification function of the Device Manager server. To use SMTP authentication, set this property to `true`. To not use SMTP authentication, set this property to `false`. Specifying this property is optional.

Default: `false`

server.mail.alert.type

This property specifies the type of alerts to be reported by the email notification function of the Device Manager server. The following values can be specified:

`Trap`: Reports only SNMP trap alerts.

`Server`: Reports only the alerts detected by the background threads responsible for checking component status and the configuration version.

`All`: Reports both SNMP trap alerts and the alerts detected by the background threads responsible for checking component status and the configuration version.

Note: If `All` is set, alerts are reported from both SNMP and the server even if these alerts refer to the same error information.

Default: `Trap`

server.mail.alert.status

This property specifies the severity of alerts to be reported by the email notification function of the Device Manager server. The Device Manager server reports alerts whose severity is higher than the severity specified for this property. The following values (listed in ascending order of importance) can be specified:

`Normal`, `Service`, `Moderate`, `Serious`, `Acute`

Default: `Moderate`

server.subsystem.ssid.availableValues

This property specifies the range of the SSIDs that can be assigned automatically to storage subsystems registered in Device Manager. It is valid for Lightning 9900V, Hitachi USP, and Universal Storage Platform V/VM.

The values that can be specified for this property are as follows:

Hexadecimal numbers in the range from 4 to FFFD: To specify consecutive numbers, use a hyphen (-) to specify the range. To specify non-consecutive numbers, use commas as separators. The values are not case sensitive. If multiple values and ranges that include duplicated numbers are specified, the logical union of all specified values is used.

`All`: The string `All` specifies that the entire range of values can be specified. This value is not case sensitive.

Automatic SSID assignment can be performed only when a value or values are specified in this property.

Default: `All`

server.smisclient.indication.port

This property specifies the port number used to receive event indications from SMI-S providers.

Specifiable range: `1024` to `49151`.

Default: `5983`

If you have changed the value of the `server.smisclient.indication.port` property and wish to specify settings for an SMI-S Enabled subsystem from Tiered Storage Manager, you first need to refresh the target SMI-S subsystem.

Device Manager Database Properties

The `database.properties` file contains the database properties.

- In Windows:

  installation-folder-for-the-Device-Manager-server`\HiCommandServer\config\database.properties`

- In Solaris or Linux:

  installation-directory-for-the-Device-Manager-server`/HiCommandServer/config/database.properties`

This property file contains the set of directives that pertain to establishing a connection with the Device Manager server's database. Before the Device Manager server will run you need to correctly enter these settings and start the Database Management System (DBMS). If the server cannot connect to its DBMS, an entry is written to the error log (the default location is in the logs directory). This information can help considerably when you are troubleshooting a new installation.

dbm.traceSQL

This property designates whether the output to trace.log is SQL. Set `true` to output to SQL. Set `false` not to output SQL.

Default: `false`

dbm.startingCheck.retryCount

This property specifies the number of times that the Device Manager server (at startup) retries checking of whether the DBMS has started when the server is launched. The specifiable values are from 0 to 100. Under normal conditions, you do not need to change the default value of this property.

Default: 18

dbm.startingCheck.retryPeriod

This property specifies the interval (in seconds) that the Device Manager server (at startup) retries checking of whether the DBMS has started when the server is launched. The specifiable values are from 0 to 60 (seconds). Under normal conditions, you do not need to change the default value of this property.

Default: 10 seconds

Device Manager Logger Properties

The logger.properties file contains the logger properties.

- In Windows:

  installation-folder-for-the-Device-Manager-server\HiCommandServer\config\logger.properties

- In Solaris or Linux:

  installation-directory-for-the-Device-Manager-server/HiCommandServer/config/logger.properties

This properties file contains a set of directives that configure Device Manager server's logging module, including the names, locations and verbosity level of the various operation and error log files. You can also use this file to configure trace logging for debugging and diagnostic purposes.

The properties logger.loglevel, logger.MaxBackupIndex, and logger.MaxFileSize are applied to the following files: access.log.*n*, cim_access.log.*n*, error.log.*n*, service.log.*n*, stdout.log.*n*, stderr.log.*n*, statuscheck.log.*n*, trace.log.*n*, CIMOMTracen.log, and SMISClientTracen.log.

The properties logger.hicommandbase.loglevel, logger.hicommandbase.MaxBackupIndex, and logger.hicommandbase.MaxFileSize are applied to the following files: HDvMtrace*n*.log, HDvMGuiTrace*n*.log, and HDvMGuiMessage*n*.log.

The *n* in the file name indicates the backup generation number of the file.

The Windows event log is viewable in the Event Viewer. The default syslog is specified in /etc/syslog.conf

logger.loglevel

In this property, you can specify the verbosity level for the trace.log.*n*, error.log.*n*, CIMOMTracen.log, and SMISClientTracen.log (the *n* in the file name indicates the backup generation number of the file). The values accepted in this field are (in decreasing order of detail): DEBUG, INFO, WARN, ERROR, and FATAL. If this property is set to the default, entries whose verbosity level is either INFO, WARN, ERROR, or FATAL are written into the trace.log.*n*. In this case, entries whose verbosity level is DEBUG are not written into the logs.

Default: INFO

logger.MaxBackupIndex

In this property, you can specify the maximum number of backups for the access.log.*n*, cim_access.log.*n*, error.log.*n*, service.log.*n*, stdout.log.*n*, stderr.log.*n*, statuscheck.log.*n*, trace.log.*n*, CIMOMTracen.log, and SMISClientTracen.log.

The *n* in the file name indicates the backup generation number of the file. When a log file reaches its maximum length its file name is modified by appending a counter, for example, access.log.1. As more backup log files are created, their counter or version suffix is incremented (for example, access.log.1 becomes access.log.2), until the specified number of rolling backups have been created. After that, the oldest backup log file is deleted each time a new backup is created. Specifiable values are from 1 to 20.

Default: 10

logger.MaxFileSize

In this property, you can specify the maximum size for the access.log.*n*, cim_access.log.*n*, error.log.*n*, service.log.*n*, stdout.log.*n*, stderr.log.*n*, statuscheck.log.*n*, trace.log.*n*, CIMOMTracen.log, and SMISClientTracen.log (the *n* in the file name indicates the backup generation number of the file). If the maximum size is exceeded, a new log file is created. Unless KB is specified for kilobytes or MB for megabytes, the specified size is interpreted to mean bytes.

Specifiable range: from 512 KB to 32 MB

Default: 1 MB

logger.hicommandbase.loglevel

In this property, you can specify the verbosity level for each operation (trace) log file and error log file written by Common Component. The log files are HDvMtrace*n*.log, HDvMGuiTrace*n*.log, and HDvMGuiMessage*n*.log, where *n* is an integer that represents the backup number for the file. Each logging event has its own importance level independent from its type (error, warning, and information). The levels, in increasing order of importance, are: 30, 20, 10, and 0. The default logging level for production systems is 20, which means that messages for logging event levels 20, 10, and 0 are written into the HDvMtrace1.log, but messages for logging event level 30 are not.

Default: 20

logger.hicommandbase.sysloglevel

In this property, you can specify the verbosity level for the operation (trace) log data and error log data written to the event log (in Windows) or to syslog (in Solaris or Linux) by Common Component. Each logging event has its own importance level independent from its type (error, warning, and information). The levels, in increasing order of importance, are: 30, 20, 10 and 0. The default logging level for production systems is 0, which means that messages for only the logging event leveled 0 are written into the EventLog (Windows) or the syslog (Solaris or Linux), but messages for the logging event leveled 30, 20, and 10 are not. The default value is recommended.

Default: 0

logger.hicommandbase.MaxBackupIndex

In this property, you can specify the maximum number of backups for each trace and error log file that is written by Common Component. The log files are `HDvMtrace`*n*`.log`, `HDvMGuiTrace`*n*`.log`, and `HDvMGuiMessage`*n*`.log` (the *n* in the file name indicates the backup generation number of the file). Valid values are from 1 to 16.

When a log file reaches its maximum length, its file name is modified by increasing a counter (for example, `HDvMtrace2`). As more backup log files are created, their counter or version suffix is incremented (for example, `HDvMtrace2.log` becomes `HDvMtrace3.log`), until the specified number of rolling backups have been created. After that, the oldest backup log file is deleted each time a new backup is created.

Default: `10`

logger.hicommandbase.MaxFileSize

In this property, you can specify the maximum size of each operation (trace) log file and error log file that is written by Common Component. The log files are `HDvMtrace`*n*`.log`, `HDvMGuiTrace`*n*`.log`, and `HDvMGuiMessage`*n*`.log` (the *n* in the file name indicates the backup generation number of the file). The specified size is assumed to be in bytes unless you specify `KB` for kilobytes, `MB` for megabytes or `GB` for gigabytes. Valid values are from `4096` to `2147483647`(less than 2 GB).

Default: `5 MB`

Device Manager Dispatcher Properties

The `dispatcher.properties` file contains the dispatcher properties.

- In Windows:

  installation-folder-for-the-Device-Manager-server`\HiCommandServer\config\dispatcher.properties`

- In Solaris or Linux:

  installation-directory-for-the-Device-Manager-server`/HiCommandServer/config/dispatcher.properties`

This property file contains a set of configurable directives pertaining to the operation of Device Manager server's dispatcher layer, including properties that allow the fine-tuning of various background processes (daemons) and the optimization of the thread-priority for service agents.

server.dispatcher.agent.priority

This property assigns the priority for Device Manager Agent threads. Valid values are from 1 to 10 (1 = minimum priority; 5 = normal priority; 10 = maximum priority). You should change the default value only if you need to fine-tune the agent dispatcher's performance. The recommended values are from 5 to 8, and you should not set it to the maximum thread priority (9-10), because while that might cause individual requests to execute faster, it is likely to cause an overall degradation in performance when multiple users are sending concurrent requests.

Default: 5

server.dispatcher.message.timeout

This property sets the timeout (in minutes) for pending response messages before they are expired (purged). A pending message contains a response from a process that has been running for a long time (such as the addition of a storage subsystem) but has not yet been polled by the client or has not yet been sent to the client via the Device Manager notification service.

Default: 15 minutes

server.dispatcher.message.timeout.in.processing

This property sets the timeout period (in minutes) for Web Client processing and CLI processing that does not completed for some reason.

Default: 720 minutes

server.dispatcher.daemon.pollingPeriod

This property defines the polling interval (in minutes) for the background agents responsible for checking component status and configuration version. A value of `0` will disable these polling agents.

Default: 5 minutes

server.dispatcher.traps.purgePeriod

This property defines the purging interval for stale SNMP traps or alerts (in minutes). A value of `0` will disable the purging of traps from the server.

Default: 5 minutes

server.dispatcher.startTimeOfIgnoringConnectionAlert

This property defines the start time of the interval for stopping SNMP communication alert. Accessing a storage subsystem that is in regular reboot will incur this alert.

Default: 2:45

server.dispatcher.endTimeOfIgnoringConnectionAlert

This property defines the end time of the interval for stopping SNMP communication alert. If you access a storage subsystem that is in regular reboot, that will cause this alert.

Default: 3:15

server.dispatcher.daemon.receiveTrap

This property determines whether to use the SNMP trap reception function.

To use the SNMP trap reception function, specify `true`. To not use the function, specify `false`.

The SNMP trap reception function uses port 162.

If port 162 is not used by another product when you perform a new installation of Device Manager, this property is automatically set to `true`. If the port is used by another product, you need to change the setting for that product or disable this setting in the window for setting up the SNMP trap reception function, which is displayed during installation of Device Manager.

If this property is set to `true`, the SNMP trap information for storage subsystems will be output to the log messages, regardless of the settings for the SNMP trap log output function. For details about how to specify settings for the SNMP trap log output function, see [Device Manager SNMP Trap Log Output Function Properties](#).

Default: `true`

server.dispatcher.snm2.configchange.pollingPeriod

This property specifies the interval (in seconds) at which the Device Manager server checks whether the configuration of Hitachi AMS 2000 or Hitachi SMS is changed by Storage Navigator Modular 2 launched from Web Client. If the `server.configchange.enabled` property is set to `true` and the Device Manager server detects changes in the storage subsystem configuration, storage subsystem information in the database is automatically updated (refreshed).

You can specify a value from `0` to `3600`. If you specify `0`, storage subsystem information in the database is not refreshed when the storage subsystem configuration is changed because the Device Manager server does not detect the change.

Default: `300` (seconds)

server.dispatcher.configchange.pollingPeriod

This property specifies the interval (in seconds) at which the Device Manager server checks whether the configuration of Thunder 9200, Thunder 9500V, or Hitachi AMS/WMS subsystems is changed by Storage Navigator Modular (for Web) or Storage Navigator Modular 2 launched from Web Client. If the `server.configchange.enabled` property is set to `true` and the Device Manager server detects changes in the storage subsystem configuration, storage subsystem information in the database is automatically updated (refreshed).

You can specify a value from `0` to `3600`. If you specify `0`, storage subsystem information in the database is not updated when the storage subsystem configuration is changed because the Device Manager server does not detect the change.

Default: `60` (seconds)

server.dispatcher.daemon.configUpdate.detection.interval

This property specifies the interval (in minutes) at which the Device Manager server checks whether the configuration of Universal Storage Platform V/VM is changed by a storage management tool other than Device Manager (such as CCI or SVP) or Device Manager CLIEX. If the Device Manager server detects changes in the Universal Storage Platform V/VM configuration, a warning message is displayed in Device Manager Web Client.

You can specify a value from `0` to `1440`. If you specify `0`, the Device Manager server does not check whether the configuration of Universal Storage Platform V/VM is changed.

Default: `10` (minutes)

Caution:

- If a warning message is displayed in Web Client, manually refresh the corresponding storage subsystem information.

  You can also specify the settings so that information in the database is automatically updated in case a user forgets to perform a manual refresh after changing the storage subsystem configuration. To do so, set up the following properties:
  - `server.dispatcher.daemon.autoSynchro.doRefresh` property
  - `server.dispatcher.daemon.autoSynchro.type` property
- The Device Manager server cannot detect the following configuration change performed on Universal Storage Platform V/VM:
  - Creating, changing, or deleting copy pairs
  - Changing the status of an LDEV (such as Normal, Blocked, or Copying)
  - Changing the access attribute of an LDEV (such as Read/Write, Read Only, or Protect)
- The Device Manager server treats the following operations as configuration changes of Universal Storage Platform V/VM:
  - Restarting SVP
  - Refreshing the configuration information of Universal Storage Platform V/VM displayed in Storage Navigator.
  - Switching the SVP in a cluster configuration from the executing node to the standby node, or vice versa.
  - Turning on the DKC

server.dispatcher.daemon.autoSynchro.doRefresh

This property specifies whether to automatically refresh the Universal Storage Platform V/VM information in the database if the Device Manager server detects that the configuration of the Universal Storage Platform V/VM has changed.

When `true` is specified for this property, if a user does not perform a manual refresh after the Device Manager server detects a change, the Universal Storage Platform V/VM information in the database is automatically refreshed at the interval specified in the `server.dispatcher.daemon.autoSynchro.type` property. If `false` is specified, the database is not automatically refreshed.

Default: `true`

⚠ ***Caution:*** If you specify `true`, only the information about the Universal Storage Platform V/VM is updated in the database. The information in the configuration file of a host that recognizes the Universal Storage Platform V/VM command device is not updated in the database.

server.dispatcher.daemon.autoSynchro.type

This property specifies the interval at which storage subsystem information in the database is automatically updated (refreshed) using one of the following values:

`H`: Specify this format to automatically refresh the information at regular intervals. Specify the interval in the `server.dispatcher.daemon.autoSynchro.interval` property.

`D`: Specify this format to automatically refresh the information once a day at a specific time. Specify the time in the `server.dispatcher.daemon.autoSynchro.startTime` property.

`W`: Specify this format to automatically refresh the information once a week at a specific time on a specific day. Specify the day in the `server.dispatcher.daemon.autoSynchro.dayOfWeek` property, and the time in the `server.dispatcher.daemon.autoSynchro.startTime` property.

This property is enabled only if the `server.dispatcher.daemon.autoSynchro.doRefresh` property is set to `true`.

Default: `D`

server.dispatcher.daemon.autoSynchro.dayOfWeek

This property specifies the day on which storage subsystem information in the database is automatically updated (refreshed) using one of the following values:

`Sun   Mon   Tue   Wed   Thu   Fri   Sat`

This property is enabled only if the `server.dispatcher.daemon.autoSynchro.type` property is set to `W`. In addition, storage subsystem information is automatically refreshed (updated) according to the time zone setting for the management server.

Default: `Sat`

server.dispatcher.daemon.autoSynchro.startTime

This property specifies the time at which storage subsystem information is automatically refreshed (updated) in the database starts in the format *hh*:*mm*. Specify a value from 00 to 23 for *hh*, and 00 to 59 for *mm*.

This property is enabled only if the `server.dispatcher.daemon.autoSynchro.type` property is set to `D` or `W`. In addition, storage subsystem information is automatically refreshed (updated) according to the time zone setting for the management server.

Default: `23:00`

server.dispatcher.daemon.autoSynchro.interval

This property specifies the interval (in hours) at which storage subsystem information in the database is automatically updated (refreshed).

You can specify a value from `1` to `24`.

This property is enabled only if the `server.dispatcher.daemon.autoSynchro.type` property is set to `H`.

Default: `24` (hours)

server.dispatcher.daemon.autoSynchro.refresh.interval

This property specifies the interval (in minutes) between the time when the Universal Storage Platform V/VM information in the database is automatically refreshed and the time when the next refresh starts.

This property is enabled only if the `server.dispatcher.daemon.autoSynchro.doRefresh` property is set to `true`.

You can specify a value from `0` to `120`. If you specify `0`, storage subsystem information is automatically refreshed continuously without an interval.

Under normal conditions, you do not need to change the default values in this file.

Default: `5` (minutes)

server.dispatcher.daemon.autoSynchro.refresh.timeout

This property specifies the timeout period (in minutes) for automatic refresh processing. This property is enabled if the `server.dispatcher.daemon.autoSynchro.doRefresh` property is set to `true`.

If a refresh of Universal Storage Platform V/VM does not finish even if the time period specified in this property has elapsed, the next refresh starts without waiting for the preceding refresh operation to finish (refresh operations are performed in parallel).

You can specify a value from `0` to `1440`. If you specify `0`, the next refresh starts after the active refresh operation finishes.

Under normal conditions, you do not need to change the default values in this file.

Default: `720` (minutes)

Device Manager MIME Properties

The `mime.properties` file contains the MIME properties.

- In Windows:

  installation-folder-for-the-Device-Manager-server`\HiCommandServer\config\mime.properties`

- In Solaris or Linux:

  installation-directory-for-the-Device-Manager-server`/HiCommandServer/config/mime.properties`

This property file contains the translation/lookup table for all Multipurpose Internet Mail Extensions (MIME) file types recognized by the Device Manager web server. Each property in this lookup table maps a particular extension suffix to the MIME type for that file. Under normal conditions, you do not need to change the default values in this file. In any event, only expert system administrators should make any additions to this file.

Device Manager Client Properties

The `client.properties` file contains the client properties.

- In Windows:

  `installation-folder-for-the-Device-Manager-server``\HiCommandServer\config\client.properties`

- In Solaris or Linux:

  `installation-directory-for-the-Device-Manager-server``/HiCommandServer/config/client.properties`

This property file contains the settings related to display and operation of Device Manager Web Client.

client.logger.trace

This property defines whether to output the trace information or not by applying Java Web Start's log output function. Set this property to `true` to output trace information. Set this property to `false` to not output trace information.

⚠ ***Note:*** In order to output trace information, Java Web Start's log output function must be activated. For more information about Java Web Start's log output function, see the Device Manager online Help.

Default: `false`

client.message.timeout

This property defines the maximum wait time for the Device Manager server response (timeout of connection) in seconds. Web Client sends the notification messages to the server, and the server sends the notification of the task completion or the alert in response. The connection between the client and the server is on while waiting the response of the notification from the server. This property sets the timeout of this waiting time. The client sends the notification message again after the timeout. This timeout will be applied each time Web Client accesses the server.

⚠ ***Note:*** When the client is accessing the server through a proxy server and the connection timeout of the proxy is shorter than the timeout of this property, the notification message might be lost, because the timeout of the proxy server cuts the connection before the Device Manager server can send the response to the Web Client. If this is the case, please set the timeout for this property to a time shorter than the timeout of the proxy.

Default: 300 seconds

client.outputhorcmfunction.enabled

This property specifies whether Web Client is able to use the CCI functionality for creating a configuration definition file. Set this property to `true` to enable Web Client to use this function.

Before changing this property, stop HBase Storage Mgmt Common Service. After changing this property, restart HBase Storage Mgmt Common Service. For details about how to start and stop HBase Storage Mgmt Common Service, see Starting the Device Manager Server and Common Component and Stopping the Device Manager Server and Common Component.

Default: `false`

table.ldev.rowsperpage

This property specifies the values displayed in the drop-down list used for setting the number of lines displayed per page on a window using a Web Client sortable table. The values set by this property appear in a Web Client drop-down list. Up to two choices for the number of lines can be included in the drop-down list. To set two choices, specify the two values separated by a comma. The minimum number of lines that can be specified is `1`. The maximum number of lines that can be specified depends on the environment: for example, on the web browser the client uses and the CPU performance and memory capacity of the client computer. The maximum number of lines (standard) for each Web browser is as follows:

- Firefox® 2.0.0.*x*: 100
- Firefox 3.0.*x* or Firefox 3.5: 300
- Internet Explorer 6.0, Internet Explorer 7.0 or Internet Explorer 8.0: 1000
- Mozilla 1.4: 2000
- Mozilla 1.7: 300

If you specify a value larger than the maximum (standard) value, a warning dialog box might appear indicating that the computer might be unable to respond. If this occurs, decrease the value of the property and restart HBase Storage Mgmt Common Service. For details about how to start and stop HBase Storage Mgmt Common Service, see Starting the Device Manager Server and Common Component and Stopping the Device Manager Server and Common Component.

Default: 25, 300

client.assignlun.upperlimit.enabled

This property enables or disables the upper limit check on the number of LUNs that are assigned when storage is added.

If *LUN assignment*, which is the procedure for adding storage, is performed in a state where many volume paths have already been determined, HBase Storage Mgmt Common Service might stop running. This problem occurs when the size of the memory required to display the information for *LUN assignment* and the log output information exceeds the upper limit of the Java heap size for HBase Storage Mgmt Common Service. Therefore, to prevent HBase Storage Mgmt Common Service from stopping, set and check the upper limit for the number of LUNs that can be assigned in a single operation. The upper limit of the number of LUNs, which is used for the check, is 100. To enable the check, specify true, and to disable the check, specify false.

Before changing this property, stop HBase Storage Mgmt Common Service. After changing this property, restart HBase Storage Mgmt Common Service. For details about how to start and stop HBase Storage Mgmt Common Service, see Starting the Device Manager Server and Common Component and Stopping the Device Manager Server and Common Component.

Default: true

client.report.csv.format.escaped

This property switches the format of the CSV report for information of the storages and users that are managed by Device Manager. If this property is set to true, each value is output enclosed by double quotation marks (“). For details on the report function, see the Device Manager online Help.

Default: true

client.addstorage.block.per.storage

This property specifies whether multiple users are prohibited from simultaneously assigning a path to one LDEV. If this property is set to true, simultaneous path assignment is prohibited. If this property is set to false, simultaneous path assignment is permitted.

Default: true

client.ldev.rowsperpage.retain.enabled

This property specifies whether to keep the setting when the number of lines displayed per page for a sortable table is changed.

If this property is set to true, after a user changes the number of displayed lines for a sortable table, that table is initially displayed using the new setting the next time the same user views the same sortable table. The number of displayed lines that you specify is kept for each user account and for each sortable table.

If this property is set to `false`, the new value is not kept. The sortable table is displayed by using the smaller value specified for the `table.ldev.rowsperpage` property in the `client.properties` file.

If this property is set to `false`, the sortable table is initially displayed using the smaller number of displayed lines specified for the `table.ldev.rowsperpage` property in the Device Manager server `client.properties` file.

Default: `true`

⚠ ***Note:*** Even if the property value is changed from `true` to `false`, the setting for the number of displayed lines changed by each user is saved in the Device Manager server. Therefore, if this property is set to `true` again, then each sortable table will be initially displayed using the setting that each user previously set.

Device Manager Security Properties

The `server.properties` and `security.properties` files contain server security properties.

- In Windows:

  installation-folder-for-the-Device-Manager-server`\HiCommandServer\config\server.properties`

  installation-folder-for-the-Device-Manager-server`\HiCommandServer\config\security.properties`

- In Solaris or Linux:

  installation-directory-for-the-Device-Manager-server`/HiCommandServer/config/server.properties`

  installation-directory-for-the-Device-Manager-server`/HiCommandServer/config/security.properties`

WARNING: Do not use a text editor to edit these properties. For more information on changing the security properties, see Security Settings Related to Communication.

server.http.secure

This property sets the security level of the Device Manager server. This setting is used for communication in the following routes:

- Between the Device Manager server and Web Client

  For details on how to use HiKeytool to set the security level, see Enabling TLS/SSL Server Security.

- Between the Device Manager server and SMI-S provider

  For details on how to use HiKeytool to set the security level, see Security Settings for the Device Manager Server (Communication with SMI-S Provider).

Specifiable values are as follows:

- 1 = Basic Authentication. The Device Manager server operates in protected mode, and client applications attempting to connect with the server must submit an authorized user's logon ID and password and be authenticated against the Access Control List (ACL).

Note: These requirements do not apply to requests for files that are intentionally designated as being excluded from ACL security protection (see the server.http.security.unprotected property in server.http.security.unprotected).

- 2 = Secure Socket (TLS/SSL). In this security mode, the server opens an additional secure HTTP listener on a port designated by the server.https.port property. All communications via this port are strongly encrypted using Secure Socket Layer (SSL) or Transport Layer Security (TLS). For further information on SSL and TLS, see * MERGEFORMATSecurity Settings Related to Communication. In order for a server to use the secure HTTP protocol, a keypair and associated server certificate must be present in the Device Manager server keystore. We strongly recommend this setting if the Device Manager server is exposed to any public network or Internet.

  Default: 1

server.http.security.realm

This property sets the security realm message for the Device Manager server's authentication challenge. This text is usually displayed in a browser's logon dialog box.

Default: `Device Manager Security`

server.http.security.clientIP

This property specifies IP addresses, in IPv4 format, that can be used to connect to the Device Manager server. This setting limits the IP addresses permitted for connection, thus preventing denial-of-service attacks or other attacks that intend to overflow buffers. The following shows a specification example when the Device Manager server accepts connections from `172.16.0.1` and IP addresses in the range from `192.168.0.0` to `192.168.255.255`:

```
server.http.security.clientIP=172.16.0.1,192.168.*.*
```

You can use asterisks as a wildcard character when specifying multiple connection sources by using a single IP address. To specify multiple IP addresses, separate them with commas. Invalid IP addresses and spaces are ignored.

Caution:

- You do not need to specify the IP address (the local loopback address) of the computer on which the Device Manager server is installed. In this property, it is assumed that the Device Manager server can always be connected to using the local loopback address.
- You also need to register the IP addresses to the environment definition file `httpsd.conf` for Common Component. For details, see * MERGEFORMATSpecifying Which Device Manager Clients Can Access the Device Manager Server.

Default: `*.*.*.*` (Any IP address can be used to connect to the Device Manager server.)

server.http.security.clientIPv6

This property specifies IP addresses, in IPv6 format, that can be used to connect to the Device Manager server. This setting limits the IP addresses permitted for connection, thus preventing denial-of-service attacks or other attacks that intend to overflow buffers. The following shows a specification example when the Device Manager server accepts connections from IP addresses in the range from `12AB:0:0:CD30::` to `12AB:0:0:CD3F:FFFF:FFFF:FFFF:FFFF`.

```
server.http.security.clientIPv6=12AB:0:0:CD30::/60
```

You can specify a range of IP addresses in CIDR format. To specify multiple IP addresses, separate them with commas. Invalid IP addresses and spaces are ignored.

Caution:

- You do not need to specify the IP address (the local loopback address) of the computer on which the Device Manager server is installed. In this property, it is assumed that the Device Manager server can always be connected to using the local loopback address.
- You also need to register the IP addresses to the environment definition file httpsd.conf for Common Component. For details, see * MERGEFORMATSpecifying Which Device Manager Clients Can Access the Device Manager Server.

Default: `::` (Any IP address can be used to connect to the Device Manager server.)

server.https.security.keystore

This property assigns the name of the Keystore file that contains the keypair and associated server certificate used for establishing an encrypted communication via Secure Sockets Layer(SSL) or Transport Layer Security. The default setting is `keystore`.

The `keystore` file shipped with a Device Manager server is an empty placeholder file that does not contain the required keypair and associated server certificate needed to run the Device Manager server in secure mode. If you attempt to start the server in secure mode with an empty `keystore` file, the server will log a fatal error and terminate abnormally. A keypair and associated self-signed or trusted certificate must first be installed into the keystore before encrypted communications can be started. For more information about server certificates, see Creating a Certificate Signing Request (CSR) (Security Settings for the Device Manager Server) and Importing a Digitally-signed Certificate into the Device Manager Server Keystore.

Default: keystore

server.http.security.unprotected

This property designates a comma-delimited list of any non-protected file resources under the server's document root. To specify multiple file resources, separate them with commas. Spaces are ignored. When files or directories are designated as unprotected, they are not subject to Access Control List checks (user authentication), regardless of the security mode setting for the server. Entire directories (including nested sub-directories) can be flagged as unprotected by using an asterisk as a wildcard character. If you specify a space, all resources are protected, so that every request to the Device Manager server will require user authentication.

This property allows anyone to view the index.html front page via a browser, without user authentication being required. More importantly, it allows the Java Web Start application to update its JAR file and deploy (via the HiCommand.jnlp file) to the end-user's system without raising a series of logon dialogs. Similarly, the GUI's help files (and certain client installation information) can be viewed via a Web browser without separate authentication being required at each step. Under normal conditions, you do not need to change the default value of this property.

Default: index.html, HiCommand/*, webstart/*, images/*, style/*, docs/*, favicon/ico

server.https.security.truststore

This property assigns the name and location of the truststore file that contains the server certificates. The Device Manager server uses the default truststore distributed with the JRE named "`cacerts`".

Default: `{java.home}/lib/security/cacerts`

Note:

- This property cannot be modified with HiKeytool. If you want to change the value, you must do so by editing the value in the `server.properties` file.
- `{java.home}` means *`installation-directory-for-Common-Component`*`/jdk/jre`.

Device Manager SNMP Trap Log Output Function Properties

The `customizedsnmptrap.properties` file contains the properties of the SNMP trap log output function.

- In Windows:

  `installation-folder-for-the-Device-Manager-server``\HiCommandServer\config\customizedsnmptrap.properties`

- In Solaris or Linux:

  `installation-directory-for-the-Device-Manager-server``/HiCommandServer/config/customizedsnmptrap.properties`

customizedsnmptrap.customizedSNMPTrapEnable

This property allows you to enable the SNMP trap log output function. Specify `true` to use the log output function, or `false` to not to use the function.

Default: `false`

customizedsnmptrap.customizelist

This property allows you to specify how to customize the SNMP trap log output. For details, see Settings for Recording the Received SNMP Traps in Log Files.

Caution: If you do not specify this property, the SNMP trap data will not be output to the log even if you specify `true` for the `customizedsnmptrap.customizedSNMPTrapEnable` property.

Default: None

Device Manager Launchable Applications Properties

The `launchapp.properties` file contains properties of launchable applications.

- In Windows:

  installation-folder-for-the-Device-Manager-server\HiCommandServer\config\launchapp.properties

- In Solaris or Linux:

  installation-directory-for-the-Device-Manager-server/HiCommandServer/config/launchapp.properties

This property file contains information for the server that contains launchable applications.

launchapp.snm2.url

This property specifies the URL of the web server for Storage Navigator Modular 2 to be launched from the Web browser in a client. Specify this property when the target storage subsystem is Thunder 9500V or Hitachi AMS/WMS. If you have specified a value for both this property and the `launchapp.damp.url` property, which is used for launching Storage Navigator Modular, this property has priority, and Storage Navigator Modular 2 is launched.

Default: None

The following shows an example of specifying the URL of the web server for Storage Navigator Modular 2:

```
launchapp.snm2.url=http://192.168.17.235:23015/program/StorageNavigatorModular/applet
```

Caution:

- You cannot use an IP address in IPv6 format. In IPv6 environments, specify a host name.
- If the management server has multiple NICs, use the IP address of the network that connects to the management client (Web Client) to set the URL IP address. Do not specify the host name.

For details on how to set up an environment required to link with Storage Navigator Modular 2, see Launch Settings for Storage Navigator Modular 2.

launchapp.damp.url

This property specifies the URL of the web server for Storage Navigator Modular (for Web) or Damp (for Web) to be launched from the Web browser in a client.

When the target storage subsystem is Thunder 9500V or Hitachi AMS/WMS, and you have specified a value for both this property and the `launchapp.snm2.url` property, which is used for launching Storage Navigator Modular 2, the setting of `launchapp.snm2.url` has priority, and Storage Navigator Modular 2 is launched.

Default: None

The following example shows how to specify the URL of the web server for Storage Navigator Modular (for Web):

```
launchapp.damp.url=http://192.168.17.235:23015/program/DeviceManager/s
nm
```

The following example shows how to specify the URL of the web server for DAMP (for Web):

```
launchapp.damp.url=http://192.168.17.235:23015/program/DeviceManager/d
amp
```

⚠ ***Caution:***

- You cannot use an IP address in IPv6 format. In IPv6 environments, specify a host name.
- Setting up alias information is necessary in order to use Storage Navigator Modular (for Web) or DAMP (for Web). For details on setting the environment information in one operation, see Launch Settings for Storage Navigator Modular (for Web) or Launch Settings for DAMP (for Web).
- If the management server has multiple NICs, use the IP address of the network that connects to the management client (Web Client) to set the URL IP address. Do not specify the host name.

launchapp.snm2.rmi.port

If you change the port number used for RMI communication in Storage Navigator Modular 2, you need to specify the new port number in this property. If you do not do this, Device Manager cannot link with Storage Navigator Modular 2. Valid values are from `1` to `65535`.

Specify this property when the target storage subsystem is Thunder 9500V or Hitachi AMS/WMS.

If you want to run Storage Navigator Modular 2 on a computer also running Storage Navigator Modular (for Web), do not specify the same number for the port numbers that are used for RMI communication in Storage Navigator Modular (for Web) and Storage Navigator Modular 2.

If you have specified a value for both this property and the `launchapp.snm.rmi.port` property, which is used to specify the port number used for RMI communication in Storage Navigator Modular (for Web), the setting of this property has priority, and Storage Navigator Modular 2 is launched.

For details on how to view and change the communication port number specified in Storage Navigator Modular 2, see the manual for Storage Navigator Modular 2.

Default: None

launchapp.snm.rmi.port

If you have changed the port number used for RMI communication in Storage Navigator Modular (for Web), you need to specify the new port number in this property. If you do not do this, Device Manager cannot link with Storage Navigator Modular (for Web). Valid values are from `1` to `65535`.

If you want to run Storage Navigator Modular (for Web) on a computer also running Storage Navigator Modular 2, do not specify the same number for the port numbers used for RMI communication in Storage Navigator Modular (for Web) and Storage Navigator Modular 2.

If the target storage subsystem is Thunder 9500V or Hitachi AMS/WMS and you have specified a value for both this property and the `launchapp.snm2.rmi.port` property, which is used to specify the port number used for RMI communication in Storage Navigator Modular 2, the setting of `launchapp.snm2.rmi.port` has priority, and Storage Navigator Modular 2 is launched.

For details on how to view and change the communication port number specified in Storage Navigator Modular (for Web), see the *Storage Navigator Modular (for Web) User's Guide*.

Default: None

Device Manager Mainframe Host Agent Properties

The `host.properties` file contains properties of the mainframe host agent.

- In Windows:

  installation-folder-for-the-Device-Manager-server`\HiCommandServer\config\host.properties`

- In Solaris or Linux:

  installation-directory-for-the-Device-Manager-server`/HiCommandServer/config/host.properties`

This property file contains settings for communication between the Device Manager server and mainframe hosts.

host.mf.agent.connection.timeout

This property specifies the timeout (in seconds) for communication processing between the Device Manager server and a mainframe host agent. Valid values are `0` and from `30` to `3600` (seconds). If you specify `0`, no timeout applies. You should only modify this property if you are an expert system administrator seeking to fine-tune performance of the mainframe host agent.

Default: `300`

Device Manager Report Function Properties

The `DvMReport.properties` file contains report function properties.

- In Windows:

  installation-folder-for-the-Device-Manager-server`\HiCommandServer\config\DvMReport.properties`

- In Solaris or Linux:

  installation-directory-for-the-Device-Manager-server`/HiCommandServer/config/DvMReport.properties`

DetailedArrayReport.outputPath

This property specifies the storage location of the CSV file that can be generated from the Detailed Array Reports window in Web Client.

⚠ ***Note:*** The value specified for the storage location of the CSV file is enabled when the Detailed Array Reports - Reports subwindow is first displayed on Web Client after the Device Manager server service is restarted.

Default: *installation-directory-for-the-Device-Manager-server*`/DvMReport/CSV`

Provisioning Manager Server Configuration Information Properties

The `server.properties` file contains properties related to the server configuration information.

- In Windows:

  `installation-folder-for-the-Provisioning-Manager-server``\conf\server.properties`

- In Solaris or Linux:

  `installation-directory-for-the-Provisioning-Manager-server``/conf/server.properties`

server.operation.abortTimeout

This property specifies the amount of time (timeout period) from when suspension of a host setting operation begins, until the time the operation is to be stopped automatically.

You can specify a value (in hours) from 0 to 10000. If `0` is specified, a suspended operation is not stopped automatically.

Default: 24

server.operation.eventTimeout

This property specifies the amount of time (timeout period) from when Provisioning Manager begins holding the transaction logs for a host setting operation that has either completed successfully or has failed, until it purges the logs automatically.

You can specify a value (in hours) from 0 to 10000. If `0` is specified, the operation history is not purged automatically.

Default: 24

server.rmiapi.port

This property specifies the port number of the management server.

You can specify a value from 1 to 65535.

Default: 20333

server.history.maxNumber

This property specifies the maximum number of items to be recorded in the transaction logs (recorded in the database file that records log information).

You can specify a value from 1 to 100000.

Default: 10000

server.history.maxDays

This property specifies the number of days for which the transaction log data is to be retained. The number of days set here is used as a reference for automatically deleting logs. Any log data that exceeds the specified number of days is deleted.

You can specify a value from 1 to 100000 (days). If no value is specified, transaction log data is not automatically deleted after a number of days elapse.

Default: None

server.installTime

The date, time, and time zone of the completed installation are written into this property.

Provisioning Manager Logger Properties

The `logger.properties` file contains the logger properties.

- In Windows:

  installation-folder-for-the-Provisioning-Manager-server`\conf\logger.properties`

- In Solaris or Linux:

  installation-directory-for-the-Provisioning-Manager-server`/conf/logger.properties`

Logger.loglevel

This property specifies the output level threshold for trace logs and message logs output by the Provisioning Manager log output functionality.

This property is used for the trace logs and message logs of the Provisioning Manager server and GUI listed below. The *n* in the file name indicates the backup generation number of the file.

- `HPvMGuiTrace`*n*`.log`
- `HPvMGuiMessage`*n*`.log`
- `HPvMServerTrace`*n*`.log`
- `HPvMServerMessage`*n*`.log`

In Provisioning Manager, the output level is specified for all message types (error, warning, and information). There are four levels (0, 10, 20, and 30), which indicate the level of importance. The smaller number indicates a higher level of importance. Only messages with an output level that is less than or equal to the value set in this field are output to the trace log or message log.

Although this field will accept 0, 10, 20, and 30 as values, use of the default output level of 20 is recommended.

Default: `20`

Logger.sysloglevel

This property specifies the output level threshold for logs output to the OS (event log in Windows, syslog in Solaris or Linux) by the log output functionality of Common Component.

In Provisioning Manager, the output level is specified for all message types (error, warning, and information). There are four levels (0, 10, 20, and 30), which indicate the level of importance. The smaller number indicates a higher level of importance. Only messages with an output level that is less than or equal to the value set in this field are output to the event log or syslog.

Although this field will accept 0, 10, 20, and 30 as values, use of the default output level of 0 is recommended.

Default: `0`

Logger.MaxBackupIndex

This property specifies the maximum number of trace log files and message log files that can be output by the Provisioning Manager log output functionality.

⚠ ***Caution:*** This property is applied to the Provisioning Manager server and GUI trace log files and message log files.

A log file is created with a size as specified in Logger.MaxFileSize, and is assigned a file name with a version number added (for example, `HPvMServerTrace1.log` and `HPvMServerTrace2.log`). Log files are used in the order of their numbers, and trace information is written into them. When the last file becomes full, the first file is overwritten.

You can specify a value from 1 to 16.

Default: `10`

Logger.MaxFileSize

This property specifies the maximum size of a trace log file or message log file output by the Provisioning Manager log output functionality. This property is applied to the Provisioning Manager server, GUI trace log files, and message log files. If you do not specify `KB` (for kilobytes), `MB` (for megabytes), or `GB` (for gigabytes), the specified value is assumed to be in bytes.

You can specify a value from 4096 bytes to 2147483647 bytes (up to but not including 2 GB).

Default: 1 MB

Provisioning Manager Client Properties

The `client.properties` file contains the client properties.

- In Windows:

  `installation-folder-for-the-Provisioning-Manager-server``\conf\client.properties`

- In Solaris or Linux:

  `installation-directory-for-the-Provisioning-Manager-server``/conf/client.properties`

This property file contains the settings related to display and operation of Provisioning Manager Web Client.

client.ldev.rowsperpage.retain.enabled

This property specifies whether to keep the setting when the number of lines displayed per page for a sortable table is changed.

If this property is set to `true`, when a user changes the number of displayed lines for a sortable table, that table is initially displayed using the new setting the next time the same user views the same sortable table. The number of displayed lines that you specify is kept for each user account and for each sortable table.

If this property is set to `false`, the sortable table is set to the initial display of 25 lines per page.

Default: `true`

⚠ ***Note:*** Even if the property value is changed from `true` to `false`, the setting for the number of displayed lines changed by each user is kept in the Provisioning Manager server. Therefore, if this property is set to `true` again, then each sortable table will be set to the initial display using the previous user-specified setting.

Acronyms and Abbreviations

ACL	Access Control List
AJP	Apache JServ Protocol
AMS	Adaptable Modular Storage
API	application program interfaces
CA	Certification Authority
CCI	Command Control Interface
CD-ROM	Compact Disk - Read Only Memory
CHA	Channel Adapter
CHAP	Challenge Handshake Authentication Protocol
CIDR	Classless Inter-Domain Routing
CLI	Command Line Interface
CLPR	Cache Logical PaRtition
CN	Common Name
CPU	Central Processing Unit
CSR	Certificate Signing Request
CSS	Cascading Style Sheet
CU	Control Unit
CVS	Custom Volume Size
DASD	direct access storage device
DER	Distinguished Encoding Rules
DHCP	Dynamic Host Configuration Protocol
DIT	Directory Information Tree
DN	Distinguished Name
DNS	Domain Name System
DoS	Denial of Services
DST	Daylight Saving Time
FAT	File Allocation Tables
FC	Fibre Channel
FTP	File Transfer Protocol
GB	gigabyte(s)
GUI	Graphical User Interface
HSD	Host Storage Domain
HTTPS	HyperText Transfer Protocol Secure
I/O	Input/Output

ID	IDentifier
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IIS	Internet Information Services
IP-SAN	Internet Protocol Storage Area Network
IPv4	Internet Protocol Version 4
IPv6	Internet Protocol Version 6
iSCSI	Internet Small Computer System Interface
JWS	Java WE
KB	kilobyte(s)
LAN	local-area network
LBA	Logical Block Addressing
LDAP	Lightweight Directory Access Protocol
LDEV	logical device
LDKC	Logical DisK Controller
LUN	Logical unit number
LUSE	Logical Unit Size Expansion
MOF	Managed Object Format
NAS	Network Attached Storage
NAT	Network Address Translation
NPIV	N Port ID Virtualization
NSC	Network Storage Controller
NTFS	NT File System
NTP	Network Time Protocol
OS	Operating System
P-VOL	Primary VOLume
PAP	Password Authentication Protocol
PEM	Privacy Enhanced Mail
PID	Process ID
PKI	Public Key Infrastructure
RADIUS	Remote Authentication Dial-In User Service
RAID	Redundant Array of Independent Disks
RCU	Remote Control Unit
RDN	Relative Distinguished Name
RFC	Request For Comments
S-ATA	Serial ATA
S-VOL	Secondary VOLume
SIM	Service Information Message
SLPR	Storage Logical PaRtition
SNMP	Simple network management Protocol
SSID	Storage Subsystem ID
SSL	Secure Sockets Layer
SSO	Single Sign - On
SVP	Service Processor
TCP/IP	transmission control protocol/internet protocol
TLS	Transport Layer Security

URL	Uniform Resource Locator
VCS	VERITAS Cluster Server
VDS	Virtual Disk Service
V-VOL	Virtual VOLume
WBEM	Web - Based Enterprise Management
WWN	Worldwide name
XGA	eXtended Graphics Array

Index

Hitachi Data Systems

Corporate Headquarters
750 Central Expressway
Santa Clara, California 95050-2627
U.S.A.
Phone: 1 408 970 1000
www.hds.com
info@hds.com

Asia Pacific and Americas
750 Central Expressway
Santa Clara, California 95050-2627
U.S.A.
Phone: 1 408 970 1000
info@hds.com

Europe Headquarters
Sefton Park
Stoke Poges
Buckinghamshire SL2 4HD
United Kingdom
Phone: + 44 (0)1753 618000
info.eu@hds.com

Hitachi Data Systems