



Hitachi Command Suite

Dynamic Link Manager (for Windows®) User Guide

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Acronyms and abbreviations

[Glossary](#)

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Preface

This document describes how to use the Hitachi Dynamic Link Manager.

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Intended audience

This document is intended for storage administrators who use Hitachi Dynamic Link Manager (HDLM) to operate and manage storage systems, and assumes that readers have:

- Knowledge of Windows and its management functionality
- Knowledge of Storage system management functionality
- Knowledge of Cluster software functionality
- Knowledge of Volume management software functionality

Product version

This document revision applies to HDLM for Windows v8.1.2 or later.

Release notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document.

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/Appendix	Description
Chapter 1, Overview of HDLM on page 1-1	Describes an overview of HDLM, and its features.
Chapter 2, HDLM Functions on page 2-1	Describes the system configuration of HDLM, and the basic terms and functions for HDLM.
Chapter 3, Creating an HDLM Environment on page 3-1	Describes the necessary preparations for installing HDLM, and then describes how to install HDLM and set up the various functions.
Chapter 4, HDLM Operation on page 4-1	Describes how to use HDLM by using both the HDLM GUI and commands, and how to manually start and stop the HDLM manager. This chapter also describes how to configure an environment to properly operate HDLM, such as changing the HDLM management-target devices that connect paths or replacing the hardware that makes up a path. Chapter 4 also describes how to check path information by using the Windows management tool.
Chapter 5, Troubleshooting on page 5-1	Describes how to troubleshoot a path error, HDLM failure, or any other problems that you might encounter.

Chapter/Appendix	Description
Chapter 6, Command Reference on page 6-1	Describes all the HDLM commands.
Chapter 7, Utility Reference on page 7-1	Describes the HDLM utilities.
Chapter 8, Messages on page 8-1	Describes information for all the possible messages that could be output by HDLM. The chapter also explains what to do in response to each message.
Appendix A, Functional Differences Between Versions of HDLM on page A-1	Describes the differences between HDLM versions.

Related documents

The following related Hitachi Command Suite documents are available on the documentation CD:

- *Hitachi Command Suite Global Link Manager User Guide*, MK-92HC214
- *Hitachi Command Suite Global Link Manager Installation and Configuration Guide*, MK-95HC107
- *Hitachi Command Suite Global Link Manager Messages*, MK-95HC108
- *Hitachi Adaptable Modular Storage 500 User and Reference Guide*
- *Hitachi Simple Modular Storage Series User's Guide*
- *Hitachi Unified Storage Series User's Guide*
- *Hitachi USP Series User's Guide*
- *Hitachi Workgroup Modular Storage Series User's Guide*
- *Universal Storage Platform V User's Guide*
- *Universal Storage Platform VM User's Guide*
- *Virtual Storage Platform User's Guide*
- *VSP G1000 Series User's Guide*
- *Reference Manual / File Conversion Utility & File Access Library*

Document conventions

This document uses the following typographic conventions:

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

Convention	Description
Monospace	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.
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.
<u>underline</u>	Indicates the default value. Example: [<u>a</u> b]
<i>PROMPT></i>	Indicates the prompt in the window where the command is executed. <i>PROMPT</i> indicates the current directory path displayed in the window.

Conventions for storage capacity values

Physical storage capacity values (for example, disk drive capacity) are calculated based on the following values:

Physical capacity unit	Value
1 kilobyte (KB)	1,000 (10^3) bytes
1 megabyte (MB)	1,000 KB or $1,000^2$ bytes
1 gigabyte (GB)	1,000 MB or $1,000^3$ bytes
1 terabyte (TB)	1,000 GB or $1,000^4$ bytes
1 petabyte (PB)	1,000 TB or $1,000^5$ bytes
1 exabyte (EB)	1,000 PB or $1,000^6$ bytes

Logical storage capacity values (for example, logical device capacity) are calculated based on the following values:

Logical capacity unit	Value
1 block	512 bytes
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

Logical capacity unit	Value
1 TB	1,024 GB or 1,024 ⁴ bytes
1 PB	1,024 TB or 1,024 ⁵ bytes
1 EB	1,024 PB or 1,024 ⁶ bytes

Accessing product documentation

The HDLM user documentation is available on the Hitachi Data Systems Portal: <https://portal.hds.com>. Check this site for the most current documentation, including important updates that may have been made after the release of the product.

Getting help

Hitachi Data Systems Support Portal is the destination for technical support of your current or previously-sold storage systems, midrange and enterprise servers, and combined solution offerings. The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, log on to the Hitachi Data Systems Support Portal for contact information: <https://portal.hds.com>.

Hitachi Data Systems Community is a new global online community for HDS customers, partners, independent software vendors, employees, and prospects. It is an open discussion among these groups about the HDS portfolio of products and services. It is the destination to get answers, discover insights, and make connections. The HDS Community complements our existing Support Portal and support services by providing an area where you can get answers to non-critical issues and questions. **Join the conversation today!** Go to community.hds.com, register, and complete your profile.

Comments

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Thank you!

Overview of HDLM

HDLM is a software package that manages paths between a host and a storage system. HDLM is designed to distribute loads across multiple paths and will switch a given load to another path if there is a failure in the path that is currently being used, thus improving system reliability.

This chapter gives an overview of HDLM and describes its features.

- [What is HDLM?](#)
- [HDLM Features](#)

What is HDLM?

With the widespread use of data warehousing and increasing use of multimedia data, the need for high-speed processing of large volumes of data on networks has rapidly grown. To satisfy this need, networks dedicated to the transfer of data, such as SANs, are now being used to provide access to storage systems.

HDLM manages the access paths to these storage systems. HDLM provides the ability to distribute loads across multiple paths and switch to another path if there is a failure in the path that is currently being used, thus improving system availability and reliability.

The figure below shows the connections between hosts and storage systems. A server on which HDLM is installed is called a *host*.

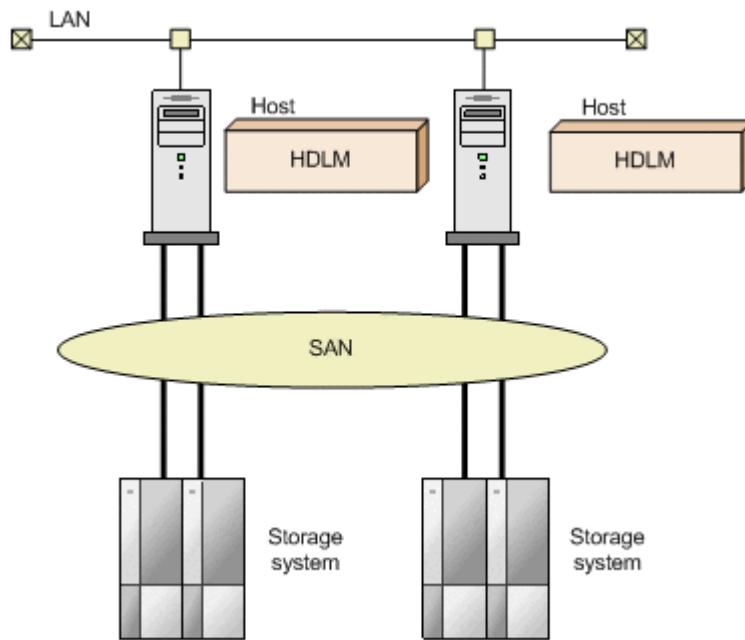


Figure 1-1 Connections Between Hosts and Storage systems

For details about the storage systems supported by HDLM, see [Storage systems Supported by HDLM on page 3-4](#).

HDLM Features

HDLM features include the following:

The ability to distribute a load across multiple paths. This is also known as *load balancing*.

When a host is connected to a storage system via multiple paths, HDLM can distribute the load across all the paths. This prevents one, loaded down path from affecting the processing speed of the entire system.

For details on load balancing, see [Distributing a Load Using Load Balancing on page 2-11](#).

The ability to continue running operations between a host and storage system, even if there is a failure. This is also known as performing a *failover*.

When a host is connected to a storage system via multiple paths, HDLM can automatically switch to another path if there is some sort of failure in the path that is currently being used. This allows operations to continue between a host and a storage system.

For details on performing failovers, see [*Performing Failovers and Failbacks Using Path Switching on page 2-17*](#).

The ability to bring a path that has recovered from an error back online. This is also known as performing a *failback*.

If a path is recovered from an error, HDLM can bring that path back online. This enables the maximum possible number of paths to always be available and online, which in turn enables HDLM to better distribute the load across multiple paths.

Failbacks can be performed manually or automatically. In an automatic failback, HDLM will automatically restore the path to an active state after the user has corrected the problem that exists on the physical path.

For details on performing failbacks, see [*Performing Failovers and Failbacks Using Path Switching on page 2-17*](#).

The ability to automatically check the status of any given path at regular intervals. This is also known as *path health checking*.

HDLM can easily detect errors by checking the statuses of paths at user-defined time intervals. This allows you to check for any existing path errors and to resolve them promptly and efficiently.

For details on setting up and performing path health checking, see [*Detecting Errors by Using Path Health Checking on page 2-32*](#).

A GUI, which allows you to operate HDLM in a visually pleasing and easy to navigate environment. This is also known as the HDLM GUI.

HDLM can utilize both configuration-diagrams and the list format to display information about all the paths that exist between hosts and Hitachi storage systems. You can use the GUI to easily change the status of any given path, and to set up a proper operating environment.

For details on the HDLM GUI, see the HDLM GUI Help.

HDLM Functions

This chapter describes the various functions that are built into HDLM. Before the function specifications are explained though, this chapter will go into detail about the HDLM management targets, system configuration, and basic terms that are necessary to know to effectively operate HDLM. After that, the rest of the chapter focuses on describing all the HDLM functions, including the main ones: load distribution across paths and path switching.

- [Devices Managed by HDLM](#)
- [System Configuration](#)
- [LU Configuration](#)
- [Program Configuration](#)
- [Driver Levels of the HDLM and MPIO Drivers](#)
- [Distributing a Load Using Load Balancing](#)
- [Performing Failovers and Failbacks Using Path Switching](#)
- [Monitoring Intermittent Errors \(Functionality When Automatic Failback Is Used\)](#)
- [Detecting Errors by Using Path Health Checking](#)
- [Distributing a Load by Using the Dynamic I/O Path Control Function](#)
- [Dynamic Re-configuration](#)
- [Error Management](#)

- [Collecting Audit Log Data](#)
- [Integrated HDLM management using Global Link Manager](#)
- [Cluster Support](#)

Devices Managed by HDLM

Below is a list of devices that can or cannot be managed by HDLM. The devices that can be managed by HDLM are called *HDLM management-target devices*.

HDLM management-target devices:

The following devices are from the storage systems listed in Section [What is HDLM? on page 1-2](#):

- SCSI devices
- Hitachi storage system command devices, such as Hitachi RAID Manager command devices
- The EMC DMX series, EMC CX series, and HP EVA series

Note that only the OSs below can be used to manage these devices.

For the EMC DMX series, EMC CX series, and HP EVA series:

- Windows Server 2003 (x86) SP1 or later
- Windows Server 2003 (IPF) SP1 or later
- Windows Server 2003 (x64)

For the EMC CX series:

- Windows Server 2008 can also be used.

For the HP EVA series:

- Windows Server 2008 R2 can also be used.

Non-HDLM management-target devices:

- SCSI devices other than those that are in the storage systems listed in Section [What is HDLM? on page 1-2](#)
- Built-in disks on a host
- Non-disk devices (tape devices, etc.)

System Configuration

HDLM is available in two SAN environment types: FC-SAN and IP-SAN. Note that the EMC DMX series, EMC CX series, and HP EVA series can only be used in an FC-SAN environment.

System Configuration Using an FC-SAN

In an FC-SAN, fiber cables connect hosts to storage systems. The cable port on the host is called a *host bus adapter* (HBA). The cable port on the storage system is called a *port* (P) on a *channel adapter* (CHA).

A *logical unit* (LU), which lies in a storage system, is either an input target or an output target to or from a host. The areas within an LU are called *Devs*.

A route that connects a host to a Dev in an LU is called a *path*.

HDLM assigns a unique ID to each management-target path. This ID is called *AutoPATH_ID*. Sometimes, the path is also just simply called a *management target*.

The following figure shows the configuration of an HDLM system using an FC-SAN.

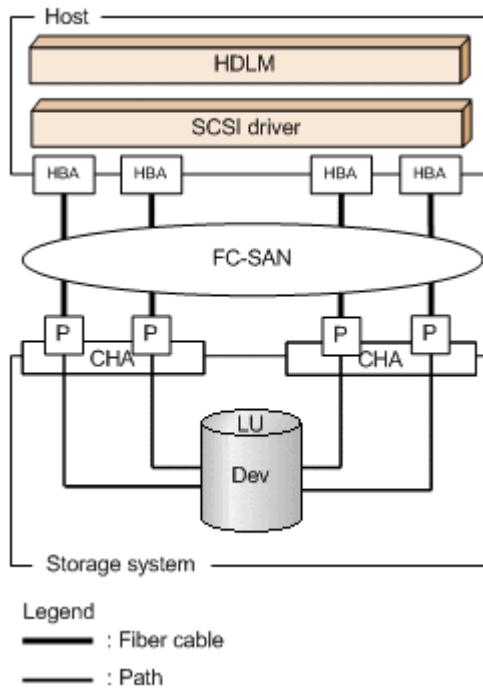


Figure 2-1 Configuration of an HDLM System When Using an FC-SAN

The following table lists the HDLM system components when using an FC-SAN.

Table 2-1 HDLM System Components When Using an FC-SAN

Components	Description
HBA	A host bus adapter. This serves as a cable port on the host.
FC-SAN	A dedicated network that is used for the transfer of data between hosts and storage systems
CHA	A channel adapter
P	A port on a CHA. This serves as a cable port on a storage system.
LU	A logical unit with which a host can perform I/O operations. This unit can be accessed from the network.
Dev	A logical area (a partition) in an LU
Path	A route that connects a host to a Dev in an LU

System Configuration Using an IP-SAN

In an IP-SAN, LAN cables are used to connect hosts to storage systems. The cable port on the host is called an *iSCSI host bus adapter* (iSCSI HBA) or a *network interface card* (NIC). In order to use an NIC, the *iSCSI software* must be installed ahead of time on the host. The cable port on the storage system is called a *port* (P) on a *channel adapter* (CHA) used for iSCSI connections.

A *logical unit* (LU), which lies in a storage system, is either an input target or an output target to or from a host. The areas within an LU are called *Devs*.

A route that connects a host to a Dev in an LU is called a *path*.

HDLM assigns a unique ID to each management-target path. This ID is called *AutoPATH_ID*. Sometimes, the path is also just simply called a *management target*.

[Figure 2-2 Configuration of an IP-SAN System When Using an iSCSI HBA on page 2-5](#) shows the configuration of an IP-SAN system when using an iSCSI HBA. [Figure 2-3 Configuration of an IP-SAN System When Using iSCSI Software and an NIC on page 2-6](#) shows the configuration of an IP-SAN system when using the iSCSI software and an NIC.

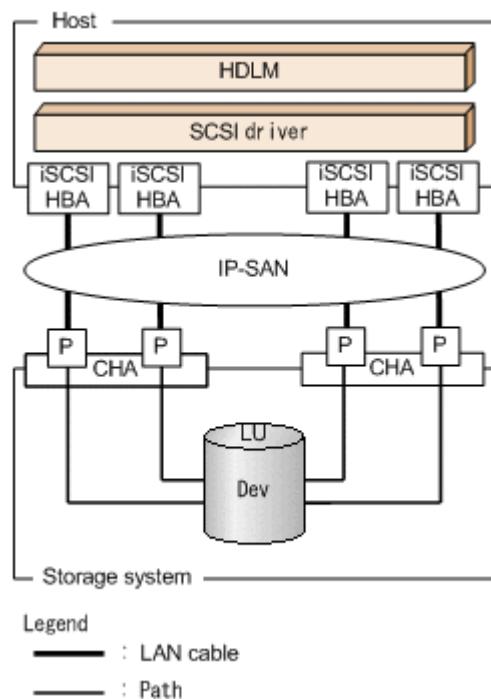


Figure 2-2 Configuration of an IP-SAN System When Using an iSCSI HBA

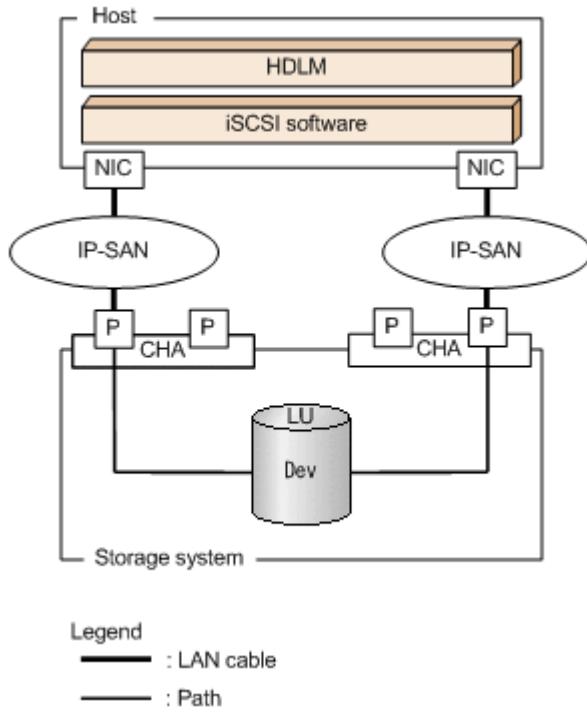


Figure 2-3 Configuration of an IP-SAN System When Using iSCSI Software and an NIC

The following table lists the HDLM system components when using an IP-SAN.

Table 2-2 HDLM System Components When Using an IP-SAN

Components	Description
iSCSI software	The driver software that contains the iSCSI initiator function
iSCSI HBA	A host bus adapter that contains the iSCSI initiator function. This serves as a cable port on a host. The <i>iSCSI HBA</i> is referred to as the <i>HBA</i> in HDLM commands and the HDLM GUI. Sometimes, it is also just simply called an <i>HBA</i> in this manual.
NIC	A network interface card that serves as a cable port on a host. The <i>NIC</i> is referred to as the <i>HBA</i> in HDLM commands and the HDLM GUI. Sometimes, it is also just simply called an <i>HBA</i> in this manual.
IP-SAN	A data transfer network that connects hosts and storage systems by using the iSCSI standard.
CHA	A channel adapter used for iSCSI connections
P	A port on a CHA. This serves as a cable port on a storage system.
LU	A logical unit with which the host can perform I/O operations. This unit can be accessed from the network.
Dev	A logical area (a partition) in an LU
Path	A route that connects a host to a Dev in an LU

Setting Range of the iSCSI Software and iSCSI HBA

The following describes the ranges that can be used for the iSCSI software and iSCSI HBA settings. For notes on how to set these values, see the corresponding documentation for your particular iSCSI software and iSCSI HBA.

- IP addresses
Use the same network address for both an HBA and a CHA port connected via a common path.
- Other settings
 - An IP-SAN can be used for multiple hosts.
 - A single HBA can connect to multiple CHA ports.

When using the iSCSI software together with multiple NICs, be sure to connect each NIC to a different IP network. Also, be sure to connect to the storage system by using a different CHA port for each IP network. To view an example of the configuration described above, see [Figure 2-3 Configuration of an IP-SAN System When Using iSCSI Software and an NIC on page 2-6](#).

Storage systems Supported by HDLM

The following storage systems can be used with an IP-SAN: the Hitachi AMS/WMS series, Hitachi Universal Storage Platform 100, Hitachi Universal Storage Platform 600, Hitachi Universal Storage Platform 1100, Hitachi NSC 55, and Hitachi SMS series.

LU Configuration

After you have properly installed HDLM, the LU configuration will change as follows:

Before the installation of HDLM:

In the Windows' Disk Management window of a host, one SCSI device is displayed as multiple LUs, each of which corresponds to one path.

In other words, the number of LUs in a storage system appeared to be the same as the number of paths connected to the various SCSI devices.

After the installation of HDLM:

The MPIO driver combines what was once viewed as multiple LUs (each with one path) into one LU containing multiple paths. In the Windows' Disk Management window of a host, only the disks that have a one-to-one correspondence with an LU in the storage system are displayed.

This means that each LU in the storage system is always recognized as only one LU, regardless of the number of paths that are connected to SCSI devices.

You can display all the various SCSI devices from the Windows' Device Manager window.

After the installation of HDLM, an LU recognized by a host is called a *host LU* (HLU). The areas in a host LU that correspond to the Devs in a storage system LU are called *host devices* (HDev).

On a system using HDLM, in order to access a target LU, a drive letter is first assigned to the disk that has been integrated by the MPIO driver. Such disks are displayed in the Windows' Disk Management window.

The following figure shows the LU configuration recognized by the host, after the installation of HDLM.

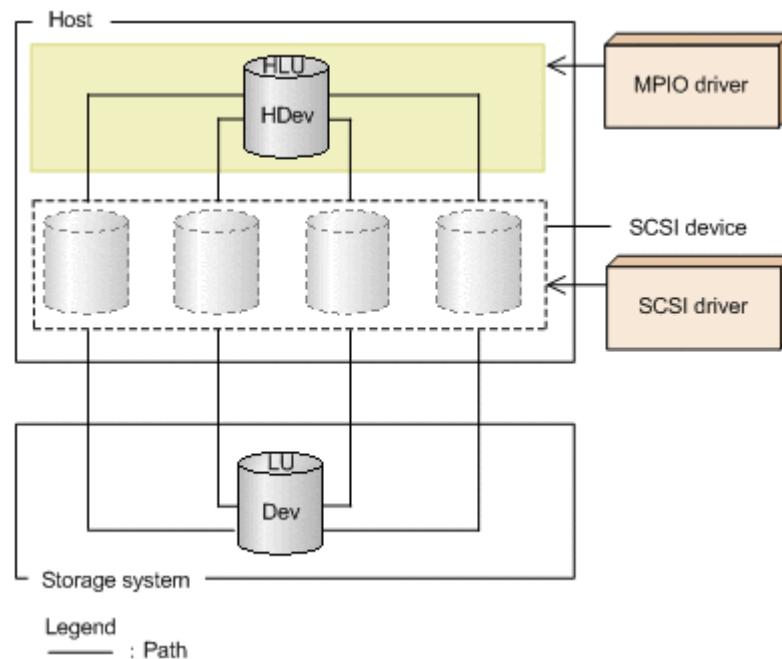


Figure 2-4 LU Configuration Recognized by the Host After the Installation of HDLM

The following table lists and describes the components recognized by the host.

Table 2-3 Components Recognized by the Host

Components	Description
HLU	An LU that the host recognizes via the HDLM driver. This type of LU is called a <i>host LU</i> . Regardless of how many paths are connected to it, only one host LU is recognized for each LU in the storage system.
HDev	A Dev in an LU that the host recognizes via the HDLM driver. This type of Dev is called a <i>host device</i> .

Program Configuration

HDLM is actually a combination of several programs. Because each program corresponds to a specific HDLM operation, it is important to understand the name and purpose of each program, along with how they are all interrelated.

The following figure shows the configuration of the HDLM programs.

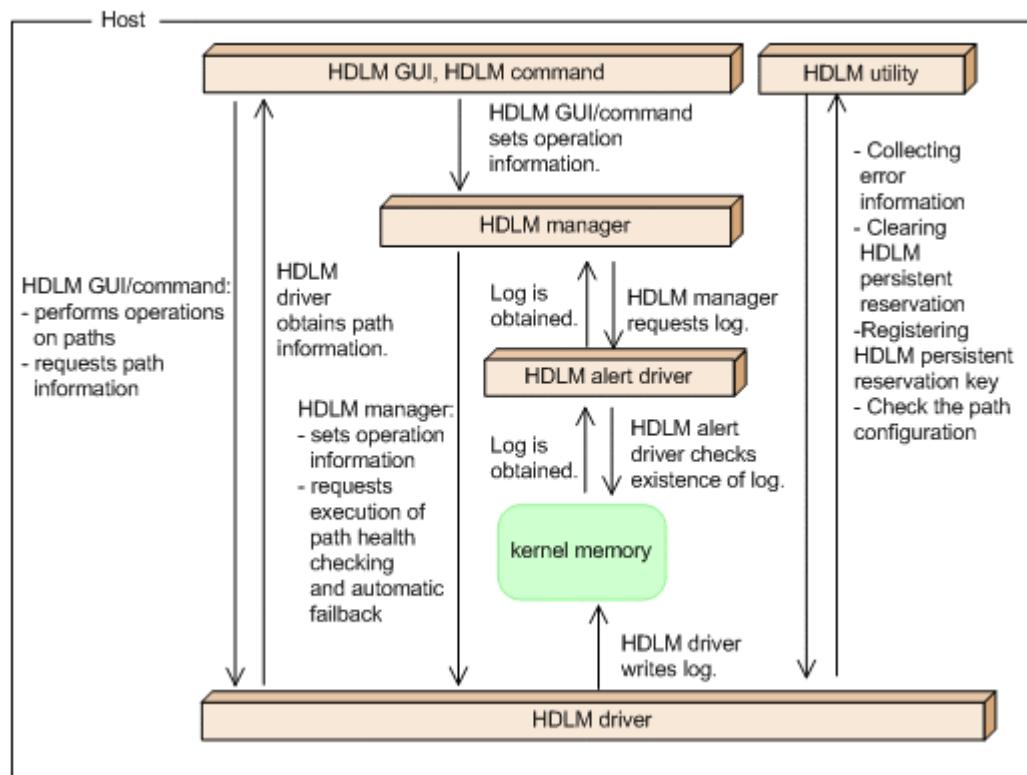


Figure 2-5 Configuration of the HDLM Programs

The following table lists and describes the functions of these programs.

Table 2-4 Functions of HDLM Programs

Program name	Functions
HDLM GUI	Provides a graphical user interface (GUI), which enables you to: <ul style="list-style-type: none">Manage pathsDisplay error informationSet up the HDLM operating environment
HDLM command	Provides the <code>dlnkmgr</code> command, which enables you to: <ul style="list-style-type: none">Manage pathsDisplay error informationSet up the HDLM operating environment
HDLM utility	Provides the HDLM utility, which enables you to: <ul style="list-style-type: none">Collect error information

Program name	Functions
	<ul style="list-style-type: none"> • Clear persistent reservations • Register persistent reservation keys • Check the configuration of the paths • Check the installation information • Perform unattended installations of HDLM • Perform unattended removals of HDLM
HDLM manager	<p>Provides the HDLM manager, which enables you to:</p> <ul style="list-style-type: none"> • Configure the operating environment • Request path health checks and automatic failbacks to be performed • Collect error log data
HDLM alert driver	Reports the log information collected by the HDLM driver to the HDLM manager.
HDLM driver	<p>Controls all the HDLM functions, manages paths, and detects errors. The HDLM driver consists of the following:</p> <ul style="list-style-type: none"> • Core logic component Controls the basic functionality of HDLM. • Filter component Sends and receives I/O data. The driver name is <code>hd1mdsm.sys</code>.

Note:

HDLM programs other than the HDLM GUI are referred to as the *HDLM Core components*.

Driver Levels of the HDLM and MPIO Drivers

The HDLM and MPIO drivers are positioned at a higher driver level than the SCSI drivers. In other words, applications that are accessing LUs in storage systems will first use the HDLM and MPIO drivers, and then use the SCSI drivers, in order to access the LUs.

The following figure shows the driver levels of the HDLM and MPIO drivers.

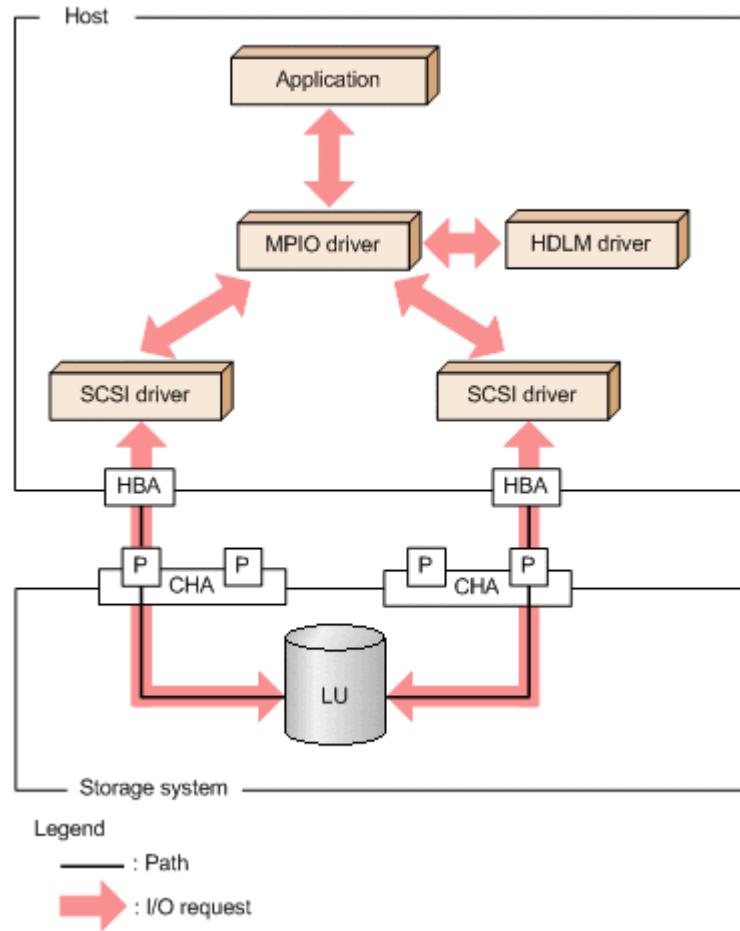


Figure 2-6 Driver Levels of the HDLM and MPIO Drivers

Distributing a Load Using Load Balancing

When the system contains multiple paths to a single LU, HDLM can distribute the load across the paths by using multiple paths to transfer the I/O data. This function is called *load balancing*, and it prevents a single, heavily loaded path from affecting the performance of the entire system.

Note that some I/O operations managed by HDLM can be distributed across all, available paths, and some cannot. Therefore, even when the load balancing function is used, a particular I/O operation might not necessarily allocate data to every available path. RAID Manager issuing IOCTL to a command device is an example of an I/O operation that cannot allocate data to every path.

Note:

Do not use the load balancing function that is accessible from the Microsoft iSCSI Software Initiator user interface.

In a cluster environment, the load balancing function is available for the Hitachi AMS2000/AMS/WMS/SMS series, Hitachi USP series, Universal Storage Platform V/VM series, and Virtual Storage Platform series. In a non-

cluster environment, the load balancing function is available for the Hitachi AMS2000/AMS/WMS/SMS series, Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, and EMC DMX series. For details on the various cluster software that HDLM supports, see [Cluster Support on page 2-48](#).

[Figure 2-7 Flow of I/O Data When the Load Balancing Function Is Not Used on page 2-12](#) shows the flow of I/O data when the load balancing function is not used. [Figure 2-8 Flow of I/O Data When the Load Balancing Function Is Used on page 2-13](#) shows the flow of I/O data when the load balancing function is used. Both figures show examples of I/O operations being issued for the same LU by multiple applications.

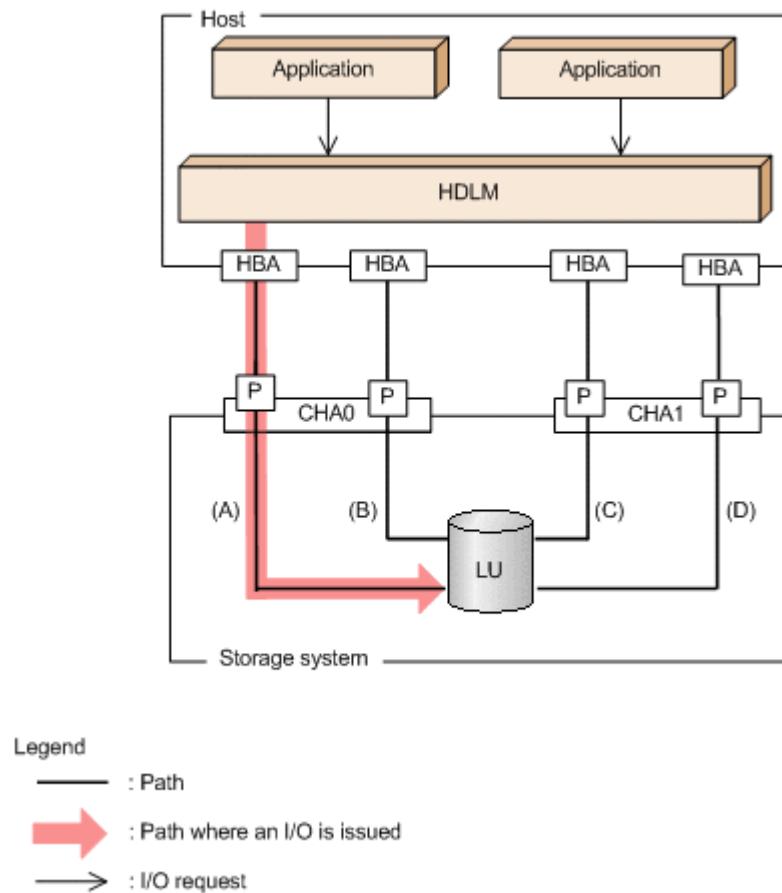


Figure 2-7 Flow of I/O Data When the Load Balancing Function Is Not Used

When the load balancing function is not used, I/O operations converge onto a single path (A). The load on that one path (A) will cause a bottleneck, which might cause problems with system performance.

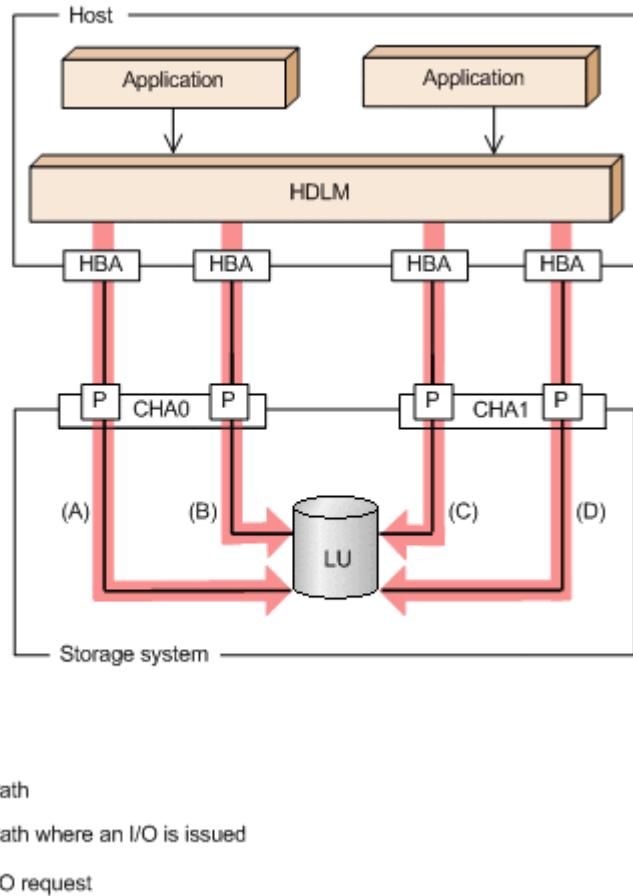


Figure 2-8 Flow of I/O Data When the Load Balancing Function Is Used

When the load balancing function is used, I/O operations are distributed via multiple paths (A, B, C, and D). This helps to prevent problems with system performance and helps prevent bottlenecks from occurring.

Paths to Which Load Balancing Is Applied

This subsection describes, for each type of storage system, the paths to which the load balancing function is applied.

When Using the Hitachi AMS/WMS Series

When HDLM performs load balancing, it differentiates between load balancing among owner paths and among non-owner paths. An *owner path* is a path that passes through the *owner controller* for a target LU. When you set up an LU, you have to specify which CHA to be used as the owner controller for the LU. Because different LUs might have different owner controllers, different LUs might also have different owner paths. A *non-owner path* is a path that passes through a CHA other than the owner controller. This type of CHA is also known as a *non-owner controller*. An owner path is usually used in preference to a non-owner path. In order to prevent system performance from slowing down, HDLM does not perform load balancing between owner paths and non-owner paths. If failures occur across some of the owner paths,

load balancing will be performed among the remaining, usable owner paths. It is only when absolutely no owner paths are available, that load balancing is then performed among the non-owner paths.

For the example in [Figure 2-9 Overview of Load Balancing on page 2-14](#), suppose that in the owner controller of LU0 is CHA0. When the LU is accessed, the load is balanced between the two paths A and B, which are both owner paths. When one of the paths (A) cannot be used, then the LU is accessed from the only other owner path (B). When both of the owner paths (A and B) cannot be used, the load is then balanced between two other, non-owner paths (C and D).

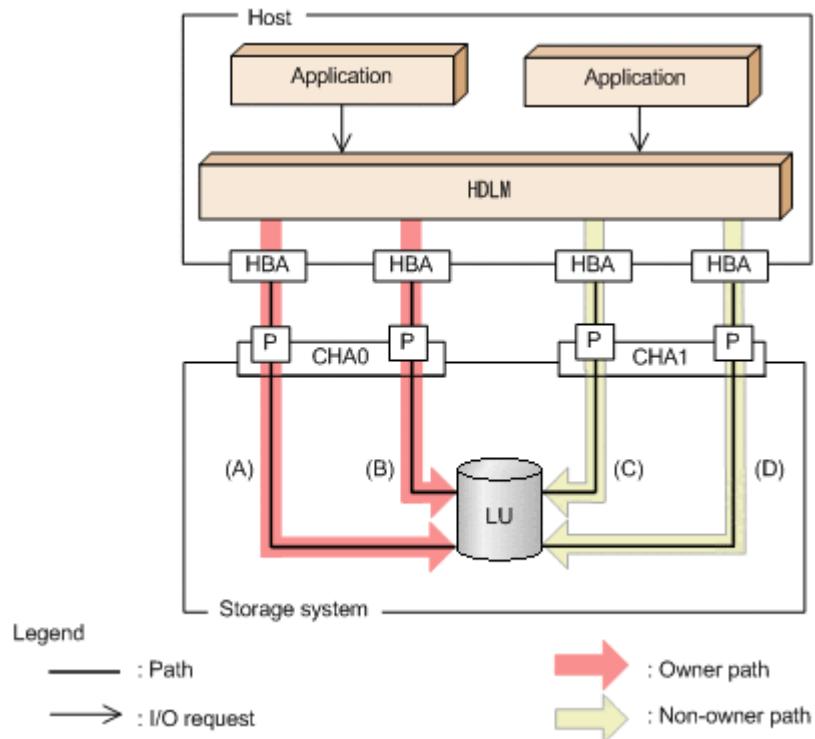


Figure 2-9 Overview of Load Balancing

When Using Other Than the Hitachi AMS/WMS Series

All online paths are owner paths. Therefore, for the example in [Figure 2-8 Flow of I/O Data When the Load Balancing Function Is Used on page 2-13](#), the load is balanced among the four paths A, B, C, and D. If one of the paths were to become unusable, the load would be balanced among the three, remaining paths.

Notes:

Load balancing is performed for the following storage systems:

- Hitachi USP series
- Universal Storage Platform V/VM series
- Virtual Storage Platform series
- VSP G1000 series

- Hitachi AMS2000 series[#]
- Hitachi SMS series[#]
- HUS100 series[#]
- HUS VM

#: This storage system applies when the dynamic I/O path control function is disabled.

When Using a Global-Active Device for the VSP G1000 Series

The default settings of the storage system specify that all paths are owner paths. Load balancing is performed on all paths that access the primary and secondary volumes of global-active device pairs.

However, if the primary site and the secondary site are far apart, I/O performance might be low for I/O issued to a site other than the location of the host. In such a case, specify the non-preferred path option on the storage system at the site where the host is not located. A path for which the non-preferred path option is specified is a non-owner path and cannot be used until all the owner paths become unavailable.

If you specify the non-preferred path option on the storage system, execute the `refresh` operation of the HDLM command, or restart the host.

Load Balancing Algorithms

HDLM has the following six load balancing algorithms:

- The Round Robin algorithm
- The Extended Round Robin algorithm
- The Least I/Os algorithm
- The Extended Least I/Os algorithm
- The Least Blocks algorithm
- The Extended Least Blocks algorithm

The above algorithms are divided into two categories, which differ in their processing method. The following describes both of these processing methods:

The Round Robin, Least I/Os, and Least Blocks algorithms

These algorithms select which path to use every time an I/O is issued. The path that is used is determined by the following:

- Round Robin
 - The paths are simply selected in order from among all the connected paths.
- Least I/Os
 - The path that has the least number of I/Os being processed is selected from among all the connected paths.
- Least Blocks

The path that has the least number of I/O blocks being processed is selected from among all the connected paths.

The Extended Round Robin, Extended Least I/Os, and Extended Least Blocks algorithms

These algorithms determine which path to allocate based on whether the data of the I/O to be issued is sequential with the data of the I/O that was issued immediately beforehand.

If the data is sequential, the path used will be the one to which the data of the I/O that was issued immediately beforehand was distributed.

However, if a specified number of I/Os has been issued to a path, processing switches to the next path.

If the data is not sequential, these algorithms select the path to be used each time an I/O request is issued.

- Extended Round Robin

The paths are simply selected in order from among all the connected paths.

- Extended Least I/Os

The path that has the least number of I/Os being processed is selected from among all the connected paths.

- Extended Least Blocks

The path that has the least number of I/O blocks being processed is selected from among all the connected paths.

The following table lists and describes the features of the load balancing algorithms.

Table 2-5 Features of the Load Balancing Algorithms

Algorithm type	Algorithm features
<ul style="list-style-type: none">• Round Robin[#]• Least I/Os• Least Blocks	These types of algorithms are most effective when a lot of discontinuous, non-sequential I/Os are issued.
<ul style="list-style-type: none">• Extended Round Robin• Extended Least I/Os• Extended Least Blocks	If the I/O data is from something like a read request and is generally sequential with the previous I/Os, an improvement in reading speed can be expected due to the storage system cache functionality. These types of algorithms are most effective when a lot of continuous, sequential I/Os are issued.

#

Some I/O operations managed by HDLM can be distributed across all, available paths, and some cannot. Thus, you should be aware that even if you specify the Round Robin algorithm, some of the I/O operations will never be issued uniformly across all the given paths.

The default algorithm is the Extended Least I/Os algorithm, which is set when HDLM is first installed. When an upgrade installation of HDLM is performed, the algorithm that is currently being used is inherited.

Select the load balancing algorithm most suitable for the data access patterns of your system environment. However, if there are no recognizable data access patterns, we recommend using the default algorithm, the Extended Least I/Os algorithm.

You can specify the load balancing function from the Options window of the HDLM GUI or by using the `dlnkmgmt` command's `set` operation. For details on how to use the window components, see the HDLM GUI Help. For details on the `set` operation, see [set \(Sets Up the Operating Environment\) on page 6-16](#).

Performing Failovers and Failbacks Using Path Switching

When the system contains multiple paths to an LU and an error occurs on the path that is currently being used, HDLM can switch to another functional path, so that the system can continue operating. This is called a *failover*.

If a path in which an error has occurred recovers from the error, HDLM can then switch back to that path. This is called a *failback*.

Two types of failovers and failbacks are available:

- Automatic failovers and failbacks
- Manual failovers and failbacks

Failovers and failbacks switch which path is being used and also change the statuses of the paths. A path status is either *online* or *offline*. An online status means that the path can receive I/Os. On the other hand, an offline status means that the path cannot receive I/Os. A path will go into the offline status for the following reasons:

- An error occurred on the path.
- A user intentionally placed the path offline by using the Path Management window in the HDLM GUI.
- A user executed the HDLM command's `offline` operation.
For details on the `offline` operation, see [offline \(Places Paths Offline\) on page 6-6](#).
- Hardware, such as cables or HBAs, has been removed.

For details on path statuses and the transitions of those statuses, see [Path Status Transition on page 2-21](#).

Automatic Path Switching

The following describes the automatic failover and failback functions, which automatically switch a path.

Automatic Failovers

If you detect an error on the path that is currently being used, you can continue to use the system by having the status of that path automatically changed to offline, and then automatically have the system switch over to

another online path. This functionality is called *automatic failover*. Automatic failovers can be used for the following levels of errors:

Critical

A fatal error that might stop the system.

Error

A high-risk error, which can be avoided by performing a failover or some other countermeasure.

For details on error levels, see [*Filtering of Error Information on page 2-37*](#).

If the Hitachi AMS/WMS series is being used, HDLM will select the path to be used next from among the various paths that access the same LU, starting with owner paths, and then non-owner paths.

For example, in [*Figure 2-10 Path Switching on page 2-19*](#), the owner controller of an LU is CHA0, and access to the LU is made via only one path (A). After that access path (A) is placed offline, the first choice for the switching destination is the other path connected to CHA0 (B). If an error also occurs on that path (B), then the next possibility for a path comes from one of the two paths (C or D) connected to CHA1.

When the Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000 series, Hitachi AMS2000 series[#], Hitachi SMS series[#], HUS100 series[#], or HUS VM is being used, all the paths are owner paths. This means that all the paths that are accessing the same LU are possible switching destinations. For example, in [*Figure 2-10 Path Switching on page 2-19*](#), the LU is accessed using only the one path (A). However, after that path is placed offline, the switching destination can come from any of the other three paths (B, C, or D).

#

This storage system applies when the dynamic I/O path control function is disabled.

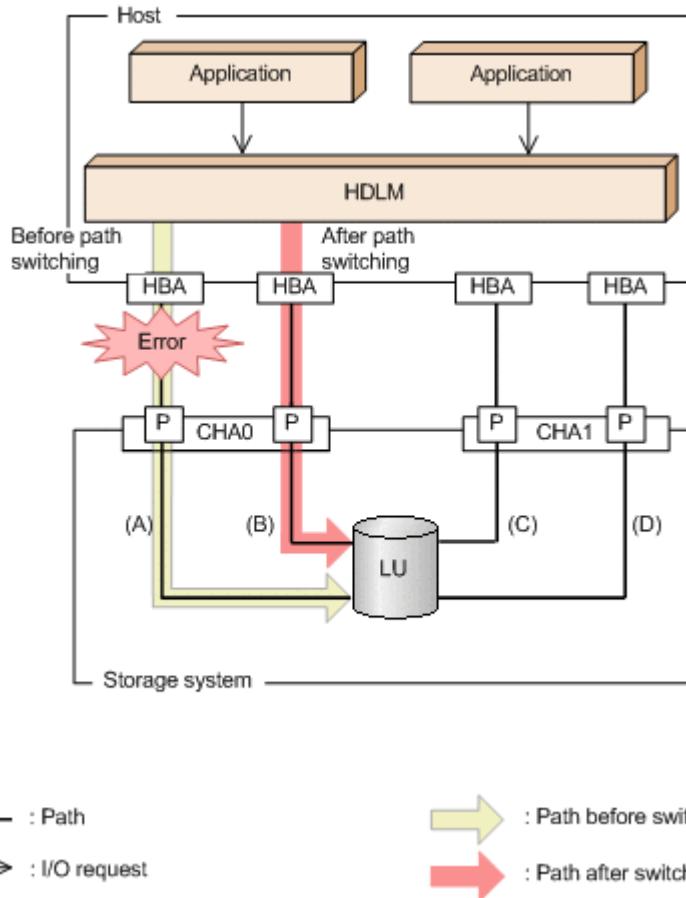


Figure 2-10 Path Switching

Automatic Failbacks

When a path recovers from an error, HDLM can automatically place the recovered path back online. This function is called the *automatic fallback* function.

In order to use the automatic fallback function, HDLM must already be monitoring error recovery on a regular basis.

When using the Hitachi AMS/WMS series, HDLM will select the next path to be used first from among the online owner paths, and then from the online non-owner paths. As a result, if an owner path recovers from an error, and then HDLM automatically places the recovered path online while a non-owner path is in use, the path will be automatically switched over from the non-owner path to the owner path that just recovered from the error.

When the Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000 series, Hitachi AMS2000 series^{#1}, Hitachi SMS series ^{#1}, HUS100 series^{#1} or HUS VM is being used, all the paths are owner paths. As a result, if the path that was previously used recovers from an error, and then HDLM automatically places the recovered path online, the

path that is currently being used will continue to be used (as opposed to switching over to the path that was just recovered).

When intermittent errors^{#2} occur on paths and you are using the automatic fallback function, the path status might frequently alternate between the online and offline statuses. In such a case, because the performance of I/Os will most likely decrease, if there are particular paths in which intermittent errors might be occurring, we recommend that you set up intermittent error monitoring so you can detect these paths, and then remove them from those subject to automatic failbacks.

You can specify the automatic fallback or intermittent error monitoring function from the Options window of the HDLM GUI or by using the `dlnkmgr` command's `set` operation. For details on operations from the Options window, see the HDLM GUI Help. For details on the `set` operation, see [set \(Sets Up the Operating Environment\) on page 6-16](#).

#1

This storage system applies when the dynamic I/O path control function is disabled.

#2

An *intermittent error* means an error that occurs irregularly because of some reason such as a loose cable connection.

Manual Path Switching

You can switch the status of a path by manually placing the path online or offline. Manually switching a path is useful, for example, when system maintenance needs to be done.

You can manually place a path online or offline by doing the following:

- Use the HDLM GUI Path Management window.
- Execute the `dlnkmgr` command's `online` or `offline` operation.

For details on the `online` operation, see [online \(Places Paths Online\) on page 6-11](#). For details on the `offline` operation, see [offline \(Places Paths Offline\) on page 6-6](#).

However, if there is only one online path for a particular LU, that path cannot be manually switched offline. Also, a path with an error that has not been recovered from yet cannot be switched online.

HDLM uses the same algorithms to select the path that will be used next, regardless of whether automatic or manual path switching is used.

When using the Hitachi AMS/WMS series, HDLM will select the next path to be used first from among the online owner paths, and then from the online non-owner paths. When the Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000 series, Hitachi AMS2000 series[#], Hitachi SMS series[#], HUS100 series[#], or HUS VM is being used, all the paths that access the same LU as the path that is currently being used are candidates for the switching destination path.

By changing the path status to online in the Path Management window, or by executing the `online` operation, an offline path can be placed online. For details on the `online` operation, see [online \(Places Paths Online\) on page 6-11](#). After a path status is changed to online, the path can be selected as a useable path by HDLM in the same manner as automatic path switching. When using the Hitachi AMS/WMS series, HDLM selects the path to use from online owner paths, and then from online non-owner paths. When the Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000 series, Hitachi AMS2000 series#, Hitachi SMS series#, HUS100 series#, or HUS VM is being used, since all the paths are owner paths, the path to use is not switched even if you change the path status to online by using the Path Management window or the `online` operation.

For details on how to change the path status in the Path Management window, see the HDLM GUI Help.

#

This storage system applies when the dynamic I/O path control function is disabled.

Path Status Transition

Each of the online and offline statuses described in [Performing Failovers and Failbacks Using Path Switching on page 2-17](#) is further subdivided into several statuses. The path statuses (the online path statuses and offline path statuses) are explained below.

The Online Path Statuses

The online path statuses are as follows:

- **Online**
I/Os can be issued normally.
- **Online (P)**
A state in which a path in the `Online` status is in the waiting-to-execute status to be taken offline.
This status occurs in a cluster configuration only.
The `Online (P)` status indicates that the user has requested an `Online` path to be taken offline, for a path that is connected to an LU that is currently performing reserve processing. I/O operations can still be issued normally until the reserve processing on the LU finishes. After the reserve processing finishes, the offline operation request will be performed and the path status will become `Offline (C)`.
The (P) means *pending*, which indicates that the operation to take the path offline is in the waiting-to-execute status (i.e. a request has been made).
- **Online (E)**
An error has occurred on the path, but none of the other paths that access the same LU are in the `Online` status.

If none of the paths accessing a particular LU are in the `Online` status, one of the paths is changed to the `Online (E)` status. This ensures that the LU can be accessed through at least one path.

The `(E)` means *error*, which indicates that an error has occurred on the path from some previous operation.

- `Online (EP)`

The status of an `Offline (P)` path changes to `Online (EP)` when the path goes through the following process during reserve processing in a cluster configuration:

- When exactly two paths are connected to an LU and the user performs an offline operation on the `Offline (E)` path to change it to `Offline (P)` and the other path is `Online (E)`.
- When one path is `Offline (P)`, the other path must be `Online (E)`. If HDLM detects an error in the `Online (E)` path, then the path statuses will change as follows:

The `Online (E)` path changes to `Offline (E)`.

The `Offline (P)` path changes to `Online (EP)`.

If the reserve processing finishes after the path has changed from `Online (EP)` to `Offline (P)`, the offline operation will end successfully and the path will change to `Offline (C)`.

If the reserve processing finishes while the path is `Online (EP)`, the offline operation will fail and the path will change to `Online (E)`.

- `Online (S) #`

The paths to the primary volume (P-VOL) in the HAM environment have recovered from an error, but I/O to the P-VOL is suppressed.

- `Online (D) #`

The paths to the primary volume (P-VOL) in an HAM environment have recovered from an error, but I/O to the P-VOL is suppressed. If an error occurs in all the paths to a secondary volume (S-VOL), the status of the P-VOL paths will be automatically changed to the `Online` status. To change the status to the `Online (D)` status, specify the `-dfha` parameter for the HDLM command's `online` operation.

#

The status changes to this status when using HAM (High Availability Manager).

The Offline Path Statuses

The offline path statuses are as follows:

- `Offline (C)`

The path is offline because an offline operation was performed.

The `(C)` indicates the command attribute, which indicates that the path was placed offline by using the GUI or a command.

- `Offline (E)`

The status indicating that an I/O could not be issued on a given path, because an error occurred on the path.

The (E) means *error*.

- Offline (P)

This status occurs in a cluster configuration only.

The Offline (P) status indicates that the user has requested an offline operation on an Offline (E) path that is connected to an LU that is currently performing reserve processing. After the reserve processing finishes, the offline operation request will be performed and the path status will become Offline (C).

The (P) means *pending*, which indicates that the operation to take the path offline is in the waiting-to-execute status (i.e. a request has been made).

Status Transitions of a Path

The following figure shows the status transitions of a path.

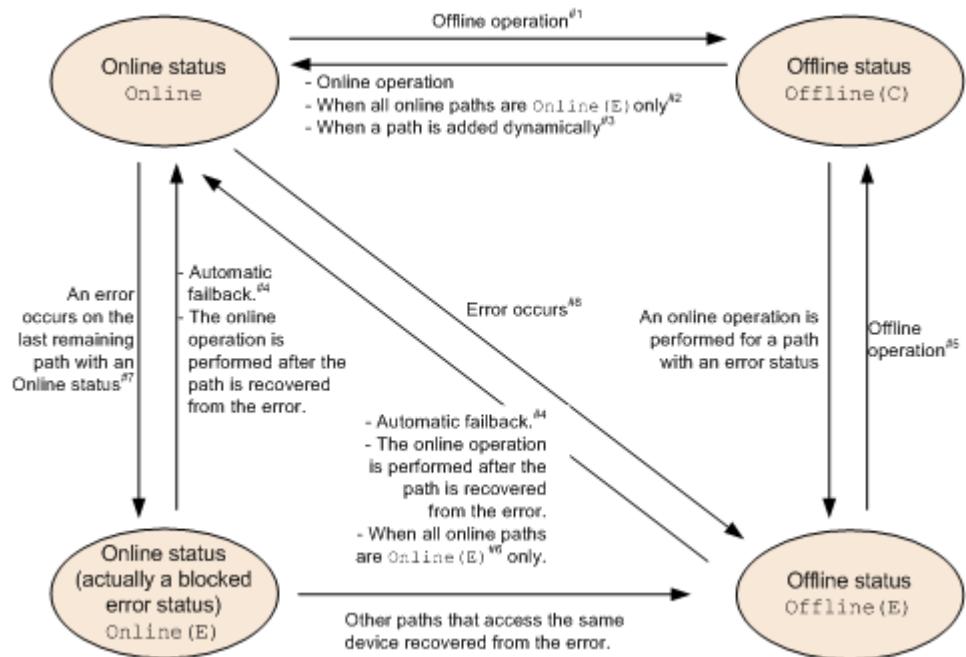


Figure 2-11 Path Status Transitions

Legend:

Online operation: Online operation performed in the Path Management window or by executing the `dlkmgr` command's `online` operation.

Offline operation: Offline operation performed in the Path Management window or by executing the `dlkmgr` command's `offline` operation.

#1

During reserve processing for an LU, the Online status is temporarily changed to Online (P). When the reservation processing finishes, the Online (P) status is changed to Offline (C).

#2

When the following conditions are satisfied, the connected Offline (C) paths are automatically placed online:

- All the online paths are Online (E) and all the SCSI devices connected to the Online (E) paths have been deleted.
- SCSI devices are connected and all the Offline (E) paths are subject to automatic failback.
- SCSI devices are connected to the Offline (C) paths.

#3

When a path is added dynamically, initially the path status is Offline (C). The path status will then automatically change to Online. For details on dynamically adding a path, see [*Setting Up an Added LU and Path as an HDLM Management-target on page 4-17*](#).

#4

When the following conditions are all satisfied, a path that has been determined to have an intermittent error also becomes subject to automatic failback:

- All the paths connected to an LU are Online (E), Offline (E), or Offline (C).
- All the paths connected to an LU have been determined to have an intermittent error.
- The processing of continuous I/O operations issued to an LU is successful.

#5

During reserve processing for an LU, the Offline (E) status is temporarily changed to Offline (P). After the reserve processing finishes, the Offline (P) status is changed to Offline (C).

#6

When the following conditions are satisfied, the connected Offline (E) paths are automatically placed online:

- All the online paths are Online (E) and all the SCSI devices connected to the Online (E) paths have been deleted.
- The Offline (E) paths are assumed to have had an intermittent error, and are thus excluded from automatic failbacks.
- The SCSI devices are connected to the Offline (E) paths.

#7

The path status changes when I/O is issued to a path where a failure has occurred.

#8

The path status changes when I/O is issued to a path where a failure has occurred or when HDLM detects a path failure during path health

checking. For details on path health checking, see [Detecting Errors by Using Path Health Checking on page 2-32](#).

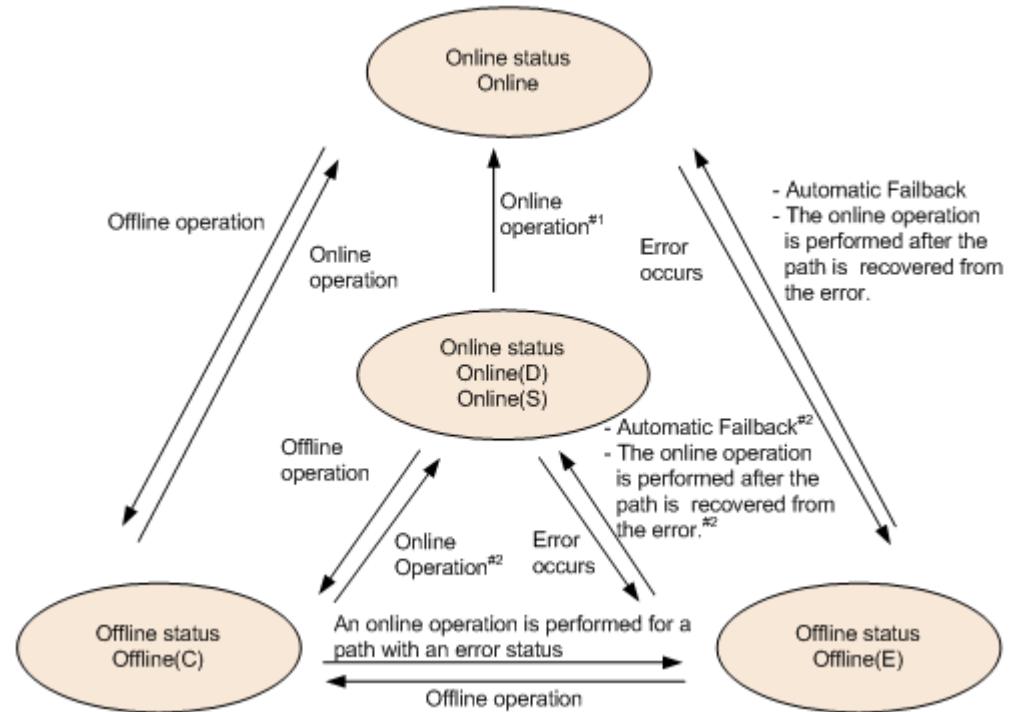


Figure 2-12 Path Status Transitions (P-VOL in HAM environment)

Legend:

Online operation: Online operation performed by executing the `dlnkmgr` command's `online` operation.

Offline operation: Offline operation performed by executing the `dlnkmgr` command's `offline` operation.

#1

Also when an error occurs in all the paths to an S-VOL in the Online (D) status.

#2

When I/O operations are processed on an S-VOL.

If there is only one available online path for an LU, it cannot be placed offline by using the Path Management window or by executing the `offline` operation. This ensures that the LU can always be accessed by at least one path. For details on the `offline` operation, see [offline \(Places Paths Offline\) on page 6-6](#).

If an error occurs in the only available online path for an LU, the status of the path will change to Online (E).

If you are using the automatic failback function, after the path has recovered from the error, HDLM will automatically place the path online. There are, however, the following exceptions:

- When you are using intermittent error monitoring, sometimes, the path in which the intermittent error occurred is not automatically placed online after the path has been recovered from the error. If this happens, manually place the path online. If the only other online path is in the `Online (E)` status when the path is recovered from the error, the path recovered from the error might be placed online automatically. For details, see [Figure 2-14 What Will Happen When an Intermittent Error Does Not Occur on a Path on page 2-29](#).
- There are cases in which the path is automatically placed online even if you are not using the automatic fallback function. If a piece of hardware that supports the Windows plug-and-play function is removed, HDLM will place the path associated with that hardware offline, as well. If the hardware is then re-installed, HDLM will automatically place the path back online. However, this is the case only when there is no other cause or reason for the path being placed offline. In this case, because HDLM will automatically place the path back online without using the automatic fallback function, you do not need to manually place the path online.

When you use the LU dynamic deletion function, the `Online (E)` path will be deleted. Therefore, that path is not displayed in the Path Management window. Also, the `view` operation does not display the `Online (E)` path.

Note:

If there is a path failure immediately after a path is taken offline by using either the an HDLM command or the HDLM GUI, the status might change from `Offline (C)` to `Offline (E)`. If an offline operation was just performed, wait about 2 minutes, check the path status by using an HDLM command or the HDLM GUI, and then make sure that the status has changed to `Offline (C)`. If it is still `Offline (E)`, retry the offline operation.

Monitoring Intermittent Errors (Functionality When Automatic Failback Is Used)

An intermittent error refers to an error that occurs irregularly because of something like a loose cable. In such a case, I/O performance might decrease while an automatic fallback is being performed to repair an intermittent error. This is because the automatic fallback operation is being performed repeatedly (because the intermittent error keeps occurring). To prevent this from happening, HDLM can automatically remove the path where an intermittent error is occurring from the paths that are subject to automatic failbacks. This process is called *intermittent error monitoring*.

We recommend that you use intermittent error monitoring along with the automatic fallback function.

A path in which an error occurs a specified number of times within a specified interval is determined to have an intermittent error. The path where an intermittent error occurs has an error status until the user chooses to place the path back online. Failbacks are not performed for such paths. This status is referred to as the *not subject to auto fallback* status.

Checking Intermittent Errors

You can check the paths in which intermittent errors have occurred by viewing the execution results of the HDLM command's `view` operation or the HDLM GUI **Path List** view.

For details on the `view` operation, see [view \(Displays Information\) on page 6-33](#). For details on how to use the **Path List** view of the HDLM GUI and window components, see the HDLM GUI Help.

Setting Up Intermittent Error Monitoring

When you enable the intermittent error monitoring function, specify the following monitoring conditions: the error monitoring interval, and the number of times that the error needs to occur. If an error occurs on a particular path the specified number of times within the specified error-monitoring interval, then an intermittent error will occur on the path. For example, if you specify 30 for the error monitoring interval and 3 for the number of times that the error needs to occur, the path is determined to have an intermittent error if an error occurs 3 or more times in 30 minutes.

You can set up intermittent error monitoring by executing the `dlnkmgr` command's `set` operation or using the HDLM GUI Options window.

Intermittent error monitoring can be used only when automatic failback has already been enabled. The values that can be specified for intermittent error monitoring depend on the values specified for automatic failbacks. For details on how to specify the settings, see [set \(Sets Up the Operating Environment\) on page 6-16](#) or the HDLM GUI Help.

Intermittent Error Monitoring Actions

Intermittent error monitoring is performed on each path, and it automatically starts as soon as a path is recovered from an error by using the automatic failback function.

This subsection describes the following intermittent error monitoring actions:

- When an intermittent error occurs
- When an intermittent error does not occur
- When the conditions for an intermittent error to occur are changed during error monitoring

When an Intermittent Error Occurs

When an error occurs on a path a specified number of times within a specified interval, the error monitoring will finish and the path is determined to have an intermittent error, upon which the path is removed from those subject to automatic failbacks. The path that is removed will remain in the error status until the `online` operation is performed. However, if the path satisfies certain conditions (see [Figure 2-11 Path Status Transitions on page 2-23](#)), it will be subject to automatic failbacks and change to the `Online` status.

The figure below shows the action taken when an intermittent error is assumed to have occurred on the path. For this example, the path is determined to have an intermittent error when the error occurs 3 or more times within 30 minutes. The events that occur are described by using the time arrows.

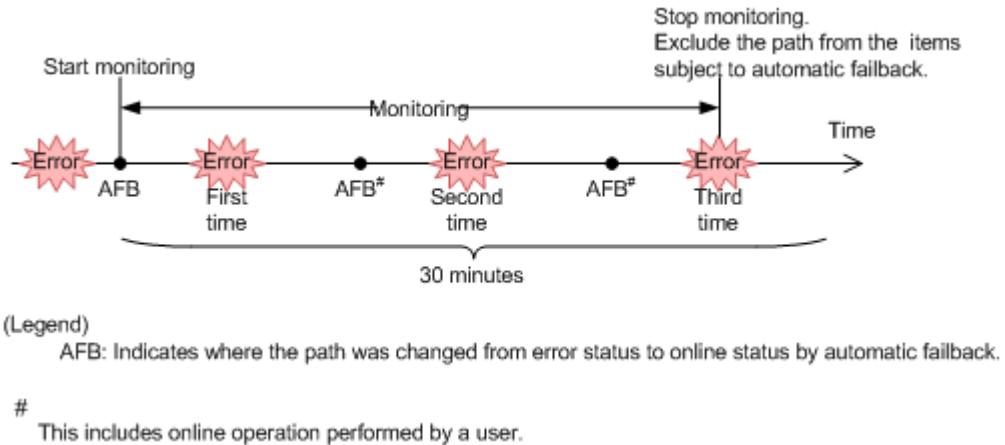


Figure 2-13 Action What Will Happen When an Intermittent Error Occurs on a Path

When an Intermittent Error Does Not Occur

If an error does not occur on a path a specified number of times within a specified interval, an intermittent error will not occur. In such a case, the error monitoring will finish when the specified error-monitoring interval finishes, upon which the number of errors is reset to 0. If an error occurs on the path again at a later time, error monitoring will resume when the path is recovered from the error via an automatic failback.

If it takes a long time for an error to occur, an intermittent error can be more easily detected by increasing the error-monitoring interval or by decreasing the number of times that the error needs to occur.

The figure below shows the action taken when an intermittent error is assumed not to have occurred on the path. For this example, the path is determined to have an intermittent error if the error occurs three or more times in 30 minutes. The events that occur are described by using the time arrows.

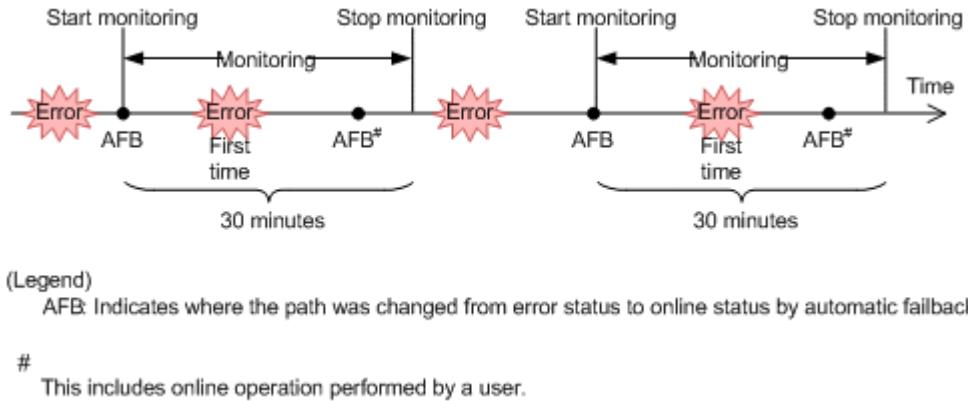


Figure 2-14 What Will Happen When an Intermittent Error Does Not Occur on a Path

As shown in [Figure 2-14 What Will Happen When an Intermittent Error Does Not Occur on a Path on page 2-29](#), normally, the count for the number of times that an error occurs is started after the path is first recovered from an error by using the automatic failback function. However, if all the paths connected to the LU are in the Offline (E), Online (E), or Offline (C) status (which is due to the disconnection of the paths or some other reason), the paths will not be recovered and put back online by using the automatic failback function. If I/O operations are continuously being issued to such an LU, the count for the number of times that the error occurs might be started even though the path will not be placed online. If the number of times that the error occurs reaches the specified value, the path is determined to have an intermittent error. In such a case, remove the cause of the error, and then manually place the path online.

When the Conditions for an Intermittent Error Are Changed During Error Monitoring

When the conditions for an intermittent error are changed during error monitoring, the number of errors and the amount of time that has passed since the error monitoring started are both reset to 0. As such, the error monitoring will not finish, and it will start over by using the new conditions.

If the conditions are changed while error monitoring is not being performed, error monitoring will start up again and use the updated conditions after any given path is recovered from an error by performing an automatic failback.

The figure below shows the action taken when the conditions for an intermittent error are changed during intermittent error monitoring. For this example, the conditions have been changed from 3 or more errors in 30 minutes, to 3 or more errors in 40 minutes. The events that occur are described by using the time arrows.

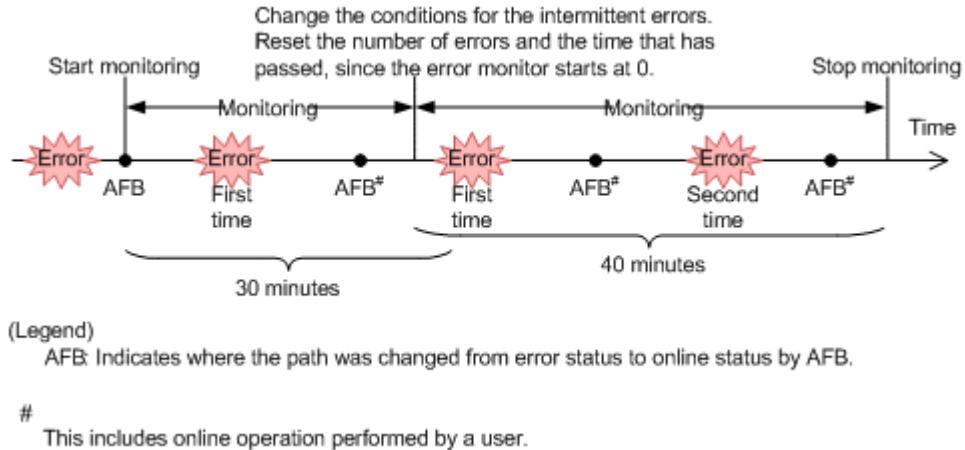


Figure 2-15 What Will Happen When Conditions Are Changed During Error Monitoring

When a User Changes the Intermittent Error Information

The following might be reset when a user changes any of the values set for the intermittent error or the path status: the number of errors that have already been counted during error monitoring, the amount of time that has passed since error monitoring has started, and the information about whether an intermittent error has occurred. [Table 2-6 When Effects of a User Changing the Intermittent Error Information on page 2-30](#) lists whether the above items are reset.

If you want to check whether intermittent error monitoring is being used for a path, check the IEP item displayed when the `dlnkmgr` command's `view -path` operation is executed with the `-iem` parameter specified, or the **Intermittent Error Path** item specified in the Path List view of the HDLM GUI. If 0 or greater is displayed in the **Intermittent Error Path** item, then intermittent error monitoring is being performed.

Table 2-6 When Effects of a User Changing the Intermittent Error Information

User operation		Number of errors and time passed since error monitoring started	Information about paths not subject to automatic fallback
Changing the intermittent error monitoring settings	Turning off	Reset	Reset ^{#1}
	Changing the conditions for an intermittent error while intermittent error monitoring is being performed	Reset ^{#2}	Inherited
	Turning intermittent error monitoring on by executing		

User operation	Number of errors and time passed since error monitoring started	Information about paths not subject to automatic failback
the set operation, (but not changing the conditions) while intermittent error monitoring is being performed		
Clicking the Apply or OK button in the HDLM GUI Options window ^{#3} while intermittent error monitoring is being performed		
Changing the intermittent error monitoring conditions while intermittent error monitoring is not being performed	(Not applicable) (Not counted.)	Inherited
Changing the automatic failback settings	Turning off	Reset
Changing the path status	Taking the path Offline(C)	Reset
	Placing the path Online while intermittent error monitoring is not being performed	(Not applicable) (Not counted.)
	Placing the path Online while intermittent error monitoring is being performed	Inherited (Not applicable) If a path has been removed from the paths subject to automatic monitoring, that path is no longer monitored.
Restarting the HDLM manager	Reset ^{#4}	Inherited
Restarting the host	Reset	Reset

#1

When you turn the intermittent error monitoring function off, information about paths not subject to automatic failback will be reset. If you do not want to reset the information about paths not subject to automatic failback when you turn the intermittent error monitoring function off, change the target paths to Offline(C).

#2

The number of errors and the time passed since error monitoring had started are both reset to 0, and then monitoring restarts from the time the setting change is made in accordance with the changed monitoring conditions.

#3

When the settings for a function other than intermittent error monitoring have been changed or even when the settings have not been changed, if the **Apply** or **OK** button is clicked, the number of error occurrences and the time since monitoring had started are both reset. To leave the settings unchanged, close the Options window by clicking the **Cancel** button. If you want to change the settings for a function other than intermittent error monitoring but do not want to reset the intermittent error monitoring status, use an HDLM command instead of the HDLM GUI.

#4

The number of errors and the time passed since error monitoring had started are both reset to 0, and then monitoring restarts from the time the HDLM manager starts.

Detecting Errors by Using Path Health Checking

HDLM can check the status of paths for which I/O operations are not being performed at regular intervals. This function is called *path health checking*.

Without path health checking, an error cannot be detected unless an I/O operation is performed, because the system only checks the status of a path when an I/O operation is performed. With path health checking, however, the system can check the status of all online paths at regular intervals regardless of whether I/Os operations are being performed. If an error is detected in a path, the path health checking function switches the status of that path to Offline(E) or Online(E). You can use the `dlnkmgr` command's `view` operation or the Path Management window of the HDLM GUI to check the path error.

For example, in a normal state, I/O operations are not performed on the paths coming from the standby host in the cluster configuration or on non-owner paths (that is, some of the paths that access a Hitachi AMS/WMS series storage system). Because of this, for the standby host or for a host connected to non-owner paths, we recommend that you use path health checking to detect errors. This enables the system to use the most up-to-date path-status information when selecting the next path to use.

You can configure path health checking by using the Options window of the HDLM GUI or by executing the `dlnkmgr` command's `set` operation. For details on the Options window, see the HDLM GUI Help. For details on the `set` operation, see [set \(Sets Up the Operating Environment\) on page 6-16](#).

Distributing a Load by Using the Dynamic I/O Path Control Function

The result of using HDLM load balancing to distribute a load can be improved, by applying the HDLM dynamic I/O path control function to the storage system in which the dynamic load balance control function is installed.

What is the Dynamic Load Balance Control Function

In a system configuration in which multiple hosts and a storage system are connected, the I/O processing load tends to concentrate on the controller of the storage system, causing throughput performance of the entire system decrease. The dynamic load balance controller function evaluates such load statuses on the controller and prevents storage system performance from decreasing.

The following is a list of the storage systems that provide the dynamic load balance controller function and are supported by HDLM.

- Hitachi AMS2000 series[#]
- Hitachi SMS series[#]
- HUS100 series

#

For using the dynamic load balance controller function there are restrictions on the versions of the microprograms you install. For details, see the release notes of HDLM.

Dynamic I/O Path Control Function

In a storage system in which the dynamic load balance controller function is installed, enable the dynamic I/O path control function to make the HDLM load balancing effective.

When the dynamic I/O path control function is enabled, the controller selected by the dynamic load balance controller function is recognized as the owner controller. Other controllers are recognized as non-owner controllers.

The dynamic I/O path control function can be enabled or disabled based on each host, connected storage system, or LU.

The dynamic I/O path control function can be specified by using the HDLM command's `set` operation. For details about the `set` operation, see [set \(Sets Up the Operating Environment\) on page 6-16](#).

Dynamic Re-configuration

Utilizing the Windows plug-and-play functionality, you can add or delete an LU or a path while the host (on which HDLM is installed) is still running. This is called the *dynamic re-configuration* function. For details on the dynamic re-

configuration function, see [*Setting Up an Added LU and Path as an HDLM Management-target on page 4-17*](#).

Adding an LU Dynamically

The function to dynamically add an LU enables you to add an LU or a path while a host (on which HDLM is installed) is running.

For details on the LU dynamic addition function, see [*Setting Up an Added LU and Path as an HDLM Management-target on page 4-17*](#).

Deleting an LU Dynamically

The dynamic LU deletion function automatically removes an LU from under HDLM control when all the paths to that LU have been disconnected.

You can use the dynamic LU deletion function by specifying the `dlnkmgr` command's `set` operation together with the `-rmlu` `on` parameter. You can also use this function from the Options window of the HDLM GUI. For details on the `set` operation, see [*set \(Sets Up the Operating Environment\) on page 6-16*](#). For details on the operation of the Options window, see the HDLM GUI Help.

For details on dynamically deleting an LU, see [*Deleting an LU Dynamically on page 4-19*](#).

Error Management

For troubleshooting purposes, HDLM collects information and stores it into log files. The error information to be collected can be filtered out by error level, and then stored into the log files.

The following figure shows the flow of data when error information is collected on a host which is running HDLM .

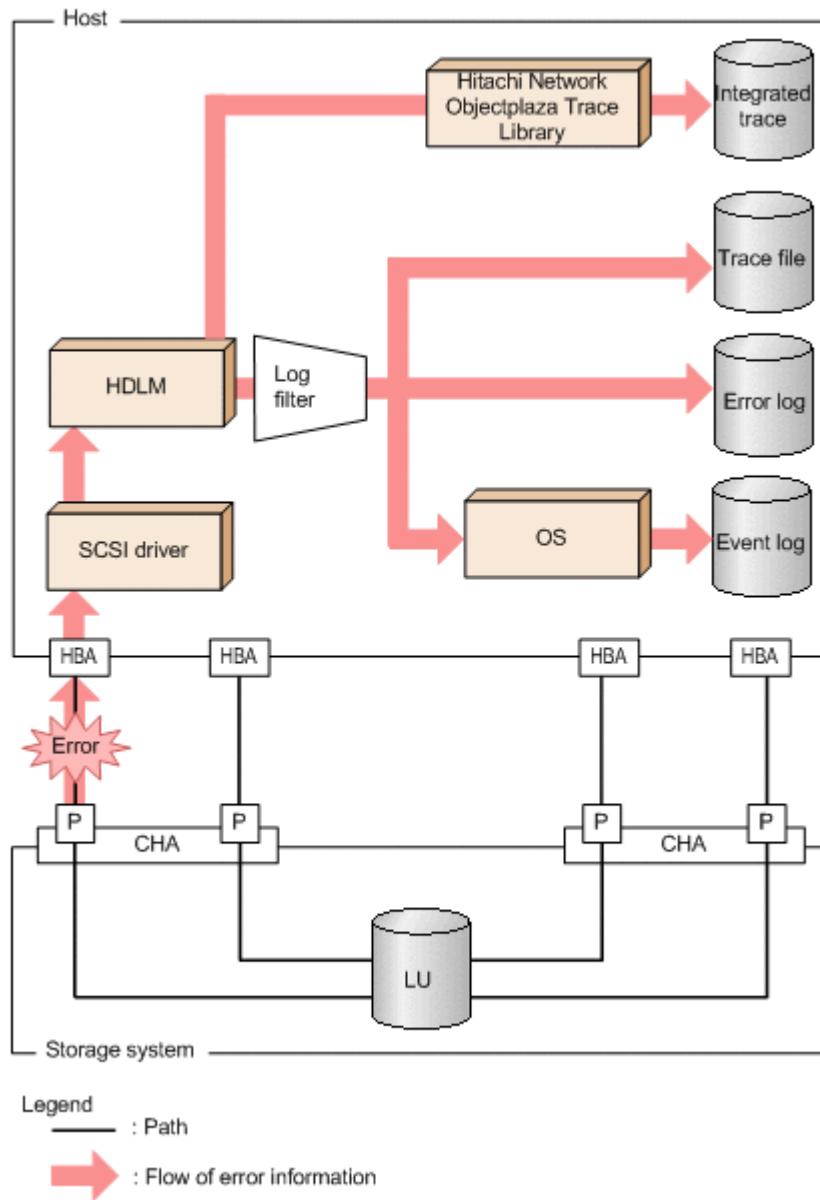


Figure 2-16 Flow of Data When Collecting Error Information

Logs might be collected in layers below HDLM, such as for the SCSI driver. For more details, see the Windows documentation.

Types of Collected Logs

HDLM collects information on detected errors and trace information and stores it into the *integrated trace file*, *trace file*, *error logs* and *event logs*. You can use the error information to examine the status of an error and analyze the cause of the error.

Information regarding a Windows system being down is output to a system memory dump file.

A system memory dump file is a file to which the system memory data is output when a Windows system is down. Specify the following procedure to output the system memory dump file.

Click **Control Panel, System, Startup/Shutdown, Write Debugging Information is chosen with Recovery**, and then choose **Kernel Memory Dump** or **Complete Memory Dump**.

The following table lists and describes the error information that can be collected in logs.

Table 2-7 Types of Error Information

Log name	Description	Output destination
Integrated trace file	Operation logs for the HDLM commands and HDLM GUI	The default file path is <i>drive-for-program-installation</i> : \Program Files ^{#1} \HITACHI \HNTRLib2\spool\hntr2n.log (<i>n</i> indicates a file number) To specify the output destination folder and the file prefix for the integrated trace file, use a Hitachi Network Objectplaza Trace Library (HNTRLib2) utility.
Trace file	Trace information on the HDLM manager is collected at the level specified by the user. If an error occurs, you might need to change the settings to collect trace information.	The trace file name is \Program Files\HITACHI \DynamicLinkManager\log \hdlmtr[1-64].log ^{#2}
Error log	Error information is collected for the user-defined level. By default, HDLM collects all error information.	HDLM Manager logs: \Program Files\HITACHI \DynamicLinkManager\log \dlmmgr[1-16].log ^{#2} HDLM GUI logs: \Program Files\HITACHI \DynamicLinkManager\log \dlmgui[1-2].log ^{#2} Hitachi Command Suite Common Agent Component logs: \Program Files\HITACHI \DynamicLinkManager\log \dlmwebagent[1-n].log ^{#2} The value <i>n</i> depends on a setting in the file dlmwebagent.properties.
Event log	Information about very severe errors (a severity level of Critical or Error) is collected. You can use administrative tools such as Event Viewer to check these event logs.	Event log (application log)

#1

For Windows Server 2003 (excluding the x86 edition) , Windows Server 2008 (excluding the x86 edition), and Windows Server 2012 Program Files is Program Files (x86) .

#2

The underlined part indicates the folder specified during the installation. After obtaining these files, be sure to also copy them to a backup location.

For details on error levels, see [Filtering of Error Information on page 2-37](#).

Note

To collect logs, HDLM uses the Hitachi Network Objectplaza Trace Library service. If this service is not active, start it by doing the following:

From **Control Panel**, choose **Administrative Tools** and then **Services** to open the Services window. From the list of services, select **Hitachi Network Objectplaza Trace Monitor 2**, and then from the **Action** menu choose **Start**.

Filtering of Error Information

Errors detected by HDLM are classified into various error levels. The following table lists and describes the error levels, in the order of most to least severe to the system.

Table 2-8 Error Levels

Error level	Meaning	Level shown in Event Viewer
Critical	Fatal errors that may stop the system.	Error
Error	Errors that adversely affect the system. This type of error can be avoided by performing a failover or other countermeasures.	Error
Warning	Errors that enable the system to continue but, if left, might cause the system to improperly operate.	Warning
Information	Information that simply indicates the operating history when the system is operating normally.	Information

Error information is filtered by error level, and then collected.

The error information in error logs and in the event log is collected based on the user-defined collection level. The collection levels are as follows:

Collection levels for error logs and event logs:

The event log always collects error information from the selected error level and higher.

The error log can collect information from any of the following levels:

- Collects no error information.
- Collects error information from the Error level and higher.

- Collects error information from the Warning level and higher.
- Collects error information from the Information level and higher (information from all the levels is collected).
- Collects error information from the Information level and higher (including maintenance information).

Collection levels for log information in trace files:

- Outputs no trace information
- Outputs error information only
- Outputs trace information on program operation summaries
- Outputs trace information on program operation details
- Outputs all trace information

For details on how to change the collection level, see [*Setting Up the HDLM Functions on page 3-73.*](#)

Collecting Error Information Using the Utility for Collecting HDLM Error Information (DLMgetras)

HDLM provides the `DLMgetras` utility for collecting HDLM error information.

By using the `DLMgetras` utility, you can simultaneously collect all the information required for analyzing errors: information such as error logs, integrated trace files, trace files, definition files, and information on the OS. You can use the collected information for when you contact your HDLM vendor or maintenance company.

For details on the `DLMgetras` utility, see [*The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.*](#)

Collecting Audit Log Data

HDLM and other Hitachi storage-related products provide an audit log function so that compliance with regulations, security evaluation standards, and industry-specific standards can be shown to auditors and evaluators. The following table describes the categories of audit log data that Hitachi storage-related products can collect.

Table 2-9 Categories of Audit Log Data That Can Be Collected

Category	Explanation
StartStop	An event indicating the startup or termination of hardware or software, including: <ul style="list-style-type: none"> • OS startup and termination • Startup and termination of hardware components (including micro-program)

Category	Explanation
	<ul style="list-style-type: none"> Startup and termination of software running on storage systems, software running on SVPs (service processors), and Hitachi Command Suite products
Failure	<p>An abnormal hardware or software event, including:</p> <ul style="list-style-type: none"> Hardware errors Software errors (such as memory errors)
LinkStatus	<p>An event indicating the linkage status between devices:</p> <ul style="list-style-type: none"> Link up or link down
ExternalService	<p>An event indicating the result of communication between a Hitachi storage-related product and an external service, including:</p> <ul style="list-style-type: none"> Communication with a RADIUS server, LDAP server, NTP server, or DNS server, Communication with the management server (SNMP)
Authentication	<p>An event indicating that a connection or authentication attempt made by a device, administrator, or end-user has succeeded or failed, including:</p> <ul style="list-style-type: none"> FC login Device authentication (FC-SP authentication, iSCSI login authentication, or SSL server/client authentication) Administrator or end-user authentication
AccessControl	<p>An event indicating that a resource access attempt made by a device, administrator, or end-user has succeeded or failed, including:</p> <ul style="list-style-type: none"> Device access control Administrator or end-user access control
ContentAccess	<p>An event indicating that an attempt to access critical data has succeeded or failed, including:</p> <ul style="list-style-type: none"> Access to a critical file on a NAS or content access when HTTP is supported Access to the audit log file
ConfigurationAccess	<p>An event indicating that a permitted operation performed by the administrator has terminated normally or failed, including:</p> <ul style="list-style-type: none"> Viewing or updating configuration information Updating account settings, such as adding and deleting accounts Setting up security Viewing or updating audit log settings
Maintenance	<p>An event indicating that a maintenance operation has terminated normally or failed, including:</p> <ul style="list-style-type: none"> Adding or removing hardware components Adding or removing software components

Category	Explanation
AnomalyEvent	An event indicating an abnormal state such as exceeding a threshold, including: <ul style="list-style-type: none"> Exceeding a network traffic threshold Exceeding a CPU load threshold Reporting that the temporary audit log data saved internally is close to its maximum size limit or that the audit log files have wrapped back around to the beginning
	An event indicating an occurrence of abnormal communication, including: <ul style="list-style-type: none"> A SYN flood attack or protocol violation for a normally used port Access to an unused port (such as port scanning)

The categories of audit log data that can be collected differ depending on the product. The following sections explain only the categories of audit log data that can be collected by HDLM. For the categories of audit log data that can be collected by a product other than HDLM, see the corresponding product manual.

Categories and Audit Events that HDLM Can Output to the Audit Log

The following table lists and explains the categories and audit events that HDLM can output to the audit log. The severity is also indicated for each audit event.

Table 2-10 Categories and Audit Events That Can Be Output to the Audit Log

Category	Explanation	Audit event	Severity #1	Message ID
StartStop	Startup and termination of the software	Startup of the HDLM manager was successful.	6	KAPL15401-I
		Startup of the HDLM manager failed.	4	KAPL15402-W
		The HDLM manager stopped.	6	KAPL15403-I
		Startup of the DLMgetras utility	6	KAPL15060-I
		Termination of the DLMgetras utility ^{#2}	6	KAPL15061-I

Category	Explanation	Audit event	Severity #1	Message ID
		Startup of the HDLM GUI was successful.	6	KAPL15201-I
		Startup of the HDLM GUI failed.	4	KAPL15204-W
		Termination of the HDLM GUI was successful.	6	KAPL15202-I
Authentication	Administrator or end-user authentication	Permission has not been granted to execute the HDLM command.	4	KAPL15111-W
		Permission has not been granted to execute HDLM utilities.	4	KAPL15010-W
		Permission has not been granted to start or stop the HDLM manager.	4	KAPL15404-W
		Permission has not been granted to start the HDLM GUI.	4	KAPL15203-W
ConfigurationAccess	Viewing or updating configuration information	Initialization of path statistics was successful.	6	KAPL15101-I
		Initialization of path statistics failed.	4	KAPL15102-W
		An attempt to place a path online or offline was successful.	6	KAPL15103-I
		An attempt to place a path online or offline failed.	4	KAPL15104-W
		Setup of the operating environment was successful.	6	KAPL15105-I
		Setup of the operating environment failed.	4	KAPL15106-W

Category	Explanation	Audit event	Severity #1	Message ID
		An attempt to display program information was successful.	6	KAPL15107-I
		An attempt to display program information failed.	4	KAPL15108-W
		An attempt to display HDLM management-target information was successful.	6	KAPL15109-I
		An attempt to display HDLM management-target information failed.	4	KAPL15110-W
		An attempt to place a path online by using the HDLM GUI was successful.	6	KAPL15207-I
		An attempt to place a path online by using the HDLM GUI failed.	4	KAPL15208-W
		An attempt to place a path offline by using the HDLM GUI was successful.	6	KAPL15207-I
		An attempt to place a path offline by using the HDLM GUI failed.	4	KAPL15208-W
		An attempt to perform an operation by using the HDLM GUI (output to a CSV file, acquiring option information, specifying option information, refreshing, clearing data, or	6	KAPL15205-I

Category	Explanation	Audit event	Severity #1	Message ID
	refreshing of the GAD non-preferred path option settings) was successful.			
	An attempt to perform an operation by using the HDLM GUI (output to a CSV file, acquiring option information, specifying option information, refreshing, clearing data, or refreshing of the GAD non-preferred path option settings) failed.	4		KAPL15206-W
	Processing of the <code>dlmprvkey -r</code> command was successful.	6		KAPL15030-I
	Processing of the <code>dlmprvkey -r</code> command failed.	4		KAPL15031-W
	Processing of the <code>dlmprvkey -v</code> command was successful.	6		KAPL15032-I
	Processing of the <code>dlmprvkey -v</code> command failed.	4		KAPL15033-W
	Processing of the <code>dlmchkpath -singleconnect</code> command was successful.	6		KAPL15034-I
	Processing of the <code>dlmchkpath -singleconnect</code> command failed.	4		KAPL15035-W
	The status of a path was successfully changed to Online.	6		KAPL15116-I

Category	Explanation	Audit event	Severity #1	Message ID
		A path was successfully deleted.	6	KAPL15119-I
		Path deletion failed.	4	KAPL15120-W
		The refresh operation was successful.	6	KAPL15121-I
		The refresh operation failed.	4	KAPL15122-W

#1

The severity levels are as follows:

4: Warning, 6: Information

#2

If you use **Ctrl + C** to cancel the `DLMgetras` utility for collecting HDLM error information, audit log data indicating that the `DLMgetras` utility has terminated will not be output.

Requirements for Outputting Audit Log Data

HDLM can output audit log data when all of the following conditions are satisfied:

- The Event Log service is running.
- The output of audit log data has been enabled by using the HDLM command's `set` operation.

However, audit log data might still be output regardless of the above conditions if, for example, an HDLM utility is executed from external media. #

#:

The following audit log data is output:

- Categories: `StartStop`, `Authentication`, and `ConfigurationAccess`
- Severity: 6 (Error, Warning, or Information)

Note:

- You might need to perform operations such as changing the log size and backing up and saving collected log data, because the amount of audit log data might be quite large.

Destination and Filtering of Audit Log Data

Audit log data is output to event logs.

You can also filter the audit log output by specifying a severity level and type for the HDLM command's `set` operation.

Filtering by severity:

The following table lists the severity levels that can be specified.

Table 2-11 Severity Levels That Can Be Specified

Severity	Audit log data to output	Correspondence with event log type
0	Error	Error
1		
2		
3		
4	Error and Warning	Warning
5		
6	Error, Warning, and Information	Information
7		

Filtering by category:

The following categories can be specified:

- StartStop
- Authentication
- ConfigurationAccess
- All of the above

For details on how to specify audit log settings, see [Setting Up the HDLM Functions on page 3-73](#).

Audit Log Data Formats

The following describes the format of audit log data:

The following is the format of audit log data. This data can be viewed in the **Description** box of the **Event Properties** dialog box, which is opened when an event is double-clicked in the **Application Log** list of the **Event Viewer** administrative tool:

program-name [process-ID] : message-section

The following shows the format of *message-section* and explains its contents.

The format of *message-section*:

common-identifier, common-specification-revision-number, serial-number, message-ID, date-and-time, entity-affected, location-affected, audit-event-type, audit-event-result, subject-ID-for-audit-event-result, hardware-identification-information, location-information, location-identification-information, FQDN, redundancy-identification-

information, agent-information, host-sending-request, port-number-sending-request, host-receiving-request, port-number-receiving-request, common-operation-ID, log-type-information, application-identification-information, reserved-area, message-text

Up to 950 bytes of text can be displayed for each *message-section*.

Table 2-12 Items Output in the Message Section

Item#	Explanation
Common identifier	Fixed to CELFSS
Common specification revision number	Fixed to 1.1
Serial number	Serial number of the audit log message
Message ID	Message ID in KAPL15nnn-1 format
Date and time	The date and time when the message was output. This item is output in the following format: <i>yyyy-mm-ddThh:mm:ss.s time-zone</i>
Entity affected	Component or process name
Location affected	Host name
Audit event type	Event type
Audit event result	Event result
Subject ID for audit event result	Depending on the event, an account ID, process ID, or IP address is output.
Hardware identification information	Hardware model name or serial number
Location information	Hardware component identification information
Location identification information	Location identification information
FQDN	Fully qualified domain name
Redundancy identification information	Redundancy identification information
Agent information	Agent information
Host sending request	Name of the host sending a request
Port number sending request	Number of the port sending a request
Host receiving request	Name of the host receiving a request
Port number receiving request	Number of the port receiving a request
Common operation ID	Operation serial number in the program
Log type information	Fixed to BasicLog

Item#	Explanation
Application identification information	Program identification information
Reserved area	This field is reserved. No data is output here.
Message text	Data related to the audit event is output.

#: The output of this item depends on the audit event.

Example of the message section for the audit event *An attempt to display HDLM management-target information was successful:*

```
CELFSS,1.1,0,KAPL15109-I,
2008-04-09T10:18:40.6+09:00,HDLMCommand,hostname=moon,ConfigurationAccess,Success,pid=3292,,,,,,,,,"Information about HDLM-management targets was successfully displayed. Command Line = dlnkmgr view -path "
```

Integrated HDLM management using Global Link Manager

By using Global Link Manager, you can perform integrated path management on systems running multiple instances of HDLM.

For large-scale system configurations using many hosts running HDLM, the operational load for managing paths on individual hosts increases with the size of the configuration. By linking HDLM and Global Link Manager, you can centrally manage path information for multiple instances of HDLM and reduce operational load. In addition, you can switch the operational status of paths to perform system-wide load balancing, and centrally manage the system by collecting HDLM failure information in Global Link Manager.

Global Link Manager collects and manages information about paths from instances of HDLM installed on multiple hosts. Even if multiple users manage these hosts, they can control and view this centralized information from client computers.

Note:

You cannot manage a single HDLM host from multiple Global Link Manager servers.

The following figure is an example of a system configuration using HDLM and Global Link Manager.

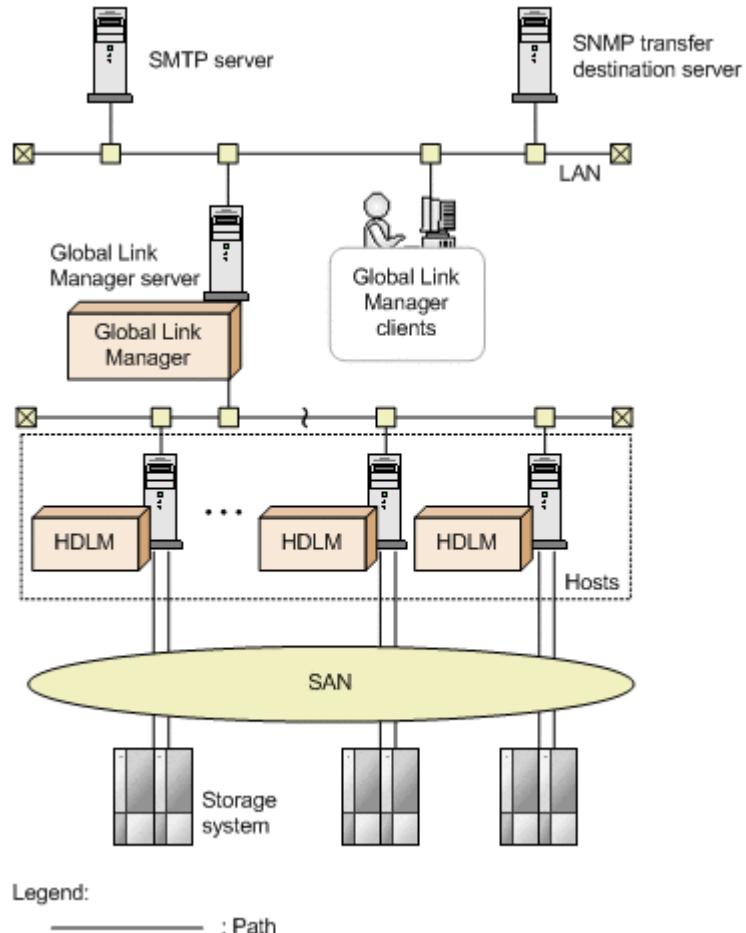


Figure 2-17 Example System Configuration Using HDLM and Global Link Manager

Cluster Support

HDLM can also be used in cluster configurations.

For details about the cluster software supported by HDLM, see [Table 3-10 Supported Cluster Software on page 3-9](#) in [Cluster Software Supported by HDLM on page 3-9](#).

When load balancing is used by cluster software supported by HDLM, HDLM uses an *active host* path to access an LU.

For example, in [Figure 2-18 Path Switching in a Cluster Configuration on page 2-49](#), when HDLM uses a path (A) from the active host to access a device within the LU, if the path is placed offline, HDLM switches to another path (B) to continue processing.

The trigger for switching nodes is dependent on the cluster software.

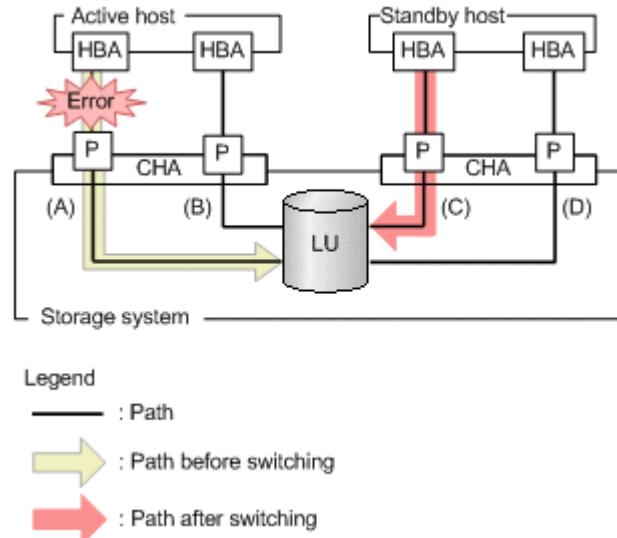


Figure 2-18 Path Switching in a Cluster Configuration

Creating an HDLM Environment

This chapter explains how to set up an HDLM environment and also how to erase environment settings.

Make sure that you have already installed HDLM and configured the function settings.

- [HDLM System Requirements](#)
- [Flow for Creating an HDLM Environment](#)
- [HDLM Installation Types](#)
- [Notes on Creating an HDLM Environment](#)
- [Installing HDLM](#)
- [Checking the Path Configuration](#)
- [Setting Up HDLM](#)
- [Setting Up Integrated Traces](#)
- [Removing HDLM](#)

HDLM System Requirements

Check the following before installing HDLM:

For the requirements for using HDLM in an HAM environment, see the release notes of HDLM.

OSs Supported by HDLM

This subsection describes the OSs, Microsoft MPIO drivers, and Web browsers supported by HDLM.

Supported OSs

You can install HDLM on any of the OSs described in the following table.

Table 3-1 Supported OSs

OS	Service pack
Windows Server 2003 (IPF)	No service pack#
	SP1
	SP2
Windows Server 2003 (x64)	No service pack
	SP2
Windows Server 2003 R2 (x64)	No service pack
	SP2
Windows Server 2003 (x86)	No service pack#
	SP1
	SP2
Windows Server 2003 R2 (x86)	No service pack
	SP2
Windows Server 2008 (IPF)	No service pack
	SP2
Windows Server 2008 R2 (IPF)	No service pack
	SP1
Windows Server 2008 (x64)	No service pack
	SP2
Windows Server 2008 R2 (x64)	No service pack
	SP1
Windows Server 2008 (x86)	No service pack
	SP2

OS	Service pack
Windows Server 2012 (x64)	No service pack
Windows Server 2012 R2(x64)	No service pack

Note:

In this manual, Windows running on a 32-bit processor is referred to as *x86*.

#

To use the Storport Miniport driver for the HBA driver in an environment where SP1 or later has not been installed, QFE update program QFE 838894 or later provided by Microsoft is required.

Microsoft MPIO Drivers

The following table lists the versions of the Microsoft MPIO driver that are bundled with HDLM.

Table 3-2 Versions of the Microsoft MPIO Driver Bundled with HDLM

Driver	Description	File version
mpdev.sys	Multipath Scsi Device Filter	1.23
mpio.sys	Multipath Support Bus- Driver	1.23
mpspfltr.sys	Multipath Scsi Filter	1.23

Note:

For Windows Server 2008 and Windows Server 2012, use the MPIO driver bundled with the OS.

Web Browsers Supported by HDLM

HDLM supports Internet Explorer 5.0 or later.

JRE used when linking with Global Link Manager

When HDLM is linked with Global Link Manager, use the JRE that comes with HDLM. If either of the JRE versions listed in the table below is installed on the host, you can also use that JRE version. To use the JRE version installed on the host, see the *Hitachi Command Suite Global Link Manager Installation and Configuration Guide*.

Table 3-3 JRE used when linking with Global Link Manager

OS	JRE
Windows Server 2008(x64)	JRE 7.0_01(32bit)
Windows Server 2008(x86)	

OS	JRE
Windows Server 2008 R2(x64)	JRE 1.8.0 (32bit)
Windows Server 2012 R2(x64)	JRE 1.8.0 (32bit)

Storage systems Supported by HDLM

This subsection describes the storage systems supported by HDLM and related programs when using intermediate volumes managed by Hitachi RapidXchange.

Supported Storage systems

The storage systems supported by HDLM are described in [Table 3-4 Supported Storage systems on page 3-4](#). The supported storage systems require a dual controller configuration. If you use the system in a HUB environment, you must set a unique loop ID for every connected host and storage system. For details about the micro-program versions for using HDLM, see the *HDLM Release Notes*. For details about storage system settings required for using HDLM, see the maintenance documentation for storage systems.

Table 3-4 Supported Storage systems

Supported storage systems ^{#1}	Interface	OS		
		Windows Server 2003, Windows Server 2003 R2	Windows Server 2008, Windows Server 2008 R2	Windows Server 2012, Windows Server 2012 R2
EMC DMX series ^{#2}	FC I/F	Y ^{#3} #6	--	--
EMC CX series ^{#4}	FC I/F	Y ^{#3}	Y ^{#7}	--
<ul style="list-style-type: none"> Hitachi AMS series Hitachi WMS series 	FC I/F	Y	Y	--
	iSCSI I/F	Y	Y	--
Hitachi AMS2000 series	FC I/F	Y	Y	Y
	iSCSI I/F	Y	Y	Y
Hitachi SMS series	FC I/F	Y	Y	--
	iSCSI I/F	Y	Y	--
<ul style="list-style-type: none"> Hitachi Universal Storage Platform 100 Hitachi Universal Storage Platform 600 Hitachi Universal Storage Platform 1100 	FC I/F	Y	Y	--
	iSCSI I/F	Y	--	--

Supported storage systems^{#1}	Interface	OS		
		Windows Server 2003, Windows Server 2003 R2	Windows Server 2008, Windows Server 2008 R2	Windows Server 2012, Windows Server 2012 R2
• Hitachi NSC 55				
Hitachi Universal Storage Platform V/VM	FC I/F	Y	Y	Y
• Hitachi Virtual Storage Platform	FC I/F	Y	Y	Y
• HP StorageWorks P9500 Disk Array				
HP EVA series ^{#5}	FC I/F	Y ^{#3}	Y ^{#8}	--
Hitachi Virtual Storage Platform G1000	FC I/F	Y	Y	Y
HP XP7 Storage	FC I/F	Y	Y	Y
HUS100 series	FC I/F	Y	Y	Y
	iSCSI I/F	Y	Y	Y
HUS VM	FC I/F	Y	Y	Y
• XP20000	FC I/F	Y	Y	Y
• XP24000				
• SVS	FC I/F	Y	Y	--
• XP10000				
• XP12000				

Legend:

Y: Usable

--: Not usable

FC I/F: FC Interface

iSCSI I/F: iSCSI Interface

#1

Dual controller configuration is required.

#2

The evaluation of EMC DMX3000 has been completed. Response to inquiries for other systems of the EMC DMX series must be the same as that of the EMC DMX3000. When using systems of the EMC DMX series other than the EMC DMX3000, evaluate the connection in advance.

#3

For Windows Server 2003 (x86) or Windows Server 2003 (IPF), SP1 or later must be installed.

#4

The evaluation of EMC CX700 has been completed. Response to inquiries for other systems of the EMC CX series must be the same as that of the EMC CX700. When using systems of the EMC CX series other than the EMC CX700, evaluate the connection in advance.

Note that, for Windows Server 2003, EMC CX700 was used for evaluations. For Windows Server 2008, EMC CX3-10 was used.

#5

The evaluation of HP EVA8000 has been completed. Response to inquiries for other systems of the HP EVA series must be the same as that of the HP EVA8000. When using HP EVA systems other than the HP EVA8000, evaluate the connection in advance.

#6

Not supported for Windows Server 2003 (x64) or Windows Server 2003 R2 (x64).

#7

Supported only for Windows Server 2008.

#8

Supported only for EVA6400 storage systems running Windows Server 2008 R2 (x64).

List of information for storage settings

To use HDLM, you need to set the information for storage settings that are indicated in the table below. The character string enclosed in square brackets [] indicates the items to be set. Selecting the item after the item enclosed in square brackets [] displays the next item. Specify the values indicated in the Setting value column.

For other settings, see the maintenance manual of the storage system.

Table 3-5 Storage Settings (Hitachi AMS/WMS Series)

Items	Items to be set	Setting value
Startup Attribute	[Tools] - [Configuration Settings] - [Boot Options]	Dual Active Mode
Port Option	[Tools] - [Configuration Settings] - [Port Options] Enable the option for each port.	Reset ALL LIP Port Mode
Host Connection Mode 1	Set the connection mode for each host group. Display the host group options and select [Detail Settings]	Standard mode or Wolfpack mode
Host Connection Mode 2	Enable the connection mode for each host group.	Reset Propagation Mode

Items	Items to be set	Setting value
	Display the host group options and select [Detail Settings]	

Table 3-6 Storage Settings (Hitachi AMS2000 series, HUS100 series)

Items	Items to be set	Setting value
System Startup Attribute	[Settings] - [Advanced Settings] - [Open Advanced Settings] [Configuration Settings] - [Boot Options] - [Set]	Dual Active Mode
Host Group Options	Set the following items for each host group: Display the host group, select [Edit Host Group] and select [Options] tab. Common Settings:	Standard mode or Wolfpack mode
	Set the following items for each host group: Display the host group, select [Edit Host Group] and select [Options] tab. Platform:	Windows

Table 3-7 Storage Settings (VSP G1000, Hitachi Virtual Storage Platform, Universal Storage Platform V/VM series, Hitachi NSC55, XP7, P9500, XP24000, XP20000, XP12000, XP10000, SVS, HUS VM)

Items	Items to be set	Setting value
Host Mode	-	0C or 2C

Table 3-8 Storage Settings (EMC DMX series[#])

Items	Items to be set		Settings
Microprogram version	-		5670.83
Port Flag Setting	Fibre Flags	HARD_ADDRESS(H)	Enable
		UNIQUE_WWN(UWN)	Enable
	SCSI Flags	COMMON_SN(C)	Enable
		DIS_Q_RESET_ON_UA(D)	Enable

#

EMC DMX3000 was used for evaluations.

HBAs

For details about the supported HBAs, see the HDLM *Release Notes*.

When Using Intermediate Volumes Managed by Hitachi RapidXchange to Exchange Data

The following table lists the related programs for when intermediate volumes managed by Hitachi RapidXchange are used to exchange data.

Table 3-9 Related Programs When Intermediate Volumes Managed by Hitachi RapidXchange Are Used to Exchange Data

OS ^{#1}	Related programs
Windows Server 2003 (x86)	File Access Library and File Conversion Utility (FAL/FCU) 01-04-64/20 or later ^{#2}
Windows Server 2003 (x64)	File Access Library and File Conversion Utility (FAL/FCU) 01-04-65/21 or later ^{#2}
Windows Server 2003 R2 (x86)	File Access Library and File Conversion Utility (FAL/FCU) 01-04-65/21 or later ^{#2}
Windows Server 2003 R2 (x64)	File Access Library and File Conversion Utility (FAL/FCU) 01-04-65/21 or later ^{#2} 01-06-67/22 or later ^{#3}
Windows Server 2003 R2 (x64) SP2	File Access Library and File Conversion Utility (FAL/FCU) 01-05-66/25 or later ^{#4}
Windows Server 2008 (x86) SP2	File Access Library and File Conversion Utility (FAL/FCU) 01-05-66/24 or later ^{#4}
Windows Server 2008 R2 (x64)	File Access Library and File Conversion Utility (FAL/FCU) 01-04-65/24 or later ^{#2} 01-05-66/24 or later ^{#4} 01-07-68/00 or later ^{#5}

#1

For details, see [Supported OSs on page 3-2](#) in [OSs Supported by HDLM on page 3-2](#).

#2

Connection mainframe: MVS

Connection storage system: Hitachi USP series

#3

Connection mainframe: MVS

Connection storage system: Hitachi Virtual Storage Platform

#4

Connection mainframe: MVS

Connection storage system: Hitachi Universal Storage Platform V

#5

Connection mainframe: MVS

Connection storage system: Hitachi Virtual Storage Platform G1000

For details about Hitachi RapidXchange, see the manual *File Access Library & File Conversion Utility for Solaris HP-UX AIX Windows Tru64 UNIX NCR SVR4 DYNIX/ptx Linux*.

Cluster Software Supported by HDLM

The following table lists the supported cluster software for when you create a cluster software configuration.

Table 3-10 Supported Cluster Software

OS	SP	Cluster software name	Hitachi USP series, Hitachi AMS2000/AMS /WMS/SMS series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000, and HUS VM	EMC DMX series	EMC CX series	HP EVA series
Windows Server 2003 (IPF) ^{#2}	No service pack	MSCS	Y	Y	Y	Y
	SP1	MSCS	Y	Y	Y	Y
		VCS 5.0	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
	SP2	MSCS	Y	Y	Y	Y
		VCS 5.0	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
Windows Server 2003 (x64) ^{#2}	No service pack	MSCS	Y	--	Y	Y
		VCS 4.3	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
	SP2	MSCS	Y	--	Y	Y

OS	SP	Cluster software name	Hitachi USP series, Hitachi AMS2000/AMS /WMS/SMS series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000, and HUS VM	EMC DMX series	EMC CX series	HP EVA series
Windows Server 2003 R2 (x64) ^{#2}	No service pack	VCS 4.3	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
		Oracle RAC 11g ^{#1}	Y	--	--	--
		MSCS	Y	--	Y	Y
	SP2	VCS 4.3, 5.0	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
		Oracle RAC 11g ^{#1}	Y	--	--	--
		MSCS	Y	--	Y	Y
Windows Server 2003 (x86) ^{#2}	No service pack	VCS 4.3, 5.0	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
		MSCS	Y	Y	Y	Y
		VCS 4.1, 4.2, 4.3	Y	--	--	--
	SP1	Oracle 9i RAC ^{#1}	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
		MSCS	Y	Y	Y	Y
		VCS 4.3, 5.0	Y	--	--	--

OS	SP	Cluster software name	Hitachi USP series, Hitachi AMS2000/AMS /WMS/SMS series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000, and HUS VM	EMC DMX series	EMC CX series	HP EVA series
Windows Server 2003 R2 (x86) ^{#2}	SP2	MSCS	Y	Y	Y	Y
		VCS 4.3, 5.0	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
		Oracle RAC 11g ^{#1}	Y	--	--	--
	No service pack	MSCS	Y	Y	Y	Y
		VCS 4.3, 5.0	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
		Oracle RAC 11g ^{#1}	Y	--	--	--
	SP2	MSCS	Y	Y	Y	Y
		VCS 4.3, 5.0, 5.1	Y	--	--	--
		Oracle 9i RAC ^{#1}	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
		Oracle RAC 11g ^{#1}	Y	--	--	--
Windows Server 2008 (IPF)	No service pack	MSCS	Y	--	Y	--
	SP2	MSCS	Y	--	Y	--
Windows Server 2008 R2 (IPF)	No service pack	MSCS	Y	--	Y	--
	SP1	MSCS	Y	--	Y	--

OS	SP	Cluster software name	Hitachi USP series, Hitachi AMS2000/AMS /WMS/SMS series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000, and HUS VM	EMC DMX series	EMC CX series	HP EVA series
Windows Server 2008 (x64)	No service pack	MSCS	Y	--	Y	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
		Oracle RAC 11g ^{#1}	Y	--	--	--
	SP2	MSCS	Y	--	Y	--
		Oracle RAC 11g ^{#1}	Y	--	--	--
	No service pack	MSCS	Y	--	Y	--
		VCS 5.1	Y	--	--	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
		Oracle RAC 11g ^{#1}	Y	--	--	--
	SP1	MSCS	Y	--	Y	--
		Oracle RAC 10g ^{#1}	Y	--	Y	--
		Oracle RAC 11g ^{#1}	Y	--	Y	--
Windows Server 2008 (x86)	No service pack	MSCS	Y	--	Y	--
		Oracle RAC 10g ^{#1}	Y	--	--	--
	SP2	MSCS	Y	--	Y	--
		Oracle RAC 11g ^{#1}	Y	--	--	--
Windows Server 2012 (x64)	No service pack	MSCS	Y	--	--	--

OS	SP	Cluster software name	Hitachi USP series, Hitachi AMS2000/AMS /WMS/SMS series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000, and HUS VM	EMC DMX series	EMC CX series	HP EVA series
Windows Server 2012 R2 (x64)	No service pack	MSCS	Y	--	--	--

Legend:

Y: Usable

--: Not usable

#1

For details about Oracle RAC versions, see the *HDLM Release Notes*.

#2

The following operating systems can manage the EMC DMX series, EMC CX series, and HP EVA series:

- Windows Server 2003 (x86) SP1 or later
- Windows Server 2003 (IPF) SP1 or later
- Windows Server 2003 (x64)

Notes:

- When you use HDLM in a cluster configuration, you must install the same version of HDLM on all the nodes that make up the cluster. If different versions of HDLM are installed, the cluster system might not operate correctly. If the `HDLM Version and Service Pack Version`, which are displayed by executing the following command, are the same, then the versions of HDLM will also be the same:

```
dlkmgr view -sys -sfunc
```

- The DiskReservation agent of the VCS is not supported.

Volume Managers Supported by HDLM

The following table lists and describes the related programs for when a volume manager is used.

Table 3-11 Related Programs When a Volume Manager Is Used

OS	Related programs
Windows Server 2003 (IPF) [#]	Veritas Storage Foundation for Windows 5.0
Windows Server 2003 (x64) [#]	Veritas Storage Foundation for Windows 5.0
Windows Server 2003 (x86) [#]	Veritas Storage Foundation for Windows 5.0
	Veritas Storage Foundation for Windows 5.1
Windows Server 2008 R2(x64) [#]	Veritas Storage Foundation for Windows 5.1

#

The EMC DMX Series, EMC CX Series and HP EVA Series do not support volume managers.

Virtual Environments Supported by HDLM

HDLM supports the following virtualization environments:

- Logical partitioning feature available on Hitachi Compute Blade blade servers
- Windows Server 2008 Hyper-V
- Windows Server 2012 Hyper-V

Memory and Disk Capacity Requirements

This section describes memory and disk capacity requirements.

Memory Requirements

The following table lists the memory requirements for a host.

Table 3-12 Memory Requirements for a Host

HDLM GUI	OS	Required memory
Not used	Windows	40MB
Used	Windows	65MB

Disk Requirements

The following table lists the disk capacity requirements for a host.

Table 3-13 Disk Space Requirements for a Host

Folder	Disk capacity requirements
<i>HDLM-installation-folder</i>	<ul style="list-style-type: none">• When you use only the HDLM Core components: 10 MB + p MB^{#1} + q MB^{#2} + 1 MB

Folder	Disk capacity requirements
	<ul style="list-style-type: none"> When you install but do not use the HDLM GUI: 150 MB + p MB^{#1} + q MB^{#2} + 1 MB When you install and use the HDLM GUI: 150 MB + 20 MB + p MB^{#1} + q MB^{#2} + 1 MB

#1

This size depends on the log files settings. The maximum size is 30000MB.

When s is the error log file size (the default value is 9900) and m is the number of error log files (the default value is 2), this value (p) can be calculated as follows:

$$p = (s \times m) / 1024 \text{ MB} \text{ (rounded-up to the nearest integer)}$$

#2

This size depends on the trace files settings. The maximum size is 1000MB.

When t is the trace file size (the default value is 1000) and n is the number of trace files (the default value is 4), this value (q) can be calculated as follows:

$$q = (t \times n) / 1024 \text{ MB} \text{ (rounded-up to the nearest integer)}$$

Number of LUs and Paths That Are Supported in HDLM

The following table lists the number of LUs and paths supported in HDLM.

Table 3-14 Number of LUs and Paths Supported in HDLM

Item	Number supported
Number of LUs	1 to 256
Number of paths per LU	1 to 12
Total number of paths	1 to 3060

Flow for Creating an HDLM Environment

Set up the environment to use HDLM as follows.



Figure 3-1 Flow of HDLM Environment Setup

HDLM Installation Types

This section describes the following types of HDLM installations: new installation, upgrade installation, migration, and re-installation.

New installation of HDLM:

Installing HDLM on a server, which HDLM has never been installed on, is called a *new installation of HDLM*.

Upgrade installation of HDLM:

Installing a newer version of HDLM over the existing version without removing the existing version is called an *upgrade installation of HDLM*. You can perform an upgrade installation for only HDLM 5.5 or later.

Migration of HDLM:

Installing HDLM 5.5 or later after removing HDLM 5.4 or earlier is called a *migration of HDLM*. By doing this, you can keep the settings from the previous version.

Re-installation of HDLM:

Installing the same version of HDLM, in order to restore the existing version, without first removing that version is called a *re-installation of HDLM*.

When installing HDLM, you can select either of the following modes for installing the HDLM programs you want:

- **HDLM Core components**
Install all HDLM programs except for HDLM GUI and Hitachi Command Suite Common Agent Component.
- **All HDLM components**
Install all HDLM programs.

Notes on Creating an HDLM Environment

This section provides notes on creating an HDLM environment.

For details about operating HDLM, see [Notes on Using HDLM on page 4-2](#).

Notes on HBAs and HBA Drivers

- If you are using the Storport Miniport driver as an HBA driver in Windows Server 2003, install QFE 838894 or later for the Microsoft Storport driver or install Windows Server 2003 SP1 or later, before installing HDLM.
- If you are using multiple HBAs, make sure that the models of the HBAs are the same. Also make sure that the HBA firmware versions and driver versions are the same.

Notes on Storage systems

- You must not change the vendor ID and product ID of the storage system. If you change these IDs, HDLM will not be able to recognize the storage system.
- If the host and the storage system are connected via a Fibre Channel switch, select *Point To Point* as the connection type. If you select *FC-AL* (Fibre Channel Arbitrated Loop) as the connection type, an unexpected path error might occur.
- Windows can recognize LUNs from 0 to 255. Therefore, set LUNs within the range from 0 to 255 in the storage system management software.

Notes on HDLM Versions

- If HDLM 5.4 or earlier has been installed, remove HDLM first and then proceed with a new installation of HDLM by following the procedure described in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#).
- For HDLM 5.6 or later, the trace files for HDLM versions earlier than 5.6 are divided into integrated trace files and trace files. The logs for the HDLM commands and HDLM GUI operations are output to integrated trace files. Trace information for the HDLM manager is output to trace files. The output destinations for the files are changed as follows:
 - When you migrate from an HDLM version earlier than 04-00 to an HDLM version 5.6 or later
 - Trace files before migration:
drive-for-program-installation:\Program Files#\HITACHI\HNTRLib\spool\hntrn.log
(*n* indicates a file number)
 - Integrated trace files after migration:
drive-for-program-installation:\Program Files#\HITACHI\HNTRLib2\spool\hntr2n.log
(*n* indicates a file number)

- Trace files after migration:

*drive-for-program-installation:\Program Files\HITACHI
DynamicLinkManager\log\hdlmtrn.log*
(*n* indicates a file number)

The underlined part indicates the folder specified during installation.

- When you migrate from HDLM versions 04-01 to 5.5 to HDLM version 5.6 or later, or when you perform an upgrade installation from HDLM 5.5 or later

- Trace files before migration or upgrade:

*drive-for-program-installation:\Program Files#\HITACHI\HNTRLib
spool\hntrn.log*
(*n* indicates a file number)

- Integrated trace files after migration or upgrade:

*drive-for-program-installation:\Program Files#\HITACHI
HNTRLib2\spool\hntr2n.log*
(*n* indicates a file number)

- Trace files after migration or upgrade:

*drive-for-program-installation:\Program Files\HITACHI
DynamicLinkManager\log\hdlmtrn.log*
(*n* indicates a file number)

The underlined part indicates the folder specified during installation.

#

For Windows Server2003 (excluding the x86 edition) , Windows Server 2008 (excluding the x86 edition) , or Windows Server 2012 , Program Files **is** Program Files (x86) .

- Before installing or upgrading HDLM 5.5 or later, make sure that no other application is using an HDLM management-target LU.
- When HDLM 5.5 or later is installed for the first time, the event described below will occur and is output to the event log. However, it does not affect the system or HDLM operations.

Description

Event provider attempted to register query "select * from WMIEvent" whose target class "WMIEvent" does not exist. The query will be ignored.

- When you use HDLM in a cluster configuration, you must install the same version of HDLM on all the nodes that make up the cluster. If different versions of HDLM are installed, the cluster system might not operate correctly. If the HDLM Version and Service Pack Version, which are displayed by executing the following command, are the same, then the versions of HDLM will also be the same:

`dlnkmgr view -sys -sfunc`

Notes on Windows

- We recommend that you install Windows and HDLM on an internal host disk. If you install them on an HDLM management-target disk, the following problems might occur:
 - You might not be able to store the OS crash-dump and error information on the disk.
 - After removing HDLM, some files might not be deleted correctly.
- When restoring a Windows system disk from a backup, restore the disk to a single-path configuration.
After restoring the disk, confirm that HDLM is running properly, and then change to a multi-path configuration.
- If the size of the `Path` system environment variable is 1024 bytes or more, the HDLM manager might not be able to start. When the HDLM manager fails to start, the following message is output to the Windows event log (system):

```
Source: Service Control Manager
Type: Error
Event ID: 7000
Description: DLMManger service could not be started for the
following reason: The service did not respond to the start
request or control request within the specified period.
```

If the HDLM manager fails to start, delete all unnecessary character strings in the path so that the size of the `Path` system environment variable is 1024 bytes or less:

For Windows Server 2003 (excluding the x86 edition) , Windows Server 2008 (excluding the x86 edition) , or Windows Server 2012:

```
Windows-installation-drive: \Program Files (x86)\Common Files
\Hitachi
Windows-installation-drive: \Program Files (x86)\HDVM\HBaseAgent
\bin
Windows-installation-drive: \Program Files (x86)\HDVM\HBaseAgent
\util\bin
HDLM-installation-folder\bin
HDLM-installation-folder\lib
```

For other versions of Windows:

```
Windows-installation-drive: \Program Files\Common Files\Hitachi
Windows-installation-drive: \Program Files\HDVM\HBaseAgent\bin
Windows-installation-drive: \Program Files\HDVM\HBaseAgent\util
\bin
HDLM-installation-folder\bin
HDLM-installation-folder\lib
```

For Windows Server 2003 SP1 and Windows Server 2003 R2 (with no service pack), if you do not want to use one of the above methods, you can use a Microsoft hotfix to start the HDLM manager. For details about

how to obtain and use the hotfix and how it will affect the system, contact Microsoft.

- HDLM uses the Windows Installer service. Therefore, when you install HDLM, take the following precautions:
 - a. In the **Startup Type** setting for the Windows Installer service, specify **Manual** or **Automatic**.
 - b. Before installing HDLM, make sure that no other programs are using the Windows Installer service.

If you install HDLM while the **Startup Type** setting for the Windows Installer service is disabled or while another program is using the Windows Installer service, the following message will appear and the installation might fail:

```
KAPI09034-E An Internal error occurred in the HDLM Installer.  
Code = -99 nnnnn
```

If this message appears during a new installation of HDLM:

Confirm that conditions 1 and 2 above are met, and then install HDLM again.

If this message appears during an upgrade or re-installation of HDLM:

Confirm that conditions 1 and 2 above are met, and then re-attempt an upgrade or re-installation of HDLM.

Be aware that even though an upgrade or re-installation of HDLM failed, the Add/Remove Programs window might indicate that HDLM has been installed normally.

- If you install HDLM when either of the following conditions exists, an error might be displayed for the mirror disk in the Disk Management window of Windows.
 - A mirror disk volume that uses a Windows dynamic disk exists among the HDLM management-target devices
 - An application that uses the dmaadmin service is being executed.

This error does not affect the data on the HDLM management-target devices. If you restart the host and then activate the disk in the Disk Management window of Windows, this error will not appear. To prevent this error from occurring, perform the following before installing HDLM:

 - When a mirror disk volume that uses a dynamic disk exists among the HDLM management-target devices
Close the management console for the disk.
 - When the application that uses the dmaadmin service is being executed
Stop the application that uses the dmaadmin service.
 - In Windows Server 2003 (excluding IPF versions), Windows Server 2008 (excluding IPF versions) and Windows Server 2012, boot disk environments that use the GUID Partition Table (GPT) are not supported.

- In Windows Server 2003 (excluding x86 versions), Windows Server 2008 (excluding x86 versions) and Windows Server 2012, we recommend that you install HDLM in a folder other than Program Files.
- When installing HDLM, the name of the HDLM installation folder and the names of all its parent folders must satisfy all of the following conditions:
 - The name must not be a reserved name specified in Windows. Reserved names include names like CON, AUX, COM1 to COM9, LPT1 to LPT9, PRN, and NUL.
 - The name must be made by using only the following characters: A - Z, a - z, 0 - 9, -, _, ., @, or a single byte space
 - The last character cannot be a single byte space.
 - The name cannot contain two or more single byte spaces in a row.

If you attempt to install HDLM in a folder that does not satisfy these conditions, problems such as those described in the table below might occur. If this happens, reinstall HDLM by following the procedures given below.

Table 3-15 Problems and What to Do When Specifying a Folder That Does Not Satisfy the Conditions for an HDLM Installation

Problem	What to do
An internal error occurred and the installation was interrupted.	Specify a folder that satisfies the above conditions and re-install the HDLM.
After the installation has finished, the error information could not be collected when the <code>DLMgetras</code> utility for collecting HDLM error information was executed.	Remove HDLM, and then re-install it by specifying a folder that satisfies the above conditions.

- When installing HDLM in Windows Server 2008 or Windows Server 2012, perform the following operation before the installation to make sure applications cannot access the HDLM management-target disks.
 - If the disk is not used as a cluster resource:
In the Windows' Disk Management windows, offline the disk.
 - If the disk is used as a cluster resource:
Stop Cluster Service.
- Windows Server 2008 or Windows Server 2012 supports user account control (UAC). If you are logged on with a non-administrator account, use the **Administrator: Command Prompt** window when executing any of the following programs to install or remove HDLM:
 - `setup.exe#`
 - `installhdml` (`installhdml` utility)
 - `removehdml` (`removehdml` utility)

This program can also be executed using **Run as administrator**.

- If you are using Hyper-V in Windows Server 2008, you cannot use HDLM on a guest OS. Install HDLM on a host OS.
If you want to install or remove HDLM on a host OS, first terminate the Hyper-V manager console. If the Hyper-V manager console is running, the installation or removal of HDLM will stop. If this happens, you can continue with the installation or removal of HDLM by first terminating the Hyper-V manager console.
- If you are using Hyper-V in Windows Server 2008, you cannot use a cluster environment on a guest OS.
- If you are using Hyper-V, unallocate the physical hard disk of an HDLM management-target device that you have allocated to a guest OS before you perform an installation, upgrade installation, or removal of HDLM on a host OS. Then, after the installation, upgrade installation or removal of HDLM on the host OS, allocate the physical hard disk to the guest OS again.

Notes on Related Software

- Do not install any multi-path management software other than HDLM. If multi-path management software other than HDLM has been installed on the host, remove the software, and then restart the host before re-installing HDLM.
- You cannot use HDLM for Windows and HDLM for VMware on the same host.
- HDLM uses the following MPIO drivers according to the host OS:
 - In Windows Server 2003
HDLM uses the MPIO driver on the HDLM DVD that is installed during HDLM installation. The MPIO driver consists of the following files: `mpio.sys`, `mpspfltr.sys`, `mpdev.sys`.
 - In Windows Server 2008 , or Windows Server 2012
HDLM uses the MPIO driver already installed with the OS, not the MPIO driver on the HDLM installation DVD.
- If you attempt to install HDLM on a Windows Server 2003 host on which an MPIO driver has already been installed, and the MPIO driver version differs from that of the driver bundled with HDLM, the KAPL09127-W message is output. This message asks whether it is OK to overwrite the existing MPIO driver. If you are upgrading HDLM, continue the installation. If any multi-path management software other than HDLM exists on the host, cancel the installation, and then remove the software.
- If you install HDLM, the KAPL09257-W or KAPL09258-E message might appear. If either of the messages appears, the version of the MPIO driver on the host is later than the one bundled with HDLM. Also, if you install a piece of multi-path management software other than HDLM, the MPIO driver might be installed. In this case, delete the setup information files for the installed MPIO driver, and then reinstall HDLM. The MPIO driver setup information is defined in the files `mpio.inf` and `mpdev.inf`. When an MPIO driver is installed, these files are renamed to `oemn.inf` (where *n* represents a number), and then registered in the following folder:

Windows-installation-folder\inf. In addition, two other `oemn.pnf` files will also be created in this folder.

If either the KAPL09257-W or the KAPL09258-E message appears, perform the following procedure to delete the two `oemn.inf` files and two `oemn.pnf` files:

- a. Check the MPIO driver version indicated in the KAPL09257-W or the KAPL09258-E message.

In this example, the MPIO driver version is *n.nn.nnnn.nnnn* (*n* represents numbers):

KAPL09257-W HDLM cannot be installed on a system where MPIO *n.nn.nnnn.nnnn* has already been installed.

- b. Find the setup information files (which have the file extension `inf`) that contain the version number information, by using the Windows search function in the following folder:

Windows-installation-folder\inf

There will be two `oemn.inf` files.

- c. Make sure that the contents of the `oemn.inf` files you have found are identical to the files `mpio.inf` and `mpdev.inf` for the MPIO driver that is installed on the host.

If you have removed HDLM and then install an earlier version of HDLM, check the `mpio.inf` and `mpdev.inf` files on the DVD for the later version of HDLM.

- d. Delete the setup information files from the following folder:

Windows-installation-folder\inf

If there are any files whose names are the same as the setup information files but have the extension `pnf`, you also need to delete these files.

Note that we strongly recommend that, before deleting any setup information files, you first back up the files and store the backup files in a different folder.

- If you are installing HDLM on Windows Server 2008 or Windows Server 2012, do not delete the multi-path I/O feature from the Server Manager.
- When a host is connected to an Oracle RAC voting disk via multiple paths, if an I/O timeout occurs for any one of these paths, HDLM will perform a failover.

Note that, depending on the Oracle RAC settings, Oracle RAC might determine that a node error has occurred before the failover has completed, upon which it will re-configure the cluster.

If HDLM is managing the paths that are connected to an Oracle RAC voting disk, change the following settings to be compatible with your version of Oracle RAC:

- When using Oracle RAC 10g 10.1.0.3.0 or later or Oracle RAC 11g: Change the value of `MISSCOUNT` to match the storage system type. Use the following table to determine a value, and then change the

current value to a value equal to or greater than the value you have determined.

Table 3-16 Formula for Calculating MISSCOUNT

Storage system type	Formula for obtaining the value of MISSCOUNT
<ul style="list-style-type: none"> • Hitachi USP series • Universal Storage Platform V/VM series • Virtual Storage Platform series • VSP G1000 series • HUS VM 	<i>number-of-paths-connected-to-the-voting-disk</i> x 60 seconds
<ul style="list-style-type: none"> • Hitachi AMS2000/AMS/WMS/SMS series • HUS100 series 	<i>number-of-paths-connected-to-the-voting-disk</i> x 30 seconds

- When using Oracle RAC 10g 10.2.0.2.0 or later or Oracle RAC 11g: In addition to the value of MISSCOUNT shown above, also change the value of DISKTIMEOUT. As with MISSCOUNT, the value of DISKTIMEOUT is different for each type of storage system. Use the following table to determine a value, and then change the current value to a value equal to or greater than the value you have determined.

Table 3-17 Formula for Calculating DISKTIMEOUT

Storage system type	Number of paths connected to the voting disk	Formula for obtaining the value of DISKTIMEOUT
<ul style="list-style-type: none"> • Hitachi USP series • Universal Storage Platform V/VM series • Virtual Storage Platform series • VSP G1000 series • HUS VM 	3 or less	You do not need to change the value of DISKTIMEOUT.
	4 or more	<i>number-of-paths-connected-to-the-voting-disk</i> x 60 seconds
<ul style="list-style-type: none"> • Hitachi AMS2000/AMS/WMS/SMS series • HUS100 series 	6 or less	You do not need to change the value of DISKTIMEOUT.
	7 or more	<i>number-of-paths-connected-to-the-voting-disk</i> x 30 seconds

For details on how to change MISSCOUNT and DISKTIMEOUT, contact the company with which you have an Oracle Support Services contract.

Note that when you remove HDLM from the above configuration, you must reset the values of `MISSCOUNT` and `DISKTIMEOUT` to their original values. Therefore, make a note of the original values of `MISSCOUNT` and `DISKTIMEOUT` before changing them.

- Configurations in which Oracle RAC is installed in Oracle Cluster File System are not supported.
- If you install HDLM while resident software (such as antivirus software) is running, HDLM might not operate correctly. Before installing HDLM, make sure that you have stopped all software programs, including all resident software.

Notes on New Installations and Upgrade Installations

- When installing HDLM, use only one cable to connect the host to the storage system until instructed otherwise in the procedure in section [*Performing a New Installation of HDLM on Windows Server 2003 on page 3-31*](#), or [*Performing a New Installation of HDLM on Windows Server 2008 and Windows Server 2012 on page 3-54*](#). If the host is restarted while it is connected to the storage system via multiple paths at a time other than those indicated in the procedure in section [*Performing a New Installation of HDLM on Windows Server 2003 on page 3-31*](#), or [*Performing a New Installation of HDLM on Windows Server 2008 and Windows Server 2012 on page 3-54*](#), the contents of the disk might become corrupted. Note that you can upgrade or re-install HDLM in a multipath configuration in Windows Server 2003 SP1 or later, in Windows Server 2008 and in Windows Server 2012.
- HDLM does not support multiple-path configurations in which both an FC-SAN and IP-SAN exist on the same LU.
- If you install HDLM for the first time, or perform an upgrade installation of HDLM after the license has expired, a license key is necessary. To update the HDLM license, execute the `dlnkmgr` command's `set-lic` operation. The expiration date of the license key is determined by the license key specified in the license key file or the input license key type. For information on license key types and the `set` operation, see [*set \(Sets Up the Operating Environment\) on page 6-16*](#).
- Installing HDLM requires 70 MB of unused capacity on the system drive.
- Terminate all programs that are running before installing HDLM.
- If you select a folder for the HDLM installation folder, and then suddenly decide to change the folder for the installation folder, the first folder that you selected might be created along with the actual folder you want to use for the installation folder. Delete the created folder because a folder other than the last selected folder is not necessary.
- Depending on the environment, installing HDLM might take a while to finish. Do not terminate the installation process while a progress bar for installation is displayed. The following is an approximate calculation of the time required for installation:
$$(5 \times \text{number-of-connected paths}) \text{ seconds}$$

- If installation of HDLM terminates abnormally and the KAPL09016-E message is output, check whether an HDLM version from another OS has been installed on the same drive.
 - When an HDLM version from another OS has been installed:
Remove the version of HDLM that is already installed, and then rerun the installation program.
 - When HDLM for another OS has not been installed:
Perform the installation again by following the procedure below:
 - From **Explorer**, in the **Tools** menu, choose **Folder Options**.
The **Folder Options** window is displayed.
 - Click the **View** tab, and in the **Advanced settings** field, under **Hidden files and folders**, select **Show hidden files and folders**.
 - Delete the following folder:

```
OS-installation-drive:\Program Files#\InstallShield
\InstallationInformation\
{DFF378A1-240E-11D5-8A43-0000E2382F13}
#
```

For Windows Server 2003 (excluding the x86 edition) , Windows Server 2008 (excluding the x86 edition) or Windows Server 2012, Program Files is Program Files (x86) .

- When installing HDLM on a host where a Device Manager agent 5.0 or later is installed, do not execute any of the following Device Manager agent commands during the installation of HDLM:


```
hbsasrv, HiScan, hdvmagt_account, hdvmagt_schedule, hldutil, TIC
```
- If you want to install only the HDLM Core components, perform an unattended installation of HDLM. For details about how to perform an unattended installation, see [The installhdlm Utility for Installing HDLM on page 7-17](#).
- After all HDLM components have been installed on a host, if you want to create a configuration that uses only the HDLM Core components, you cannot do so by performing an upgrade installation or re-installation. To re-configure HDLM with only the HDLM Core components, first remove HDLM, and then perform an unattended new installation of HDLM.
- If you want to link HDLM to other Hitachi Command Suite products, you need to install all the HDLM components, not just the HDLM Core components.
- In Windows Server 2003 SP1 or later, if you change an HDLM management-target device during an upgrade installation and then restart the host, the KAPL08019-E and KAPL08022-E messages might be output, and the path status might change to Offline(E) or Online(E) . If this happens, execute the dlnkmgr command's online operation to change the path status to Online.

Notes on Migration or Upgrade Installation

If either of the following conditions is met, the disk numbers managed by Windows might be changed from the state they were in prior to a migration installation or upgrade installation:

- The disk numbers managed by Windows are non-consecutive and an HDLM version earlier than 5.4 is migrated to 5.5 or later
- Hitachi's RAID Manager command device is used and an HDLM version earlier than 5.7 is migrated or upgraded to 5.7.1 or later

If a disk number is changed while the disk is being used by an application, perform the following:

If the disk number can be changed:

Change the disk number to the number that will be used after the change.

If the disk number cannot be changed:

Restore the disk number managed by Windows to the number that was in use prior to the migration installation or upgrade installation. For details about how to do this, contact Microsoft.

Notes on Linking with Global Link Manager

When you manage HDLM by using Global Link Manager, do not register one HDLM host into two or more Global Link Manager servers.

Installing HDLM

First, check whether HDLM has been installed on the host.

When HDLM has already been installed on the host:

You can upgrade HDLM by performing an update installation as described in [Upgrade Installation or Re-installation of HDLM on page 3-66](#) or [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#).

When you install HDLM, Hitachi Network Objectplaza Trace Library will also be installed. The file path of the Hitachi Network Objectplaza Trace Library integrated trace information file is *installation-destination-drive*: \Program Files#\HITACHI\HNTRLib2\spool\Hntr2n.log, where *n* is the number of the integrated trace information file.

#

For Windows Server 2003 (excluding the x86 edition) , Windows Server 2008 (excluding the x86 edition) , or Windows Server 2012, Program Files is Program Files (x86) .

Follow the procedure explained here to install HDLM, even in cases where the boot disk is an HDLM-managed device.

Preparations for a New Installation of HDLM

The following explains what you need to do before performing a new installation of HDLM.

For an FC connection, check the topology (Fabric, AL, etc.) and perform an appropriate setup.

To prepare for an HDLM installation:

1. Use a single cable to connect the host to the storage system.

Using multiple paths to connect a host to a storage system before installing HDLM might result in unstable Windows operations. Make sure that you only use a single-path configuration until the HDLM installation is done.

The following figure shows a single path configuration and a multi-path configuration.

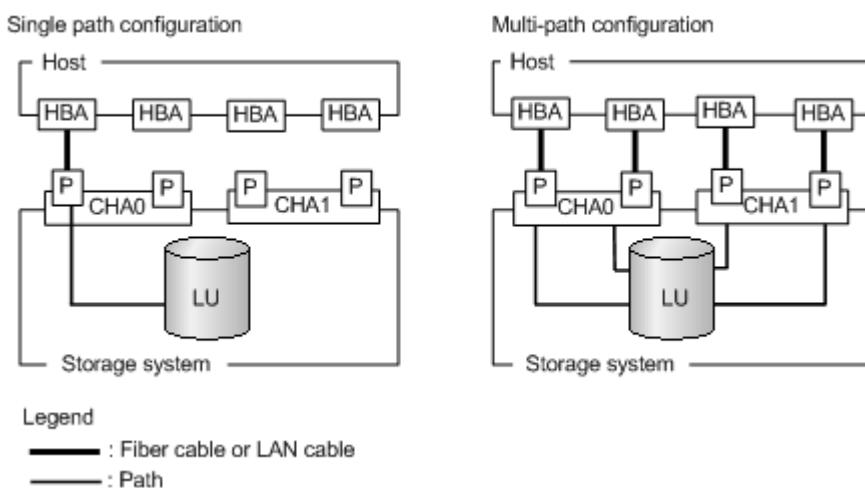


Figure 3-2 Single Path Configuration and Multi-path Configuration

2. Set up the storage system.

Assign an LU to each port.

To change the settings of a storage system, follow the maintenance documentation for that particular storage system.

3. Install the HBAs onto the host.

Install as many HBAs as you want to use.

In a cluster configuration, make sure that the manufacturer and model of the HBA is the same for all the hosts that make up the cluster. Also, make sure that the versions of the HBA micro-programs are the same.

4. Set up the switches.

For details on how to set up a switch, see the documentation for the particular switch. This step is unnecessary if you do not use a switch.

5. Set up the BIOS for the HBAs.

Set up the BIOS for all the HBAs, regardless of whether paths exist.

Different settings are used for different topologies. For details on how to set up the BIOS, see the HBA documentation.

6. Install Windows, and any non-HDLM drivers.
Install Windows and any non-HDLM drivers by following the documentation for each of the products.
7. Set up the HBAs.
See the HBA documentation and manual to complete the required setup.
8. If your configuration uses an IP-SAN, install and set up the iSCSI initiator (iSCSI software or HBA).
For details, see the iSCSI initiator documentation, the documentation for the HBA, or the storage system documentation.
9. Prepare the LUs.
For each LU that you want to use, be sure to write signatures, create partitions, and then format them. Because the system is still in the single path configuration, no problems will occur even if you write a signature for each LU.
10. Restart the host.
11. Confirm that the host is operating normally.

Preparations for Installing HDLM by Performing an Unattended Installation

An unattended installation allows a user to install HDLM without having to enter information into dialog boxes or specify HDLM functions. Instead, the user defines the required information for the dialog boxes in an installation-information settings file prior to running the installation. The procedure for an unattended installation is as follows:

1. Specify the required information for the installation in the installation-information settings file.
2. Execute the `installhdlm` utility.
3. Information will be automatically entered into the dialog boxes or HDLM functions, as defined in the installation-information settings file.
4. The installation will finish and log data will be output, showing the status and result of the installation.

This section describes the following aspects of an unattended installation:

- How to create an installation-information settings file
- Notes on installation

For details on the `installhdlm` utility, see [The `installhdlm` Utility for Installing HDLM on page 7-17](#).

For details about performing an unattended installation, see [Performing a New Installation of HDLM on Windows Server 2003 on page 3-31](#) or [Performing a New Installation of HDLM on Windows Server 2008 and Windows Server 2012 on page 3-54](#).

How to Create an Installation-Information Settings File

For an installation-information settings file, you need to define the license key file name, installation destination folder, and then any other information that is required for the particular installation.

HDLM provides a sample file in order to simplify the editing process of an installation-information settings file. The sample file is located on the supplied DVD.

To edit the installation-information settings file:

1. Copy the sample file for the installation-information settings file to any folder.

The location of the sample file is as follows:

drive-to-which-the-installation-DVD-is-inserted:\HDLM_Windows
\DLMTools\sample_installhdml.ini

2. Use a text editor to edit the sample file that was copied in step 1, in order to create an installation-information settings file for your particular configuration.

Items that need to be defined in the installation-information settings file are described in [Contents of an Installation-Information Settings File on page 7-18](#) below.

Notes on an Unattended Installation

- Do not forcibly stop the execution of the `installhdml` utility during an unattended installation of HDLM. Even if you forcibly stop the execution of the `installhdml` utility, the HDLM installation will not be stopped. If you

have specified `y` for the `restart` key in the installation-information settings file, the computer will restart after the installation finishes successfully. Make sure that you check the results of the installation in `installhdml.log`, if you had to forcibly stop the execution of the `installhdml` utility.

- The disk capacity necessary for the execution of the `installhdml` utility is as follows:

A folder specified in the `workdir` key (if the `workdir` key has not been specified, a folder specified in the `TMP` or `TEMP` environment variable) must have at least 20 KB of free disk capacity.

- Information for the HDLM operation can also be specified by using the HDLM command's `set` operation. To specify the information by using this way, see [Setting Up HDLM on page 3-72](#) and make sure that an unattended installation is completed.

For details about what can be defined in a installation-information settings file, see [Contents of an Installation-Information Settings File on page 7-18](#).

For details about the `set` operation of the HDLM command, see [set \(Sets Up the Operating Environment\) on page 6-16](#).

Performing a New Installation of HDLM on Windows Server 2003

In a Non-Cluster Environment

Before installing HDLM, have a license key ready.

If you want to perform an unattended installation, also be sure to prepare an installation-information settings file.

To install HDLM on a host that does not currently have HDLM installed on it:

1. Log on to Windows as a member of the Administrators group.
2. Save the license key file directly under the Windows installation-destination drive.

installation-drive:\hdlm_license

The license key file will be deleted after the installation finishes.

3. Perform the installation.
 - If you are not performing an unattended installation, insert the DVD into the drive.
In the displayed window, click the **Install** button next to **for Windows of Hitachi Dynamic Link Manager**.
If no window is displayed, manually run the installer (*setup.exe*).
The program checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If HDLM 5.5 or later has been installed, the KAPL09173-W message will appear. If this happens, carry out the procedure shown in [Upgrade Installation or Re-installation of HDLM on page 3-66](#). If no message appears, go to step 4.
 - If you are planning to perform an unattended installation, execute the *installhdml* utility.

At the command prompt, execute the following command:

drive-to-which-the-installation-DVD-is-inserted:\HDLM_Windows\DLMTools\installhdml -f installation-information-settings-file

This command checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If HDLM 5.5 or later has been installed, the KAPL09183-E message will appear, and then the upgrade installation or re-installation will be performed.

If you have specified *n* for the *restart* key in the installation-information settings file, go to step 11.

If you have specified `y` for the `restart` key in the installation-information settings file, go to step 16.

4. The program checks the MPIO driver version, and then installs the MPIO driver. If a message appears, asking you whether you want to install the MPIO driver, make sure that no multi-path management software other than HDLM is installed.
 - If multi-path management software other than HDLM is installed, click the **Cancel** button to cancel the installation, remove the multi-path management software, and then install HDLM.
 - If no multi-path management software other than HDLM is installed, click the **Next** button to continue the installation.
5. Follow the instructions shown in the messages that appear in the window.
 - If a license key file was saved in step 2, specify that license key file.
 - If a license key file is not being used, specify the license key directly.
6. Specify the installation folder by following the instructions shown in the messages that appear in the window.

The utility for registering HDLM persistent reservation keys (`dlmprvkey`) will be automatically executed. However, creation of the PRSV key might be unsuccessful if, for example, an NIC does not exist. If the PRSV key is created with time information only, or if key creation fails, a dialog box will prompt you to enter a PRSV key.

If this dialog box appears, go to step 7; otherwise, go to step 9.
7. Enter the PRSV key by following the instructions shown in the dialog box. The PRSV key is required for the HDLM functions to properly operate. Also, the value of the PRSV key must be unique for each host.
8. If the KAPL09128-W message appears, you will need to re-enter a correct PRSV key.

If a message does not appear, go to the next step.
9. Select an HDLM management-target device only when the OS is one of the following:
 - Windows Server 2003 (x86) SP1 or later
 - Windows Server 2003 (IPF) SP1 or later
 - Windows Server 2003 (x64)[#]

#

This OS cannot be used with the EMC DMX series.

The **Hitachi storage systems and HP StorageWorks XP Series** option is always selected. To select an EMC DMX series or EMC CX series LU as the HDLM management-target device, select **EMC Symmetrix DMX Series, CLARiiON CX Series**. To select an HP EVA series LU as the HDLM management-target device, select **HP StorageWorks EVA Series**.
10. Follow the instructions shown in the messages that appear in the window.
 - If a dialog box with the following text appears during installation, and the Storport Miniport driver is being used as the HBA driver, stop the

HDLM installation. After that, install QFE838894 or a later version of the Microsoft Storport driver, or install Windows Server 2003 SP1 or later.

Notes on using a Storport Miniport driver

Read these notes before using a Storport Miniport driver as an HBA driver.

The file version of the Storport.sys of this system (Microsoft(R) Storport driver) is *n.n.nnnn.n*.

When using a Storport Miniport driver as an HBA driver:

Please update the Storport Miniport driver to a Storport.sys with a file version *n.n.nnnn.n* or later.

- The PRSV key will be registered before the installation finishes. If the KAPL09131-W message appears, follow the procedure described in step 12.
- Although a message prompting you to restart the host appears after the installation has finished, a restart is not necessary.
- In the last installation window, the following message might be output:

When you manage a host by using Global Link Manager and Windows firewall is enabled on that host, execute the `firewall_setup` command to allow a firewall exception.

If Global Link Manager will not be used to manage HDLM, you do not need to take any action.

To manage HDLM with Global Link Manager, register Firewall exceptions. For details, see [Firewall Settings for Managing HDLM by Using Global Link Manager on page 3-70](#).

11. Check the results of the installation.

If you have performed an unattended installation, check the installation results from the command prompt.

12. After the installation finishes, execute the `dlmprsvkey` utility with the `-v` parameter specified.

Execute the following command:

`HDLM-installation-folder\bin\dlmprsvkey -v`

Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the other hosts in the SAN. If the PRSV key is not unique or is not registered, or if the KAPL09131-W message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-register the PRSV key. If the PRSV key is not registered, the HDLM functions might not properly operate. For details about the `dlmprsvkey` utility, see [The `dlmprsvkey` Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#).

If you used a license key file, it will be deleted after the installation finishes. The KAPL09115-W message will appear if deletion of this file fails. If this happens, delete the file manually.

13. Shut down the host.

Leave the host in a single-path configuration until you check (in step 21) whether HDLM has been successfully installed.

14. Modify the storage system settings.

Modify the storage system settings by following the procedure described in the maintenance documentation for that particular storage system.

15. Start the host.

16. Log on to Windows again as a member of the Administrators group.

17. Check the log file and PRSV key.

This step is unnecessary if you have performed step 12. In this case, go to step 18.

If you installed HDLM by performing an unattended installation and specified `y` for the `restart` key in the installation-information settings file, make sure that the `KAPL09181-I` message is output to `installhdml.log`. For details about this log file, see [Notes on an Unattended Installation on page 3-30](#) in [Preparations for Installing HDLM by Performing an Unattended Installation on page 3-29](#) or [About the Log File on page 7-28](#) in [The `installhdml` Utility for Installing HDLM on page 7-17](#).

Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the other hosts in the SAN. If the PRSV key is not unique or is not registered, or if the `KAPL09131-W` message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-register the PRSV key. If the PRSV key is not registered, HDLM functions might not properly operate. For details about the `dlmprsvkey` utility, see [The `dlmprsvkey` Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#). If you used a license key file, it will be deleted after the installation finishes. The `KAPL09115-W` message will appear if deletion of this file fails. If this happens, delete the file manually.

18. Execute the `dlnkmgr` command's `view` operation to display the status of each program.

An example of executing the `dlnkmgr` command's `view` operation is as follows:

```
PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size (KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on (30)
Auto Failback : on (1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off (10)
HDLM Manager Ver     WakeupTime
Alive      x.x.x-xx  yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver   WakeupTime           ElogMem Size
```

```

Alive      x.x.x-xx      yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver           WakeupTime
Alive      x.x.x-xx      yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

19. Use the results of the `view` operation to check the version of the installed HDLM.
If `x.x.x-xx` is displayed in `HDLM Version`, the correct version of HDLM has been installed.
20. Use the results of the `view` operation to check that the programs are running properly.
If `HDLM Manager`, `HDLM Alert Driver`, and `HDLM Driver` are all `Alive`, all the programs are running correctly.
21. Check the path information as described in [Checking the Path Configuration on page 3-71](#), and make sure that you have successfully installed HDLM in a single-path configuration.
22. Connect cables to all the HBAs to change the configuration to a multi-path configuration.
The following figure shows a single path configuration and a multi-path configuration.

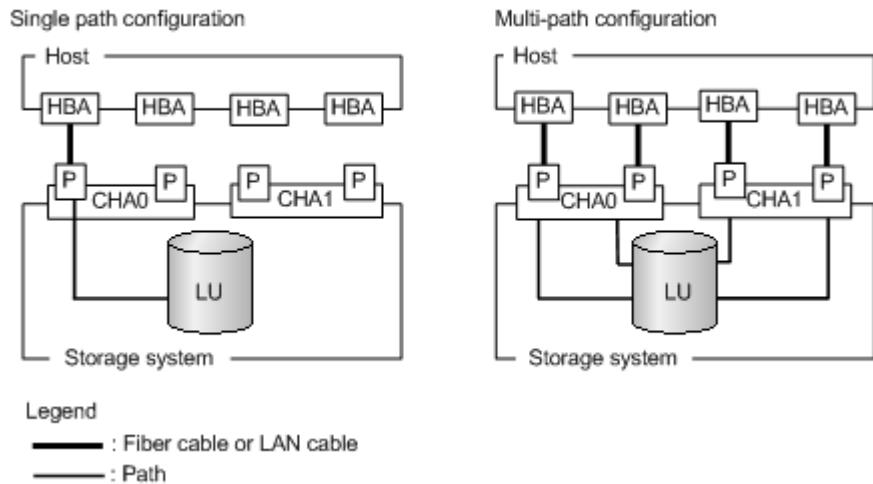


Figure 3-3 Single Path Configuration and Multi-path Configuration

23. Check the path information as described in [Checking the Path Configuration on page 3-71](#) to make sure that you have successfully assembled a multi-path configuration.

When MSCS Is Used

The following provides explanations of how to install MSCS before and after an HDLM installation.

Installing MSCS after an HDLM Installation

To install HDLM, and then MSCS:

1. Shut down all the hosts.
2. Make sure that all the hosts that make up the cluster system have been fully shut down.
3. Restart each host.
Restart them all in the single path configuration.
4. Log on to Windows as a member of the Administrators group.
5. Save the license key file directly under the Windows installation-destination drive. Also, instead of using the license key file, you can directly specify a license key during the installation of HDLM.

installation-drive:\hdlm_license

The license key file will be deleted after the installation finishes.

6. Perform the installation.
 - o If you are not performing an unattended installation, insert the DVD into the drive.
In the displayed window, click the **Install** button next to **for Windows of Hitachi Dynamic Link Manager**.
If no window is displayed, manually run the installer (setup.exe).
The program checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If HDLM 5.5 or later has been installed, the KAPL09173-W message will appear. If this happens, carry out the procedure shown in [Upgrade Installation or Re-installation of HDLM on page 3-66](#). If a message does not appear, go to step 7.
 - o If you are planning to perform an unattended installation, execute the installhdml utility.
At the command prompt, execute the following command:

drive-to-which-the-installation-DVD-is-inserted:\HDLM_Windows\DLMTools\installhdml -f installation-information-settings-file

Specify *n* for the restart key in the installation-information settings file.

This command checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If HDLM 5.5 or later has been installed, the KAPL09183-E message will appear, and then the upgrade installation or re-installation will be performed.

After the installation is complete, go to step 14.

7. The program checks the MPIO driver version, and then installs the MPIO driver. If a message appears asking you whether you want to install the MPIO driver, make sure that no multi-path management software other than HDLM is installed.
 - If multi-path management software other than HDLM is installed, click the **Cancel** button to cancel the installation, remove the multi-path management software, and then install HDLM.
 - If no multi-path management software other than HDLM is installed, click the **Next** button to continue the installation.
8. follow the procedure below:
 - The KAPL09127-W message will appear if the MPIO driver has already been installed and the version does not match the version of the MPIO driver about to be installed.
 - Click the **Next** button to install the MPIO driver.
 - Click the **Cancel** button to cancel the installation.
 - If no message appears, go to the next step.
9. Specify a license key file or enter a license key by following the instructions shown in the messages that appear in the window.
 - If a license key file was saved in step 5, specify that license key file.
 - If a license key file is not being used, specify the license key directly.
10. Specify the installation folder by following the instructions shown in the messages that appear in the window.
 The utility for registering HDLM persistent reservation keys (`dlmprvkey`) will be automatically executed. However, creation of the PRSV key might be unsuccessful if, for example, an NIC does not exist. If the PRSV key is created with time information only, or if key creation fails, a dialog box will prompt you to enter the PRSV key.
 If this dialog box appears, go to step 10; otherwise, go to step 12.
11. Enter the PRSV key by following the instructions shown in the dialog box.
 The PRSV key is required for the HDLM functions to properly operate.
 Also, the value of the PRSV key must be unique for each host.
12. If the KAPL09128-W message appears, you will need to re-enter a correct PRSV key.
 If a message does not appear, go to the next step.
13. Select an HDLM management-target device only when the OS is one of the following:
 - Windows Server 2003 (x86) SP1 or later
 - Windows Server 2003 (IPF) SP1 or later
 - Windows Server 2003 (x64)#

 This OS cannot be used with the EMC DMX series.

The **Hitachi storage systems and HP StorageWorks XP Series** option is always selected. To select an EMC DMX series or EMC CX series LU as

the HDLM management-target device, select **EMC Symmetrix DMX Series, CLARIION CX Series**. To select an HP EVA series LU as the HDLM management-target device, select **HP StorageWorks EVA Series**.

14. Follow the instructions shown in the messages that appear in the window.

- If a dialog box with the following text appears during installation, and the Storport Miniport driver is being used as the HBA driver, stop the HDLM installation. After that, install QFE838894 or a later version of the Microsoft Storport driver, or install Windows Server 2003 SP1 or later.

Notes on using a Storport Miniport driver

Read these notes before using a Storport Miniport driver as an HBA driver.

The file version of the Storport.sys of this system (Microsoft(R) Storport driver) is *n.n.nnnn.n*.

When using a Storport Miniport driver as an HBA driver:

Please update the Storport Miniport driver to a Storport.sys with a file version *n.n.nnnn.n* or later.

- The PRSV key will be registered before the installation finishes. If the KAPL09131-W message appears, follow the procedure described in step 15.
- Although a message prompting you to restart the host appears after the installation has finished, a restart is not necessary.
- In the last installation window, the following message might be output:

When you manage a host by using Global Link Manager and Windows firewall is enabled on that host, execute the `firewall_setup` command to allow a firewall exception.

If Global Link Manager will not be used to manage HDLM, you do not need to take any action.

To manage HDLM with Global Link Manager, register Firewall exceptions. For details, see [Firewall Settings for Managing HDLM by Using Global Link Manager on page 3-70](#).

15. Check the results of the installation.

If you have performed an unattended installation, check the installation results from the command prompt.

16. After the installation finishes, execute the `dlmprsvkey` utility with the `-v` parameter specified.

Execute the following command:

`HDLM-installation-folder\bin\dlmprsvkey -v`

Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the other hosts in the SAN. If the PRSV key is not unique or is not registered, or if the KAPL09131-W message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-register the PRSV key. If the PRSV key is not registered, the HDLM functions might not properly operate. For details about the `dlmprsvkey`

utility, see [The dlmprsvkey Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#).

If you used a license key file, it will be deleted after the installation finishes. The KAPL09115-W message will appear if deletion of this file fails. If this happens, delete the file manually.

17. Shut down the host.

Leave the host in a single-path configuration until you check (in step 24) whether HDLM has been successfully installed.

18. For all the hosts that make up the cluster system, perform steps 3 to 16.

19. Make sure that all the hosts that make up the cluster system have been completely shut down.

20. Restart each host.

21. Log on to Windows again as a member of the Administrators group.

22. Execute the `dlnkmgr` command's `view` operation to display the status of each program:

An example of executing the `dlnkmgr` command's `view` operation is as follows:

```
PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on(extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Failback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

23. Use the results of the `view` operation to check the version of the installed HDLM.

If `x.x.x-xx` is displayed in `HDLM Version`, the correct version of HDLM has been installed.

24. Use the results of the `view` operation to check that the programs are running properly.

If HDLM Manager, HDLM Alert Driver, and HDLM Driver are all Alive, all the programs are running correctly.

25. After the installation finishes, check the path information as described in [Checking the Path Configuration on page 3-71](#), and make sure that you have successfully installed HDLM in a single-path configuration.
26. Connect cables to all the HBAs to change the configuration to a multi-path configuration.
27. Check the path information as described in [Checking the Path Configuration on page 3-71](#) to make sure that you have successfully assembled a multi-path configuration.
28. Shut down the host.
29. For all the hosts that make up the cluster system, perform steps 19 to 27.
30. Restart each host.
31. Install MSCS.
32. Shut down each host after completing the installation of MSCS on it.
33. Restart each host.
34. Log on to Windows again as a member of the Administrators group.
35. Make sure that the program is working normally running properly, by examining the results of the `dlnkmgr` command's `view` operation.

Make sure that `on MSCS` is displayed in `Support Cluster`. An example of executing the `dlnkmgr` command's `view` operation is as follows:

```
PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : on MSCS
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Failback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Installing HDLM after an MSCS Installation

To install MSCS, and then HDLM on a host that does not currently have HDLM on it:

1. Install MSCS on the host.
2. Restart the host.
3. Log on to Windows as a member of the Administrators group.
4. Save the license key file directly under the Windows installation-destination drive. Also, instead of using the license key file, you can directly specify the license key during the installation of HDLM.

installation-drive:\hdlm_license

The license key file will be deleted after the installation finishes.

5. Perform the installation.
 - o If you are not performing an unattended installation, insert the DVD into the drive.
In the displayed window, click the **Install** button next to **for Windows of Hitachi Dynamic Link Manager**.
If no window is displayed, manually run the installer (*setup.exe*).
The program checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If HDLM 5.5 or later has been installed, the KAPL09173-W message will appear. If this happens, carry out the procedure shown in [Upgrade Installation or Re-installation of HDLM on page 3-66](#). If no message appears, go to step 6.
 - o If you are planning to perform an unattended installation, execute the *installhdml* utility.
At the command prompt, execute the following command:

drive-to-which-the-installation-DVD-is-inserted:\HDLM_Windows\DLMTools\installhdml -f installation-information-settings-file

Specify *n* for the *restart* key in the *installation-information settings file*.

This command checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If HDLM 5.5 or later has been installed, the KAPL09183-E message will appear, and then the upgrade installation or re-installation will be performed.

After the installation is complete, go to step 13.

6. The program checks the MPIO driver version, and then installs the MPIO driver. If a message appears asking you whether you want to install the

MPIO driver, make sure that no multi-path management software other than HDLM is installed.

- If multi-path management software other than HDLM is installed, click the **Cancel** button to cancel the installation, remove the multi-path management software, and then install HDLM.
- If no multi-path management software other than HDLM is installed, click the **Next** button to continue the installation.

7. Specify a license key file or enter a license key by following the instructions shown in the messages that appear in the window.

- If a license key file was saved in step 4, specify that license key file.
- If a license key file is not being used, specify the license key directly.

8. Specify the installation folder by following the instructions shown in the messages that appear in the window.

The utility for registering HDLM persistent reservation keys (`dlmprvkey`) will be automatically executed. However, creation of the PRSV key might be unsuccessful if, for example, an NIC does not exist. If the PRSV key is created with time information only, or if key creation fails, a dialog box will prompt you to enter the PRSV key.

If this dialog box appears, go to step 9; otherwise, go to step 11.

9. Enter the PRSV key by following the instructions shown in the dialog box. The PRSV key is required for the HDLM functions to properly operate. Also, the value of the PRSV key must be unique for each host.

10. If the KAPL09128-W message appears, you will need to re-enter the correct PRSV key.

If a message does not appear, go to the next step.

11. Select an HDLM management-target device only when the OS is one of the following:

- Windows Server 2003 (x86) SP1 or later
- Windows Server 2003 (IPF) SP1 or later
- Windows Server 2003 (x64)[#]

#

This OS cannot be used with the EMC DMX series.

The **Hitachi storage systems and HP StorageWorks XP Series** option is always selected. To select an EMC DMX series or EMC CX series LU as the HDLM management-target device, select **EMC Symmetrix DMX Series, CLARiX CX Series**. To select an HP EVA series LU as the HDLM management-target device, select **HP StorageWorks EVA Series**.

12. Follow the instructions shown in the messages that appear in the window.

- If a dialog box with the following text appears during installation, and the Storport Miniport driver is being used as the HBA driver, stop the HDLM installation. After that, install QFE838894 or a later version of the Microsoft Storport driver, or install Windows Server 2003 SP1 or later.

Notes on using a Storport Miniport driver

Read these notes before using a Storport Miniport driver as an HBA driver.

The file version of the Storport.sys of this system (Microsoft(R) Storport driver) is *n.n.nnnn.n*.

When using a Storport Miniport driver as an HBA driver:

Please update the Storport Miniport driver to a Storport.sys with a file version *n.n.nnnn.n* or later.

- The PRSV key will be registered before the installation finishes. If the KAPL09131-W message appears, follow the procedure described in step 14.
- Although a message prompting you to restart the host appears after the installation has finished, a restart is not necessary.
- In the last installation window, the following message might be output:

When you manage a host by using Global Link Manager and Windows firewall is enabled on that host, execute the `firewall_setup` command to allow a firewall exception.

If Global Link Manager will not be used to manage HDLM, you do not need to take any action.

To manage HDLM with Global Link Manager, register Firewall exceptions. For details, see [Firewall Settings for Managing HDLM by Using Global Link Manager on page 3-70](#).

13. Check the results of the installation.

If you have performed an unattended installation, check the installation results from the command prompt.

14. After the installation finishes, execute the `dlmprsvkey` utility with the `-v` parameter specified.

Execute the following command:

`HDLM-installation-folder\bin\dlmprsvkey -v`

Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the other hosts in the SAN. If the PRSV key is not unique or is not registered, or if the KAPL09131-W message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-register the PRSV key. If the PRSV key is not registered, the HDLM functions might not properly operate. For details about the `dlmprsvkey` utility, see [The `dlmprsvkey` Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#).

If you used a license key file, it will be deleted after the installation finishes. The KAPL09115-W message will appear if deletion of this file fails. If this happens, delete the file manually.

15. Shut down the host.

Leave the host in a single-path configuration until you check (in step 24) whether HDLM has been successfully installed.

16. For all the hosts that make up the cluster system, perform steps 1 to 15.

17. Confirm that all the hosts that make up the cluster system have been fully shut down.
18. Modify the storage system settings.
Modify the storage system settings by following the procedure described in the maintenance documentation for that particular storage system.
19. Restart each host.
20. Log on to Windows again as a member of the Administrators group.
21. Make sure that the program is running properly, by examining the results of the `dlnkmgr` command's `view` operation.
Make sure that `on MSCS` is displayed in `Support Cluster`. An example of executing the `dlnkmgr` command's `view` operation is as follows:

```

PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : on MSCS
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Failback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

22. Use the results of the `view` operation to check the version of the installed HDLM.
If `x.x.x-xx` is displayed in `HDLM Version`, the correct version of HDLM has been installed.
23. Use the results of the `view` operation to check that the programs are running properly.
If `HDLM Manager`, `HDLM Alert Driver`, and `HDLM Driver` are all `Alive`, all the programs are running correctly.
24. After the installation finishes, check the path information as described in [Checking the Path Configuration on page 3-71](#), and make sure that you have successfully installed HDLM in a single-path configuration.

25. Connect cables to all the HBAs to change the configuration to a multi-path configuration.
26. Check the path information as described in [Checking the Path Configuration on page 3-71](#) to make sure that you have successfully assembled a multi-path configuration.

When VCS Is Used

To install HDLM when VCS is used:

1. Start each host.
Start them in a single-path configuration.
2. Use the VCS Configuration Wizard to configure the Cluster components.
3. Restart the hosts.
4. Log on to Windows as a member of the Administrators group.
5. Stop VCS.
6. Save the license key file directly under the Windows installation-destination drive.

Also, instead of using the license key file, you can directly specify the license key during the installation of HDLM.

installation-drive:\hdlm_license

The license key file will be deleted after the installation finishes.

7. Perform the installation.
 - o If you are not performing an unattended installation, insert the DVD. In the displayed window, click the **Install** button next to **for Windows of Hitachi Dynamic Link Manager**. If no window is displayed, manually run the installer (*setup.exe*). The program checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If HDLM 5.5 or later has been installed, the KAPL09173-W message will appear. If this happens, carry out the procedure shown in [Upgrade Installation or Re-installation of HDLM on page 3-66](#). If no message appears, go to step 8.
 - o If you are planning to perform an unattended installation, execute the *installhdlm* utility.

At the command prompt, execute the following command:

drive-to-which-the-installation-DVD-is-inserted:\HDLM_Windows\DLMTTools\installhdlm -f installation-information-settings-file

Specify *n* for the *restart* key in the *installation-information settings file*.

This command checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If

HDLM 5.5 or later has been installed, the KAPL09183-E message will appear, and then the upgrade installation or re-installation will be performed.

After the installation is complete, go to step 15.

8. The program checks the MPIO driver version, and then installs the MPIO driver. If a message appears asking you whether you want to install the MPIO driver, make sure that no multi-path management software other than HDLM is installed.
 - If multi-path management software other than HDLM is installed, click the **Cancel** button to cancel the installation, remove the multi-path management software, and then install HDLM.
 - If no multi-path management software other than HDLM is installed, click the **Next** button to continue the installation.
9. Specify a license key file or enter a license key by following the instructions shown in the messages that appear in the window.
If a license key file was saved in step 6, specify that license key file.
If a license key file is not being used, specify the license key directly.
10. Specify the installation folder by following the instructions shown in the messages that appear in the window.
The utility for registering HDLM persistent reservation keys (`dlmprvkey`) is automatically executed. However, creation of the PRSV key might be unsuccessful if, for example, an NIC does not exist. If the PRSV key is created with time information only, or if key creation fails, a dialog box will prompt you to enter the PRSV key.
If this dialog box appears, go to step 11; otherwise, go to step 13.
11. Enter the PRSV key by following the instructions shown in the dialog box.
The PRSV key is required for the HDLM functions to properly operate.
Also, the value of the PRSV key must be unique for each host.
12. If the KAPL09128-W message appears, you will need to re-enter the correct PRSV key.
If a message does not appear, go to the next step.
13. The message **Select Storage system to be managed.** is displayed.
Click the **Next** button.
In a VCS environment, because an EMC DMX series or EMC CX series LU cannot be set as an HDLM management-target device, do not select **EMC Symmetrix DMX Series, CLARiiON CX Series**. Similarly, because an HP EVA series LU cannot be set as an HDLM management-target device, do not select **HP StorageWorks EVA Series**.
14. Follow the instructions shown in the messages that appear in the window.
 - If a dialog box with the following text appears during installation, and the Storport Miniport driver is being used as the HBA driver, stop the HDLM installation. After that, install QFE838894 or a later version of

the Microsoft Storport driver, or install Windows Server 2003 SP1 or later.

Notes on using a Storport Miniport driver

Read these notes before using a Storport Miniport driver as an HBA driver.

The file version of the Storport.sys of this system (Microsoft(R) Storport driver) is *n.n.nnnn.n*.

When using a Storport Miniport driver as an HBA driver:

Please update the Storport Miniport driver to a Storport.sys with a file version *n.n.nnnn.n* or later.

- The PRSV key will be registered before the installation finishes. If the KAPL09131-W message appears, follow the procedure described in step 16.
- Although a message prompting you to restart the host appears after the installation has finished, a restart is not necessary.
- In the last installation window, the following message might be output:

When you manage a host by using Global Link Manager and Windows firewall is enabled on that host, execute the `firewall_setup` command to allow a firewall exception.

If Global Link Manager will not be used to manage HDLM, you do not need to take any action.

To manage HDLM with Global Link Manager, register Firewall exceptions. For details, see [Firewall Settings for Managing HDLM by Using Global Link Manager on page 3-70](#).

15. Check the results of the installation.

If you have performed an unattended installation, check the installation results from the command prompt.

16. After the installation finishes, execute the `dlmprsvkey` utility with the `-v` parameter specified.

Execute the following command:

`HDLM-installation-folder\bin\dlmprsvkey -v`

Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the other hosts in the SAN. If the PRSV key is not unique or is not registered, or if the KAPL09131-W message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-register the PRSV key. If the PRSV key is not registered, the HDLM functions might not properly operate. For details about the `dlmprsvkey` utility, see [The `dlmprsvkey` Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#).

If you used a license key file, it will be deleted after the installation finishes. The KAPL09115-W message will appear if deletion of this file fails. If this happens, delete the file manually.

17. Shut down the host.

Leave the host in a single-path configuration until you check (in step 24) whether HDLM has been successfully installed.

18. Modify the storage system settings.

Modify the storage system settings by following the procedure described in the maintenance documentation for that particular storage system.

19. Restart each host.

20. Log on to Windows again as a member of the Administrators group.

21. Make sure that the program is running properly, by examining the results of the `dlnkmgr` command's `view` operation.

An example of executing the `dlnkmgr` command's `view` operation is as follows:

```
PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Failback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Even if you are using VCS, `off` appears for `Support Cluster`. Even if this is the case, the cluster support function will run properly.

22. Use the results of the `view` operation to check the version of the installed HDLM.

If `x.x.x-xx` is displayed in `HDLM Version`, the correct version of HDLM has been installed.

23. Use the results of the `view` operation to check that the programs are running properly.

If `HDLM Manager`, `HDLM Alert Driver`, and `HDLM Driver` are all `Alive`, all the programs are running correctly.

24. After the installation finishes, check the path information as described in [Checking the Path Configuration on page 3-71](#), and make sure that you have successfully installed HDLM in a single-path configuration.
25. Connect cables to all the HBAs to change the configuration to a multi-path configuration.
26. Check the path information as described in [Checking the Path Configuration on page 3-71](#) to make sure that you have successfully assembled a multi-path configuration.

When Oracle RAC Is Used

To install HDLM when Oracle RAC is used:

1. Shut down all the hosts.
2. Make sure that all the hosts that make up the cluster system have been fully shut down.
3. Restart each host.
Start them in a single-path configuration.
4. Log on to Windows as a member of the Administrators group.
5. Save the license key file directly under the Windows installation-destination drive. Also, instead of using the license key, you can directly specify the license key during the installation of HDLM.

installation-drive:\hdml_license

The license key file will be deleted after the installation finishes.

6. Perform the installation.
 - If you are not performing an unattended installation, insert the DVD into the drive.
In the displayed window, click the **Install** button next to **for Windows of Hitachi Dynamic Link Manager**.
If no window is displayed, manually run the installer (setup.exe).
The program checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If HDLM 5.5 or later has been installed, the KAPL09173-W message will appear. If this happens, carry out the procedure shown in [Upgrade Installation or Re-installation of HDLM on page 3-66](#). If no message appears, go to step 7.
 - If you are planning to perform an unattended installation, execute the installhdml utility.

At the command prompt, execute the following command:

drive-to-which-the-installation-DVD-is-inserted:\HDLM_Windows\DLMTools\installhdml -f installation-information-settings-file

Specify `n` for the `restart` key in the installation-information settings file.

This command checks whether HDLM has already been installed. If HDLM 5.4 or earlier has been installed, the KAPL09129-E message will appear. If this happens, carry out the procedure shown in [Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67](#). If

HDLM 5.5 or later has been installed, the KAPL09183-E message will appear, and then the upgrade installation or re-installation will be performed.

After the installation is complete, go to step 14.

7. The program checks the MPIO driver version, and then installs the MPIO driver. If a message appears asking you whether you want to install the MPIO driver, make sure that no multi-path management software other than HDLM is installed.
 - If multi-path management software other than HDLM is installed, click the **Cancel** button to cancel the installation, remove the multi-path management software, and then install HDLM.
 - If no multi-path management software other than HDLM is installed, click the **Next** button to continue the installation.
8. Specify a license key file or enter a license key by following the instructions shown in the messages that appear in the window.
If a license key file was saved in step 5, specify that license key file.
If a license key file is not being used, specify the license key directly.
9. Specify the installation folder by following the instructions shown in the messages that appear in the window.
The utility for registering HDLM persistent reservation keys (`dlmprvkey`) will be automatically executed. However, creation of the PRSV key might be unsuccessful if, for example, an NIC does not exist. If the PRSV key is created with time information only, or if key creation fails, a dialog box will prompt you to enter the PRSV key.
If this dialog box appears, go to step 10; otherwise, go to step 12.
10. Enter the PRSV key by following the instructions shown in the dialog box.
The PRSV key is required for the HDLM functions to properly operate.
Also, the value of the PRSV key must be unique for each host.
11. If the KAPL09128-W message appears, you will need to re-enter the correct PRSV key.
If a message does not appear, go to the next step.
12. The message **Select Storage system to be managed.** is displayed.
Click the **Next** button.
In an Oracle RAC environment, because an EMC DMX series or EMC CX series LU cannot be set as an HDLM management-target device, do not select **EMC Symmetrix DMX Series**, **CLARiiON CX Series**. Similarly, because an HP EVA series LU cannot be set as an HDLM management-target device, do not select **HP StorageWorks EVA Series**.
13. Follow the instructions shown in the messages that appear in the window.

- If a dialog box with the following text appears during installation, and the Storport Miniport driver is being used as the HBA driver, stop the HDLM installation. After that, install QFE838894 or a later version of the Microsoft Storport driver, or install Windows Server 2003 SP1 or later.

Notes on using a Storport Miniport driver

Read these notes before using a Storport Miniport driver as an HBA driver.

**The file version of the Storport.sys of this system
(Microsoft(R) Storport driver) is *n.n.nnnn.n*.**

When using a Storport Miniport driver as an HBA driver:

**Please update the Storport Miniport driver to a Storport.sys
with a file version *n.n.nnnn.n* or later.**

- The PRSV key will be registered before the installation finishes. If the KAPL09131-W message appears, follow the procedure described in step 15.
- Although a message prompting you to restart the host appears after the installation has finished, a restart is not necessary.
- In the last installation window, the following message might be output:

When you manage a host by using Global Link Manager and Windows firewall is enabled on that host, execute the `firewall_setup` command to allow a firewall exception.

If Global Link Manager will not be used to manage HDLM, you do not need to take any action.

To manage HDLM with Global Link Manager, register Firewall exceptions. For details, see [Firewall Settings for Managing HDLM by Using Global Link Manager on page 3-70](#).

14. Check the results of the installation.

If you have performed an unattended installation, check the installation results from the command prompt.

15. After the installation finishes, execute the `dlmprsvkey` utility with the `-v` parameter specified.

Execute the following command:

`HDLM-installation-folder\bin\dlmprsvkey -v`

Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the other hosts in the SAN. If the PRSV key is not unique or is not registered, or if the KAPL09131-W message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-register the PRSV key. If the PRSV key is not registered, the HDLM functions might not properly operate. For details about the `dlmprsvkey` utility, see [The `dlmprsvkey` Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#).

If you used a license key file, it will be deleted after the installation finishes. The KAPL09115-W message will appear if deletion of this file fails. If this happens, delete the file manually.

16. Shut down the host.
Leave the host in a single-path configuration until you check (in step 24) whether HDLM has been successfully installed.
17. On all the hosts that make up the cluster system, perform steps 3 to 16.
18. Make sure that all the hosts that make up the cluster system have been completely shut down.
19. Restart each host.
20. Log on to Windows again as a member of the Administrators group.
21. Make sure that the program is running properly, by examining the results of the `dlnkmgr` command's `view` operation.

An example of executing the `dlnkmgr` command's `view` operation is as follows:

```

PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on(extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Failback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

22. Use the results of the `dlnkmgr` command's `view` operation to check the version of the installed HDLM.
If `x.x.x-xx` is displayed in `HDLM Version`, the correct version of HDLM has been installed.
23. Use the results of the `dlnkmgr` command's `view` operation to check that the programs are running properly.
If `HDLM Manager`, `HDLM Alert Driver`, and `HDLM Driver` are all `Alive`, all the programs are running correctly.
24. After the installation finishes, check the path information as described in [Checking the Path Configuration on page 3-71](#), and make sure that you have successfully installed HDLM in a single-path configuration.

25. Connect cables to all the HBAs to change the configuration to a multi-path configuration.
26. Check the path information as described in [Checking the Path Configuration on page 3-71](#) to make sure that you have successfully assembled a multi-path configuration.
27. Shut down the host.
28. On all the hosts that make up the cluster system, perform steps 19 to 27.
29. Install and configure Oracle RAC.
If both of the following conditions are satisfied, you must change the Oracle RAC settings after assembling the environment.
 - Oracle RAC 10g 10.1.0.3.0 or later or Oracle RAC 11g is used.
 - A host is connected to a voting disk via multiple paths in an FC-SAN environment.
 For details, see [Notes on Creating an HDLM Environment on page 3-17](#).
30. Make sure that the program is running properly, by examining the results of the `dlnkmgr` command's `view` operation.
An example of executing the `dlnkmgr` command's `view` operation is as follows:

```

PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on (30)
Auto Failback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver : WakeupTime
Alive x.x.x-xx : yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver : WakeupTime ElogMem Size
Alive x.x.x-xx : yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver : WakeupTime
Alive x.x.x-xx : yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Even if you are using Oracle RAC, `off` appears for `Support Cluster`. Even if this is the case, the cluster support function will run normally.

Performing a New Installation of HDLM on Windows Server 2008 and Windows Server 2012

Note:

If you are running a Server Core environment in Windows Server 2008 or Windows Server 2012, perform an unattended installation to install HDLM.

In a Non-Cluster Environment

Before installing HDLM, have a license key ready.

If you want to perform an unattended installation, also be sure to prepare an installation-information settings file.

To install HDLM in a non-cluster environment:

1. Log on to Windows as a member of the Administrators group.
2. Save the license key file directly under the Windows installation-destination drive. Also, instead of using the license key file, you can directly specify a license key during the installation of HDLM.

installation-drive:\hdlm_license

The license key file will be deleted after the installation finishes.

3. Perform the installation.
 - o If you are not performing an unattended installation, insert the DVD into the drive.
In the displayed window, click the **Install** button next to **for Windows of Hitachi Dynamic Link Manager**.
If no window is displayed, manually run the installer (`setup.exe`).
The program checks whether HDLM has already been installed. If the KAPL09173-W message appears, perform the procedure shown in [Upgrade Installation or Re-installation of HDLM on page 3-66](#). If a message does not appear, go to the next step.
 - o If you are performing an unattended installation, execute the `installhdml` utility.
From the command prompt, execute the following command:

drive-containing-the-inserted-installation-DVD:\HDLM_Windows\DLMTools\installhdml -f installation-information-settings-file

This command checks whether HDLM has already been installed. If the KAPL09183-I message appears, a re-installation will be performed.

If you specified `n` for the `restart` key in the installation-information settings file, go to step 8.

If you specified `y` for the `restart` key in the installation-information settings file, go to step 18.

4. Specify a license key file or enter the license key by following the instructions shown in the messages that appear in the window.
 - If a license key file was saved in step 2, specify that license key file.
 - If a license key file is not being used, specify the license key directly.
5. Specify the installation folder by following the instructions shown in the messages that appear in the window.
 The utility for registering HDLM persistent reservation keys (`dlmprsvkey`) will be automatically executed to create a PRSV key. However, creation of the PRSV key might be unsuccessful if, for example, an NIC does not exist. If the PRSV key is created with time information only, or if key creation fails, a dialog box will prompt you to enter the PRSV key.
 If this dialog box appears, go to step 6; otherwise, go to step 7.
6. Enter the PRSV key by following the instructions shown in the dialog box.
 The PRSV key is required for the HDLM functions to properly operate. Also, the value of the PRSV key must be unique for each host.
 If the KAPL09128-W message appears, you will need to re-enter the correct PRSV key.
7. Follow the instructions shown in the messages that appear in the window.
 - The PRSV key will be registered before the installation finishes. If the KAPL09131-W message appears, follow the procedure described in step 9.
 - Although a message prompting you to restart the host appears after the installation has finished, a restart is not necessary.
 - In the last installation window, the following message might be output:

When you manage a host by using Global Link Manager and Windows firewall is enabled on that host, execute the `firewall_setup` command to allow a firewall exception.

If Global Link Manager will not be used to manage HDLM, you do not need to take any action.

To manage HDLM with Global Link Manager, register Firewall exceptions. For details, see [Firewall Settings for Managing HDLM by Using Global Link Manager on page 3-70](#).

8. Check the results of the installation.
 If you have performed an unattended installation, check the installation results from the command prompt.
9. After the installation finishes, execute the `dlmprsvkey` utility with the `-v` parameter specified.
 Execute the following command:

```
HDLM-installation-folder\bin\dlmprsvkey -v
```

Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the hosts in the SAN. If the PRSV key is not unique or

not registered, or if the KAPL09131-W message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-register the PRSV key. If the PRSV key is unregistered, HDLM functions might not properly operate. For details about the `dlmprsvkey` utility, see [The `dlmprsvkey` Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#).

If you used a license key file, it will be deleted after the installation finishes. The KAPL09115-W message will appear if deletion of this file fails. If this happens, delete the file manually.

10. If you want to select an EMC CX series or an HP EVA series LU as the HDLM management-target device, perform the following steps to register it. Otherwise, go to step 15.
 11. From **Control Panel**, choose **MPIO**.
The MPIO Properties dialog box opens.
 12. On the **MPIO-ed Devices** page, click the **Add** button.
The Add MPIO Support dialog box opens.
 13. Enter the **Device hardware ID**, and then click the **OK** button.
 - For an EMC CX series:
Enter `DGC RAID` for the **Device hardware ID**. Enter five single-byte spaces between `DGC` and `RAID`.
 - For an HP EVA series:
Enter `HP HSV` for the **Device hardware ID**. Enter six single-byte spaces between `HP` and `HSV`.
 14. Click the **OK** button to close the MPIO Properties dialog box.
 15. Shut down the host.
Leave the host in a single-path configuration until you check (in step 23) whether HDLM has been successfully installed.
 16. Modify the storage system settings.
Modify the storage system settings by following the procedure described in the maintenance documentation for that particular storage system.
 17. Start the host.
 18. Log on to Windows again as a member of the Administrators group.
 19. Check the log file and PRSV key.
This step is unnecessary if you have performed step 9. In this case, go to step 20.
If you installed HDLM by performing an unattended installation and specified `y` for the `restart` key in the installation-information settings file, make sure that the KAPL09181-I message is output to `installhdml.log`. For details about this log file, see [Notes on an Unattended Installation on page 3-30](#) in [Preparations for Installing HDLM by Performing an Unattended Installation on page 3-29](#) and [About the Log File on page 7-28](#) in [The `installhdml` Utility for Installing HDLM on page 7-17](#).
 - Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the other hosts in the SAN. If the PRSV key is not unique or is not registered, or if the KAPL09131-W message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-

register the PRSV key. If the PRSV key is unregistered, HDLM functions might not properly operate. For details about the `dlmprsvkey` utility, see [The `dlmprsvkey` Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#). If you used a license key file, it will be deleted after the installation finishes. The KAPL09115-W message will appear if deletion of this file fails. If this happens, delete the file manually.

20. Execute the `dlnkmgr` command's `view` operation to display the status of each program.

An example of executing the `dlnkmgr` command's `view` operation is as follows:

```
PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Failback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

21. Use the results of the `view` operation to check the version of the installed HDLM.

If `x.x.x-xx` is displayed in `HDLM Version`, the correct version of HDLM has been installed.

22. Use the results of the `view` operation to check that the programs are running properly.
If `HDLM Manager`, `HDLM Alert Driver`, and `HDLM Driver` are all `Alive`, all the programs are running correctly.
23. Check the path information as described in [Checking the Path Configuration on page 3-71](#), and make sure that you have successfully installed HDLM in a single-path configuration.
24. Connect cables to all the HBAs to change the configuration to a multi-path configuration.

The following figure shows a single path configuration and a multi-path configuration.

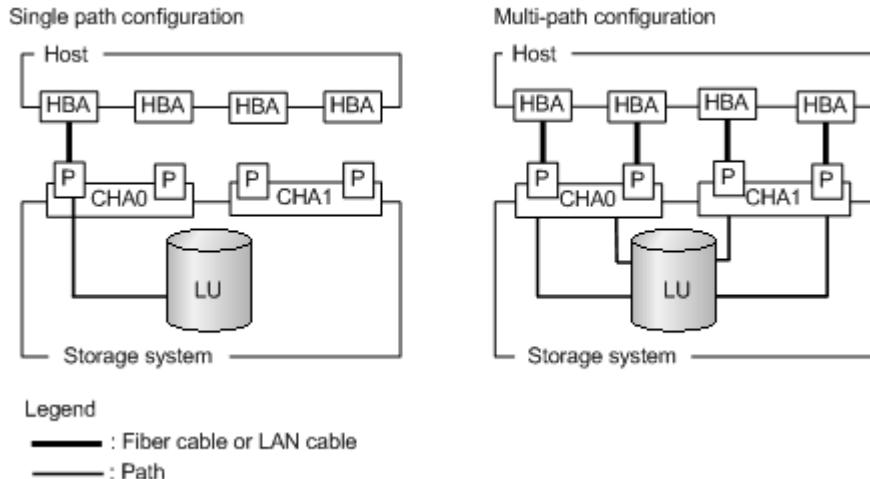


Figure 3-4 Single Path Configuration and Multi-path Configuration

25. Check the path information as described in [Checking the Path Configuration on page 3-71](#) to make sure that you have successfully assembled a multi-path configuration.

When MSCS Is Used

The following provides explanations of how to install MSCS before and after an HDLM installation.

Installing MSCS after an HDLM installation

To install HDLM and then MSCS:

1. Shut down all the hosts.
2. Make sure that all the hosts that make up the cluster system have been fully shut down.
3. Restart each host.
Restart them all in the single path configuration.
4. Log on to Windows as a member of the Administrators group.
5. Save the license key file directly under the Windows installation-destination drive. Also, instead of using the license key file, you can directly specify a license key during the installation of HDLM.

installation-drive:\hdlm_license

The license key file will be deleted after the installation finishes.

6. Perform the installation.
 - o If you are not performing an unattended installation, insert the DVD into the drive.

In the displayed window, click the **Install** button next to **for Windows of Hitachi Dynamic Link Manager**.

If no window is displayed, manually run the installer (`setup.exe`).

The program checks whether HDLM has already been installed. If the KAPL09173-W message appears, perform the procedure shown in [Upgrade Installation or Re-installation of HDLM on page 3-66](#).

If a message does not appear, go to the next step.

- If you are performing an unattended installation, execute the `installhdml` utility.

At the command prompt, execute the following command:

```
drive-containing-the-inserted-installation-DVD:\HDLM_Windows  
\DLMTools\installhdml -f installation-information-settings-  
file
```

Specify `n` for the `restart` key in the installation-information settings file.

This command checks whether HDLM has already been installed. If the KAPL09183-I message appears, the re-installation will be performed.

After the installation is complete, go to step 11

7. Specify a license key file or enter the license key by following the instructions shown in the messages that appear in the window.
 - If a license key file was saved in step 5, specify that license key file.
 - If a license key file is not being used, specify the license key directly.
8. Specify the installation folder by following the instructions shown in the messages that appear in the window.

The utility for registering HDLM persistent reservation keys (`dlmprsvkey`) will be automatically executed. However, creation of the PRSV key might be unsuccessful if, for example, an NIC does not exist. If the PRSV key is created with time information only, or if key creation fails, a dialog box will prompt you to register the PRSV key.

If this dialog box appears, go to step 9; otherwise, go to step 10.

9. Enter the PRSV key by following the instructions shown in the dialog box. The PRSV key is required for the HDLM functions to properly operate. Also, the value of the PRSV key must be unique for each host.

If the KAPL09128-W message appears, you will need to re-enter the correct PRSV key.

If a message does not appear, go to the next step.

10. Follow the instructions shown in the messages that appear in the window.
 - The PRSV key will be registered before the installation finishes. If the KAPL09131-W message appears, follow the procedure described in step 12.
 - Although a message prompting you to restart the host appears after the installation has finished, a restart is not necessary.

- In the last installation window, the following message might be output:

When you manage a host by using Global Link Manager and Windows firewall is enabled on that host, execute the `firewall_setup` command to allow a firewall exception.

If Global Link Manager will not be used to manage HDLM, you do not need to take any action.

To manage HDLM with Global Link Manager, register Firewall exceptions. For details, see [Firewall Settings for Managing HDLM by Using Global Link Manager on page 3-70](#).

11. Check the results of the installation.

If you have performed an unattended installation, check the installation results from the command prompt.

12. After the installation finishes, execute the `dlmprsvkey` utility with the `-v` parameter specified.

Execute the following command:

```
HDLM-installation-folder\bin\dlmprsvkey -v
```

Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the other hosts in the SAN. If the PRSV key is not unique or not registered, or if the KAPL09131-W message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-register the PRSV key. If the PRSV key is not registered, the HDLM functions might not properly operate. For details about the `dlmprsvkey` utility, see [The `dlmprsvkey` Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#). If you used a license key file, it will be deleted after the installation finishes. The KAPL09115-W message will appear if deletion of this file fails. If this happens, delete the file manually.

13. If you want to select an EMC CX series or an HP EVA series LU as the HDLM management-target device, perform the following steps to register it. Otherwise, go to step 18.
14. From **Control Panel**, choose **MPIO**.
The MPIO Properties dialog box opens.
15. On the **MPIO-ed Devices** page, click the **Add** button.
The Add MPIO Support dialog box opens.
16. Enter the **Device hardware ID**, and then click the **OK** button.
 - For an EMC CX series:
Enter `DGC RAID` for the **Device hardware ID**. Enter five single-byte spaces between `DGC` and `RAID`.
 - For an HP EVA series:
Enter `HP HSV` for the **Device hardware ID**. Enter six single-byte spaces between `HP` and `HSV`.
17. Click the **OK** button to close the MPIO Properties dialog box.

18. Shut down the host.
Leave the host in a single-path configuration until you check (in step 26) whether HDLM has been successfully installed.
19. Perform steps 3 to 18 on all the hosts that make up the cluster system.
20. Make sure that all the hosts in the cluster system have completely shut down.
21. Restart each host.
22. Log on to Windows again as a member of the Administrators group.
23. Execute the `dlnkmgr` command's `view` operation to display the status of each program.
An example of executing the `dlnkmgr` command's `view` operation is as follows:

```

PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on (30)
Auto Failback : on (1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off (10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

24. Use the results of the `view` operation to check the version of the installed HDLM.
If `x.x.x-xx` is displayed in `HDLM Version`, the correct version of HDLM has been installed.
25. From the results of the `view` operation, check that the programs are running properly.
If `HDLM Manager`, `HDLM Alert Driver`, and `HDLM Driver` are all `Alive`, all the programs are running correctly.
26. After the installation finishes, check the path information as described in [Checking the Path Configuration on page 3-71](#), and make sure that you have successfully installed HDLM in a single-path configuration.

27. Connect cables to all the HBAs to change the configuration to a multi-path configuration.
28. Check the path information as described in [Checking the Path Configuration on page 3-71](#) to make sure that you have successfully assembled a multi-path configuration.
29. Shut down the host.
30. Perform steps 21 to 29 on all the hosts that make up the cluster system.
31. Restart each host.
32. Install MSCS on each host.
33. Shut down all the hosts.
34. Restart each host again.
35. Log on to Windows as a member of the Administrators group.
36. Execute the `dlnkmgr` command's `view` operation to display the status of each program.

Make sure that `on MSCS` is displayed in Support Cluster. An example of executing the `dlnkmgr` command's `view` operation is as follows:

```

PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : on MSCS
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Failback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Installing HDLM after an MSCS Installation:

To install MSCS and then HDLM:

1. Install MSCS on the host.
2. Restart the host.

3. Log on to Windows as a member of the Administrators group.
4. Save the license key file directly under the Windows installation-destination drive. Also, instead of using the license key file, you can directly specify a license key during the installation of HDLM.

installation-drive:\hdlm_license

The license key file will be deleted after the installation finishes.

5. Perform the installation.
 - o If you are not performing an unattended installation, insert the DVD into the drive.
In the displayed window, click the **Install** button next to **for Windows of Hitachi Dynamic Link Manager**.
If no window is displayed, manually run the installer (*setup.exe*).
The program checks whether HDLM has already been installed. If the KAPL09173-W message will appear, perform the procedure shown in [Upgrade Installation or Re-installation of HDLM on page 3-66](#).
If a message does not appear, go to the next step.
 - o If you are planning to perform an unattended installation, execute the *installhdlm* utility.

drive-containing-the-inserted-installation-DVD:\HDLM_Windows\DLMTools\installhdml -f installation-information-settings-file

Specify *n* for the *restart* key in the installation-information settings file.

This command checks whether HDLM has already been installed. If the KAPL09183-I message will appear, the re-installation is performed.

After the installation is complete, go to step 10.

6. Specify a license key file or enter the license key by following the instructions shown in the messages that appear in the window.
 - o If a license key file was saved in step 4, specify that license key file.
 - o If a license key file is not being used, specify the license key directly.
7. Specify the installation folder by following the instructions shown in the messages that appear in the window.
The utility for registering HDLM persistent reservation keys (*dlmprsvkey*) will be automatically executed. However, creation of the PRSV key might be unsuccessful if, for example, an NIC does not exist. If the PRSV key is created with time information only, or if key creation fails, a dialog box will prompt you to enter the PRSV key.
If this dialog box appears, go to step 8; otherwise, go to step 9.
8. Enter the PRSV key by following the instructions shown in the dialog box.
The PRSV key is required for the HDLM functions to properly operate. Also, the value of the PRSV key must be unique for each host.

If the KAPL09128-W message appears, you will need to re-enter the correct PRSV key.

9. Follow the instructions shown in the messages that appear in the window.
 - o The PRSV key will be registered before the installation finishes. If the KAPL09131-W message appears, follow the procedure described in step 11.
 - o Although a message prompting you to restart the host appears after the installation has finished, a restart is not necessary.
 - o In the last installation window, the following message might be output:

When you manage a host by using Global Link Manager and Windows firewall is enabled on that host, execute the `firewall_setup` command to allow a firewall exception.

If Global Link Manager will not be used to manage HDLM, you do not need to take any action.

To manage HDLM with Global Link Manager, register Firewall exceptions. For details, see [*Firewall Settings for Managing HDLM by Using Global Link Manager on page 3-70*](#).

10. Check the results of the installation.
If you have performed an unattended installation, check the installation results from the command prompt.
11. After the installation finishes, execute the `dlmprsvkey` utility with the `-v` parameter specified.
Execute the following command:

```
HDLM-installation-folder\bin\dlmprsvkey -v
```

Make sure that the PRSV key displayed by the `dlmprsvkey` utility is unique among all the other hosts in the SAN. If the PRSV key is not unique or not registered, or if the KAPL09131-W message appears, execute the `dlmprsvkey` utility with the `-r` parameter specified to re-register the PRSV key. If the PRSV key is unregistered, the HDLM functions might not properly operate. For details about the `dlmprsvkey` utility, see [*The dlmprsvkey Utility for Registering an HDLM Persistent Reservation Key on page 7-13*](#). If you used a license key file, it will be deleted after the installation finishes. The KAPL09115-W message will appear if deletion of this file fails. If this happens, delete the file manually.

12. If you want to select an EMC CX series or an HP EVA series LU as the HDLM management-target device, perform the following steps to register it. Otherwise, go to step 17.
13. From **Control Panel**, choose **MPIO**.
The MPIO Properties dialog box opens.
14. On the **MPIO-ed Devices** page, click the **Add** button.
The Add MPIO Support dialog box opens.
15. Enter the **Device hardware ID**, and then click the **OK** button.

- For an EMC CX series:
Enter `DGC RAID` for the **Device hardware ID**. Enter five single-byte spaces between `DGC` and `RAID`.
- For an HP EVA series:
Enter `HP HSV` for the **Device hardware ID**. Enter six single-byte spaces between `HP` and `HSV`.

16. Click the **OK** button to close the MPIO Properties dialog box.

17. Shut down the host.
Leave the host in a single-path configuration until you check (in step 26) whether HDLM has been successfully installed.

18. Perform steps 1 to 17 on all the hosts that make up the cluster system.

19. Make sure that all the hosts that make up the cluster system have completely shut down.

20. Modify the storage system settings.
Modify the storage system settings by following the procedure described in the maintenance documentation for that particular storage system.

21. Restart each host.

22. Log on to Windows again as a member of the Administrators group.

23. Execute the `dlnkmgr` command's `view` operation to display the status of each program.

Make sure that `MSCS` is displayed in Support Cluster. An example of executing the `dlnkmgr` command's `view` operation is as follows:

```

PROMPT>dlnkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : on MSCS
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on (30)
Auto Failback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

24. Use the results of the `view` operation to check the version of the installed HDLM.
If `x.x.x-xx` is displayed in `HDLM Version`, the correct version of HDLM has been installed.
25. Use the results of the `view` operation to check that the programs are running properly.
If `HDLM Manager`, `HDLM Alert Driver`, and `HDLM Driver` are all `Alive`, all the programs are running correctly.
26. After the installation finishes, check the path information as described in [*Checking the Path Configuration on page 3-71*](#), and make sure that you have successfully installed HDLM in a single-path configuration.
27. Connect cables to all the HBAs to change the configuration to a multi-path configuration.
28. Check the path information as described in [*Checking the Path Configuration on page 3-71*](#) to make sure that you have successfully assembled a multi-path configuration.

Upgrade Installation or Re-installation of HDLM

You can perform an upgrade installation for only HDLM 5.5 or later. To migrate HDLM 5.4 or earlier to version 5.5 or later, see [*Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later on page 3-67*](#).

The procedure for an upgrade installation or re-installation is the same as for a new installation of HDLM, with the exception of the following steps:

- Executing the `dlmchkpath` utility to check the HDLM paths.
The `dlmchkpath` utility is executed automatically when the installation program (`setup.exe`) starts. The `dlmchkpath` utility checks whether the system is in a single-path or multi-path configuration. If a warning dialog box appears in a Windows Server 2003 environment in which no service packs are installed, return everything to a single-path configuration, and then upgrade or reinstall HDLM. Note, however, that when an unattended installation is used and the system is determined to be in a multi-path configuration, an HDLM upgrade installation or re-installation will end and no warning dialog boxes will be displayed.
For details about the `dlmchkpath` utility, see [*The dlmchkpath Utility for Checking HDLM Paths on page 7-14*](#).
- Entering the license key
The window displays the type and expiration date of the license key, which were both entered when HDLM was installed for the first time. If the license key has expired, the procedure is the same as for a new installation.
- Checking the PRSV key
If an appropriate PRSV key exists, you do not need to check for duplicate PRSV keys after the installation finishes.
- If you only upgrade or reinstall HDLM, you do not need to change the storage system settings. If you upgrade or reinstall HDLM after changes

are made to system configurations, such as adding storage systems and changing path configurations, revise the settings accordingly.

- By default, if you upgrade HDLM from version 6.3 or later in Windows Server 2003, the MPIO driver is not upgraded. As a result, the KAPL09281-I message reports that the MPIO driver will not be overwritten. If you want to repair the MPIO driver by overwriting it, select the **Re-install MPIO driver** check box.

Upgrade installation or re-installation from HDLM 5.7 or later

- Selecting an HDLM management-target device

The default of the HDLM management-target device is the same as that before the upgrade installation or re-installation. For example, if you select **EMC Symmetrix DMX Series, CLARiiON CX Series** when you installed HDLM for the first time, **EMC Symmetrix DMX Series, CLARiiON CX Series** will already be selected when it appears in the dialog box.

Note:

If you want to install all HDLM components on a host on which the HDLM Core components have been installed, use an unattended installation.

When you install HDLM without using the unattended installation option, only the HDLM Core components, which were already installed in the previous environment, will be installed. For details about unattended installations, see [The installhdlm Utility for Installing HDLM on page 7-17](#).

Migrating from HDLM 5.4 or Earlier to HDLM 5.5 or Later

To upgrade from HDLM 5.4 or earlier:

- Copy the following files to any location other than the HDLM installation folder.

`dlmmgr.xml` is a file that specifies information needed to run HDLM managers. `dlmwebagent.properties` is a file that specifies information needed for linkage with Global Link Manager. `dlmwebagent.properties` only exists in HDLM 05-02 or later. If you migrate to HDLM 5.9.1 or later, you do not need to copy the `dlmwebagent.properties` file.

`\HDLM-installation-folder\config\dlmmgr.xml`
`\HDLM-installation-folder\config\dlmwebagent.properties`

- Remove HDLM by referring to the HDLM manual for the corresponding version.

If you removed HDLM 5.4, go to step 3 because you need to delete the HDLM driver setup information files from the system before restarting the host.

In other cases, go to step 4.

- Do a search for any setup information files (files with the `inf` file extension) that satisfy all of the following conditions:

- The file is stored in the following folder:
Windows-installation-folder\inf
- The file contains the text `dlmfdrv.sys` (a driver file).
- The file has the name `oemn.inf` (where *n* is a number).

Delete any setup information files that satisfy all of the above conditions. In addition, delete the files that have the same names as the above files, but with the extension `.pnf` (`oemn.pnf`).

If you do not delete the correct files, the host might not run properly. Before deleting a file, make sure that it satisfies all of the above conditions.

4. Perform a new HDLM installation by following the procedure in [Installing HDLM on page 3-27](#).
5. Copy the files copied in step 1 to the following location, and then overwrite the existing files:

```
\HDLM-installation-folder\config\dlmmgr.xml
\HDLM-installation-folder\config\dlmwebagent.properties
```

6. Delete the files copied in step 1.
7. Restart the host.

Note:

When you install HDLM 5.5 or later in an environment where HDLM 5.4 or earlier was installed, **DLMArtDriver** is displayed in the **Non-Plug and Play Drivers** area of the **Device Manager** window. You can delete **DLMArtDriver** by using the procedure below. Note, however, that leaving **DLMArtDriver** on the window will not affect HDLM operations:

- a. From the **Device Manager** window, in the **View** menu, choose **Show hidden devices**.
- b. From the **View** menu, choose **Devices by connection**.
- c. Select **Non-Plug and Play Drivers** to display **DLMArtDriver**.
- d. Delete **DLMArtDriver**.
- e. Restart the system.

Installing JRE

HDLM starts the HDLM GUI by using JRE (JRE 1.6.0, 32-bit) bundled with the Hitachi Command Suite Common Agent Component. HDLM can also use JRE versions that are not bundled with the Hitachi Command Suite Common Agent Component to start the HDLM GUI.

Available JRE versions are as follows:

- In Windows Server 2003:
 - Oracle JRE 1.4.2_13 (32-bit)
 - Oracle JRE 5.0_10 (32-bit)
 - Oracle JRE 6.0_04 (32-bit)

- Oracle JRE 6.0_17 (32-bit)
- In Windows Server 2008:
 - Oracle JRE 6.0_17 (32-bit)
 - Oracle JRE 7.0_01 (32-bit)

If you use JRE 7.0_01, delete all the JRE configuration files copied to *HDLM-installation-folder\jre_user* before installing JRE.

To install JRE:

1. Download the JRE from the Oracle website.
2. Install the JRE on the host where the HDLM has been installed.
Do not install the JRE directly into *HDLM-installation-folder\jre_user*. If you do this, remove the JRE, and then reinstall it into another folder.
When you install JRE 6.0_04, the *C:\Program Files\Java\jre1.6.0_04* folder is created by default.
3. Copy all the configuration files, including the JRE installation folder, into the following folder:

HDLM-installation-folder\jre_user

If you use JRE 6.0_04, the folder configuration is as follows:

HDLM-installation-folder\jre_user

```
\jre1.6.0_04#
  \bin
  \lib
#
```

The folder name depends on the JRE version that will be used:

When using JRE 1.4.2_13: *j2re1.4.2_13*

When using JRE 5.0_10: *jre1.5_10*

When using JRE 6.0_17: *jre6*

When using JRE 7.0_01: *jre7*

For example, if the HDLM installation folder is *C:\Program Files\HITACHI\DynamicLinkManager* and you are using JRE 6.0_04, after copying the configuration files, the folder configuration will become the following:

```
C:\Program Files\HITACHI\DynamicLinkManager\jre_user
  \jre1.6.0_04
    \bin
    \lib
```

After installing the JRE, check to make sure that the HDLM GUI starts.

Note:

- If you remove HDLM, *HDLM-installation-folder\jre_user* will be deleted.

- If Hitachi Command Suite Common Agent Component is set to use a 32-bit version of Java installed in the system, HDLM uses the specified version of Java to start the HDLM GUI.

Firewall Settings for Managing HDLM by Using Global Link Manager

To use Global Link Manager to manage HDLM when the host OS is Windows and Windows Firewall is enabled, the following ports, which are used by the Hitachi Command Suite Common Agent Component, must be registered as firewall exceptions:

- Port set for the `server.agent.port` property (default: 24041/tcp)
- Port set for the `server.http.port` property (default: 24042/tcp)
- Port set for the `server.http.localPort` property (default: 24043/tcp)

For details about the ports used by the Hitachi Command Suite Common Agent Component, see the manual *Hitachi Command Suite Global Link Manager Installation and Configuration Guide*.

To add the ports to the exceptions list:

1. Log on as a member of the Administrators group.
2. Execute the `firewall_setup` command.
3. Check the displayed message to make sure that the command was executed successfully.

The command ended successfully.

`firewall_setup` command syntax

If the host OS is Windows, the `firewall_setup` command is used to register the ports used by the Hitachi Command Suite Common Agent Component as firewall exceptions.

The `firewall_setup` command is stored in the following location, depending on whether the Device Manager agent is installed.

- Device Manager agent is installed:

```
program-installation-destination-drive:\Program Files#\Hitachi
\HDVM\HBaseAgent\bin\firewall_setup.bat
```

- Device Manager agent is not installed:

```
program-installation-destination-drive:\Program Files#\HDVM
\HBaseAgent\bin\firewall_setup.bat
```

#

For Windows Server 2003 (excluding the x86 edition), Windows Server 2008 (excluding the x86 edition), or Windows Server 2012, Program Files is Program Files (x86).

The following table describes the `firewall_setup` command syntax.

Table 3-18 firewall_setup command syntax

Item	Details
Synopsis	<code>firewall_setup {-set -unset}</code>
Description	<p>Registers the following ports used by the Hitachi Command Suite Common Agent Component in a Windows environment as firewall exceptions:</p> <ul style="list-style-type: none">• Port set for the <code>server.agent.port</code> property (default: 24041/tcp)• Port set for the <code>server.http.port</code> property (default: 24042/tcp)• Port set for the <code>server.http.localPort</code> property (default: 24043/tcp) <p>This operation requires Administrators group privileges. If the OS is Windows Server 2008 or Windows Server 2012, the command must be executed from a command prompt started as an Administrator.</p>
Options	<p><code>-set</code> Adds firewall exceptions.</p> <p><code>-unset</code> Removes firewall exceptions.</p>

Note:

In Windows, the folder in which the Hitachi Command Suite Common Agent Component commands are installed is automatically added to the environment variable `Path`. When you execute a command, you do not need to change the current folder to the folder that contains commands.

Checking the Path Configuration

HDLM functions, such as load balancing and failover, are only available for HDLM management-target *devices* that have more than one active path. After you install HDLM or change the hardware configuration, check the structure and statuses of the paths.

To check the path information, use the `dlnkmgr` command's `view` operation or use the **Path List** view in the Path Management window of the HDLM GUI. For details about the **Path List** view, see the HDLM GUI Help.

The HDLM command's `view` operation to check path information is described below. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#).

Specify the `-path` parameter and check the output information:

Execute the following command:

```
dlnkmgr view -path > redirect-destination-file
```

Open *redirect-destination-file-1* and check the following:

- Make sure that there is at least one LU being accessed by a path. A path can be identified by `PathName`. The LU that is accessed by a path can be identified by both `DskName` and `iLU`.
- Make sure that all the paths are online. Make sure that `PathStatus` is `Online`. If a path is not online, `Reduced` will be displayed.
- Make sure that for each path the combination of the CHA port (`ChaPort`), through which multiple paths are accessing the same LU, and the HBA port (the host port number and bus number displayed in the `PathName` column) is different. The number to the left of `PathName` is the host port number. The numbers displayed between the period to the right of the host port number and the following period is the bus number.
- Make sure that there are different host port numbers and bus numbers for each physical HBA port.

If the system cannot be configured in a multi-path configuration, perform the following operations:

1. From the Device Manager window of Windows, select **Disk drives**, and then click **Scan for hardware changes**.
2. From the Disk Management window of Windows, click **Rescan Disks**.

Setting Up HDLM

HDLM includes functions like the load balancing function, the automatic failback function, the error logging function, the audit logging function, etc. You can set up these functions by using the `dlnkmgr` command's `set` operation or by using the Options window of the HDLM GUI. The following subsections describe how to set up HDLM functions by using the HDLM command's `set` operation. For details about the Options window, see the HDLM GUI Help.

Notes:

- Windows Server 2008 or Windows Server 2012 supports user account control (UAC). As a result, to execute an HDLM command, perform one of the following:
 - Use the Administrator account to perform an operation.
 - If you are not logged on as Administrator, execute the `dlnkmgr` command by using the **Administrator: Command Prompt** window.
- The HDLM GUI is unavailable when HDLM is installed in the Server Core environment. Instead, use the HDLM command's `set` operation to set up the HDLM functions.

Checking the Current Settings

This chapter describes how to check the HDLM function settings before any changes are made by using the `dlnkmgr` command's `view` operation.

Check the current settings by executing the following command:

```
PROMPT>dlnkmgr view -sys -sfunc
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on(extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size(KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Fallback : on(1)
Remove LU : off
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

To check the current audit log settings, execute the following command:

```
PROMPT>dlnkmgr view -sys -audlog
Audit Log : off
Audit Log Category : -
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Setting Up the HDLM Functions

The table below summarizes the functions that can be set in HDLM. For details about each function, see [Setting Up Load Balancing on page 3-74](#) and subsequent sections.

Each function has a default value and a recommended value. If the Options window of the HDLM GUI or no function is set by the HDLM command's set operation, the default value is applied for each function. The recommended values are used as the guideline values when functions are configured.

Table 3-19 The Recommended and Default Values for Each Function

Function	Default value	Recommended value
Load-balancing	on The Extended Least I/Os algorithm is used.	on The recommended algorithm depends on the operating environment.
Path health checking	on	on

Function	Default value	Recommended value
	30-minute check interval	The recommended checking interval depends on the operating environment.
Automatic failback	on 1-minute check interval	The recommended checking interval depends on the operating environment.
Intermittent Error Monitor	off	off
Dynamic I/O Path Control [#]	off 10-minute check interval	off The recommended checking interval depends on the operating environment.
Remove LU	off	off
Logging level	3: Collects all the error information for the "Information" level or higher	3: Collects all the error information for the "Information" level or higher
Trace level	0: Do not output trace files	0: Do not output trace files
File size for the Error log	9900 (KB)	9900 (KB)
Number of files for the Error logs	2	2
File size for trace information	1000 (KB)	1000 (KB)
Number of files for trace information	4	4
Collection of audit log data	off	The recommended value depends on the operating environment. Set on, if you want to collect audit log data.

#

This function is applied only when Hitachi AMS2000 series, Hitachi SMS series, or HUS100 series storage is used.

Setting Up Load Balancing

In a cluster environment, the load balancing function is only available for the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, Universal Storage Platform V/VM series, and Virtual Storage Platform series. In a non-cluster environment, the load balancing function is available for the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, Universal Storage Platform V/VM series, Virtual Storage Platform series, and EMC DMX series. For the EMC DMX series, EMC CX series, and HP EVA series, these conditions are applied regardless of whether or not the load balancing function is enabled in those series. For example, in a cluster environment, the load

balancing function is disabled even if you try to enable it for the EMC DMX series. For details on the cluster software supported by HDLM, see [Cluster Support on page 2-48](#).

- Setting up load balancing by using the `set` operation

The following is an example of how to set up load balancing by using a command:

```
dlnkmgr set -lb on -lbtype exlio
```

When load balancing is enabled by specifying `on` for the `-lb` parameter, specify one of the following algorithm values after the `-lbtype` parameter:

- `rr` for the Round Robin algorithm
- `exrr` for the Extended Round Robin algorithm
- `lio` for the Least I/Os algorithm
- `exlio` for the Extended Least I/Os algorithm
- `lbk` for the Least Blocks algorithm
- `exlbk` for the Extended Least Blocks algorithm

The type of algorithm specified by the `-lbtype` parameter remains stored in the system, even if you disable the load balancing function by specifying `-lb off`. If you decide to re-enable load balancing at a later time, and you do not specify an algorithm, load balancing will still be executed by using the algorithm that was previously specified.

Setting Up Path Health Checking

You can choose whether you want to use path health checking.

- Set up path health checking by using the `set` operation

The following is an example of how to set up path health checking by using a command:

```
dlnkmgr set -pchk on -intvl 10
```

When path health checking is enabled by specifying `on` for the `-pchk` parameter, you can also specify the `-intvl` parameter, in order to specify the *checking* interval. If the *checking* interval is not specified, then the previously specified value will be automatically applied. For example, if you turn off path health checking after the *checking* interval was specified as 15 minutes, and then you enable path health checking again (but without specifying a *checking* interval) the 15 value that was specified from before will be used again.

Setting Up the Automatic Failback Function

When intermittent error monitoring is enabled and the number of error occurrences is 2 or more, the following condition must be satisfied.

```
error-monitoring-interval >= checking-interval-for-automatic-failbacks x number-of-times-an-error-is-to-occur-during-intermittent-error-monitoring
```

If this condition is not satisfied, an error will occur and the warning message KAPL01080-W will be output.

If this happens, change any of the following settings: the checking interval for automatic failbacks, the intermittent error-monitoring interval, or the number of times that the error needs to occur.

If you set the number of times that the error needs to occur to 1, the above condition does not need to be satisfied.

- Setting up automatic failback by using the `set` operation

The following is an example of setting up automatic failback by using a command:

```
dlnkmgr set -afb on -intvl 10
```

To enable the automatic failback function, set it to `on`. The *checking* interval can be specified by the `-intvl` parameter. The previously specified value will be applied when a *checking* interval is not specified. For example, if you turn off the automatic failback function after the *checking* interval was specified as 5 minutes, and then you turn it back on (but without specifying a *checking* interval) the 5 minutes that were specified from before will be used again.

Setting Up Intermittent Error Monitoring

Intermittent error monitoring is specifiable only when the automatic failback function is enabled. To prevent an intermittent error from reducing I/O performance, we recommend that you monitor intermittent errors when automatic failback is enabled.

When intermittent error monitoring is enabled, you can specify intermittent error conditions. The default value for the intermittent error-monitoring interval is 30. The default value for the number of error occurrences is 3.

The system assumes that an intermittent error has occurred if the specified number of times that the error needs to occur is reached during the specified monitoring interval (minutes). A path that is assumed to have an intermittent error is excluded from performing an automatic failback. Intermittent error monitoring starts right when the path is recovered from the error by performing an automatic failback. Monitoring is performed on each, individual path.

When a value of 2 or more is specified for the number of times an error needs to occur, make sure that the condition shown in [Setting Up the Automatic Failback Function on page 3-75](#) is satisfied.

To determine whether a path is invalid for an automatic failback, you can use the results of the `dlnkmgr` command's `view` operation.

- Setting up intermittent error monitoring by using the `set` operation
The following is an example of setting up intermittent error monitoring by using a command:

```
dlnkmgr set -iem on -intvl 20 -iemnum 2
```

`on` specifies that intermittent error monitoring is to be used. To disable intermittent error monitoring, specify `off`. When you set this parameter to `on`, you can specify intermittent error conditions by using the `-intvl` and `-iemnum` parameters. Specify the monitoring interval for an intermittent error in the `-intvl` parameter, and the number of times that the error needs to occur in the `-iemnum` parameter. When these parameters are omitted, the default values of 30 and 3 are used, respectively.

Setting Up Dynamic I/O Path Control

To prevent degrading of I/O performance, this function dynamically switches the output controllers for HDLM, following the switching of controllers performed by the storage system.

The dynamic I/O path control function can be set for each storage system or LU. The checking interval for reviewing the switching status information can also be set in order to properly follow the switching of controllers performed by the storage system.

The following is an example of setting the dynamic I/O path control function:

```
dlnkmgr set -dpc on -pathid 000001 -lu
dlnkmgr set -dpcintvl 10
```

Specify "on" to enable the dynamic I/O path control function, or "off" to disable the function. For the `-pathid` parameter, specify an LU, or the ID of a path connected to the storage system. For the `-dpcintvl` parameter, specify the checking interval (in minutes) for reviewing the information about the switching of controllers performed by the storage system.

Setting Up the LU Deletion Function

For details on the LU deletion function, see [Deleting an LU Dynamically on page 4-19](#).

The following table lists values and descriptions for the LU deletion function.

Table 3-20 LU Deletion Function Values

Values in the <code>set</code> operation	Description
<code>off</code>	The LU is not removed from HDLM-management even if the error occurs on all the paths to the LU, all the paths to the LU are disconnected, or the LU is deleted. The status of the paths is either <code>Offline(E)</code> or <code>Online(E)</code> . This operation is equal to the operation in HDLM 05-01 or earlier. The <code>off</code> option is

Values in the <code>set</code> operation	Description
	recommended when you do not want to use the LU deletion function and you want the system to operate as it did in HDLM 05-01 and earlier.
<code>on</code>	<p>The LU is removed from HDLM-management when all the paths to the LU are disconnected. However, if an <code>Offline(C)</code> path is included in the disconnected paths, the LU is not deleted from HDLM-management.</p> <p>The deleted LU is restored when it is recovered from the physical failure and the disk is re-scanned.</p>
<code>on -force</code>	<p>The LU is removed from HDLM-management when all the paths to the LU are disconnected, even when an <code>Offline(C)</code> path is included.</p> <p>The removed LU is restored after it is recovered from the physical failure and the disk is re-scanned.</p>

- Setting up LU deletion by using the `set` operation

The following is an example of setting up LU deletion by using a command:

```
dlnkmgr set -rmlu on -force
```

To enable the LU deletion function, specify `on`. To disable the LU deletion function, specify `off`. If you specify `on`, you can set the conditions for the `-force` parameter.

Setting the Error Log Collection Level

There are two error logs: the HDLM manager log file `dlmmgrn.log` (*n* indicates a file number from 1 to 16) and the HDLM GUI log file `dlmguin.log` (*n* indicates a file number of 1 or 2).

The table below lists and describes the values for the audit log collection level setting.

Table 3-21 Values for the Error Log Collection Level Setting

Value	Description
0	No error logs are collected.
1	All information for errors of the "Error" level or higher is collected.
2	All information for errors of the "Warning" level or higher is collected.
3	All information for errors of the "Information" level or higher is collected.
4	All information for errors of the "Information" level or higher (including maintenance information) is collected.

If an error occurs, you might have to change the collection level to 1 or higher to collect any log information.

The higher this value is set, the more information that will be output. As the amount of log information to be output increases, it will take less time to overwrite the old error log information with the new information.

- Setting up the error log collection level by using the `set` operation

The following is an example of setting up the error log collection level by using a command:

```
dlnkmgr set -ellv 2
```

Specify the error log collection level as a number.

Setting the Trace Level

You can set up the trace level for a trace file `hdlmtrn.log` (*n* indicates a file number from 1 to 64).

The following table lists and describes the values for the trace level setting.

Table 3-22 Values for the Trace Level Setting

Value	Description
0	No trace is output.
1	Only error information is output.
2	Program operation summaries are output.
3	Program operation details are output.
4	All information is output.

If an error occurs, you might have to set the trace level to 1 or higher to collect any trace information.

The higher this value is set, the more information that will be output. As the amount of trace information to be output increases, it will take less time to overwrite the old trace information with the new information.

For normal operation, we recommend that you set the trace level to 0. If you set the trace level to a value higher than necessary, HDLM performance might decrease, or trace information required to analyze the cause of an error might be overwritten.

- Setting up the trace level by using the `set` operation

The following is an example of setting up the trace level by using a command:

```
dlnkmgr set -systflv 1
```

Specify the trace level as a number.

Setting the Error Log File Size

There are two error logs: the HDLM manager log file `dlmmgrn.log` (*n* indicates a file number from 1 to 16) and the HDLM GUI log file `dlmguin.log` (*n* indicates a file number of 1 or 2).

You can specify a value (in kilobytes) from 100 to 2000000 for the error log file size. For HDLM GUI logs, file sizes range from 100 to 9900. If you specify a value over 9901, 9900 will be used. For HDLM manager logs, the specified value will be applied as it is without being limited by the above.

When an error log file reaches its maximum size, the information in the oldest error log file will be overwritten with new information. By specifying both the log file size and the number of log files, you can collect up to 32000000KB (approximately 30GB) of error log information.

- Setting up the error log file size by using the `set` operation

The following is an example of setting up the error log file size by using a command:

```
dlnkmgr set -elfs 1000
```

Specify the size of the error log file in kilobytes.

Setting the Number of Error Log Files

There are two error logs: the HDLM manager log file `dlmmgrn.log` (*n* indicates a file number from 1 to 16) and the HDLM GUI log file `dlmguin.log` (*n* indicates a file number of 1 or 2). You can set the number of files only for the HDLM manager logs in the Options window and by the `set` operation. The number of HDLM GUI log files is set to 2.

You can specify a value from 2 to 16 for the number of HDLM manager log files.

By specifying both the log file size and the number of log files, you can collect up to 32000000KB (approximately 30GB) of error logs.

- Setting up the number of error log files by using the `set` operation

The following is an example of setting up the number of error log files by using a command:

```
dlnkmgr set -elfn 5
```

Specify the number of error log files by using numbers.

Setting the Trace File Size

Trace files for which a trace file size can be set are `hdlmtrn.log` (*n* indicates a file number from 1 to 64). The length of a trace file is fixed, regardless of how much trace information is actually in the file.

For the trace file size, you can specify a value (in kilobytes) from 100 to 16000. If you specify a value smaller than the setting value, the KAPL01097-

W message will be displayed to confirm the execution, and the trace file will be temporarily deleted.

When all the trace files become full, the oldest file is overwritten with any new trace data.

By specifying both the trace file size and the number of trace files, you can collect up to 1024000KB of trace data.

- Setting up the trace file size by using the `set` operation

The following is an example of setting up the trace file size by using a command:

```
dlnkmgr set -systfs 2000
```

Specify the size of the trace file in kilobytes.

Setting the Number of Trace Files

Trace files for which the number of files can be set are `hdlmtrn.log` (*n* indicates a file number from 1 to 64).

For the number of trace files, you can specify a value from 2 to 64. If you specify a value smaller than the value that has already been specified, the KAPL01097-W message will be displayed to confirm the execution, and the trace file will be temporarily deleted.

By specifying both the trace file size and the number of trace files, you can collect up to 1024000KB of trace data.

- Setting up the number of trace files by using the `set` operation

The following is an example of setting up the number of trace files by using a command:

```
dlnkmgr set -systfn 10
```

Specify the number of trace files by using numbers.

Setting Up Audit Log Data Collection

If you want to collect audit log data, you must also specify the collection level for audit log data and the audit log categories.

The table below lists and describes the values for the audit log collection level setting. An audit log data collection level is a severity level. The default is 6.

Table 3-23 Values Indicating Audit Log Data Collection Levels

Value (severity)	Explanation
0	Error-level audit log data is collected.
1	
2	

Value (severity)	Explanation
3	
4	Error-level and Warning-level audit log data is collected.
5	
6	Error-level, Warning-level, and Information-level audit log data is collected.
7	

The table below lists and describes the values for the audit log category setting. The default is `all`.

Table 3-24 Values Indicating Audit Log Data Categories

Value	Explanation
<code>ss</code>	Audit log events of the <code>StartStop</code> category are collected.
<code>c</code>	Audit log events of the <code>Authentication</code> category are collected.
<code>ca</code>	Audit log events of the <code>ConfigurationAccess</code> category are collected.
<code>all</code>	Audit log events of the <code>StartStop</code> , <code>Authentication</code> , and <code>ConfigurationAccess</code> categories are all collected.

This example shows how to enable the collection of audit log data:

```
dlnkmgr set -audlog on -audlv 6 -category all
```

Specify `on` if you want to collect audit log data, and `off` if you do not want to collect audit log data. If you specify `on`, you can use the `-audlv` parameter to specify the collection level for audit log data and the `-category` parameter to specify the audit log categories.

Checking the Updated Settings

This chapter describes how to check the updated settings by using the `dlnkmgr` command's `set` operation after settings have been changed.

When you change some settings, you can display information about all of HDLM function settings. The following shows an example of executing the command:

```
PROMPT>dlnkmgr view -sys -sfunc
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on (extended lio)
Support Cluster : off
Elog Level : 2
Elog File Size (KB) : 1000
Number Of Elog Files : 5
Trace Level : 1
Trace File Size (KB) : 2000
```

```

Number Of Trace Files      : 10
Path Health Checking       : on(10)
Auto Fallback              : on(10)
Remove LU                  : on
Intermittent Error Monitor : on(2/20)
Dynamic I/O Path Control   : off(10)
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

After you have set up the collection of audit log data, use the following command to make sure that the setting has been specified correctly:

```

PROMPT>dlkmgr view -sys -audlog
Audit Log                  : on(6)
Audit Log Category          : all
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Setting Up Integrated Traces

When HDLM is used, the `dlkmgr` command and GUI operation logs are output to the *integrated trace information files* of Hitachi Network Objectplaza Trace Library (HNTRLib2) (*installation-destination-drive:\Program Files#\HITACHI\HNTRLib2\spool\Hntr2n.log* files (*n* indicates a file number)).

#

For Windows Server 2003 (excluding the x86 edition), Windows Server 2008 (excluding the x86 edition), or Windows Server 2012, `Program Files` is `Program Files (x86)`.

If a lot of integrated trace information is output, the older information might end up getting deleted in a very short amount of time. Also, if a large amount of integrated trace information is suddenly all output at the same time, any integrated trace information that is overflowing the buffer might not be saved into the integrated trace files. To save as much information as possible, change the settings for Hitachi Network Objectplaza Trace Library, increasing the integrated trace file size and buffer size. Note that if the values are too large, it will place a heavy load on the system. When determining these values, be sure to consider these operational tradeoffs.

The following table lists the default values and recommended values for the integrated trace file setting.

Table 3-25 Default and Recommended Values for the Integrated Trace File Settings

Setting	Default value	Recommended value
Integrated trace file size	256 (KB)	4096 (KB)

Setting	Default value	Recommended value
Number of integrated trace files	4	8
Buffer size per monitoring interval	Monitoring cycle	10 (seconds)
	Buffer size per monitoring interval	64 (KB)
Number of messages to be output per monitoring interval	Monitoring cycle	0 (seconds)
	Number of messages to be output	0

If Hitachi Network Objectplaza Trace Library (HNTRLib2) is already installed, the existing settings will be inherited. If you change these settings, keep in mind that programs other than HDLM also use them. If an earlier Hitachi Network Objectplaza Trace Library (HNTRLib) is already installed, the settings will not be inherited.

To change the integrated trace file settings:

1. In **Explorer**, double-click the following file:

program-installation-destination-drive:\Program Files#\HITACHI\HNTRLib2\bin\hntr2ut12.exe

If you are using the Server Core environment, execute hntr2ut12.exe from the **Command Prompt** window.

#

For Windows Server 2003 (excluding the x86 edition), Windows Server 2008 (excluding the x86 edition), or Windows Server 2012, Program Files is Program Files (x86).

The dialog box shown in [Figure 3-5 Hitachi Network Objectplaza Trace Utility 2 Release 2.0 Dialog Box. on page 3-85](#) appears.

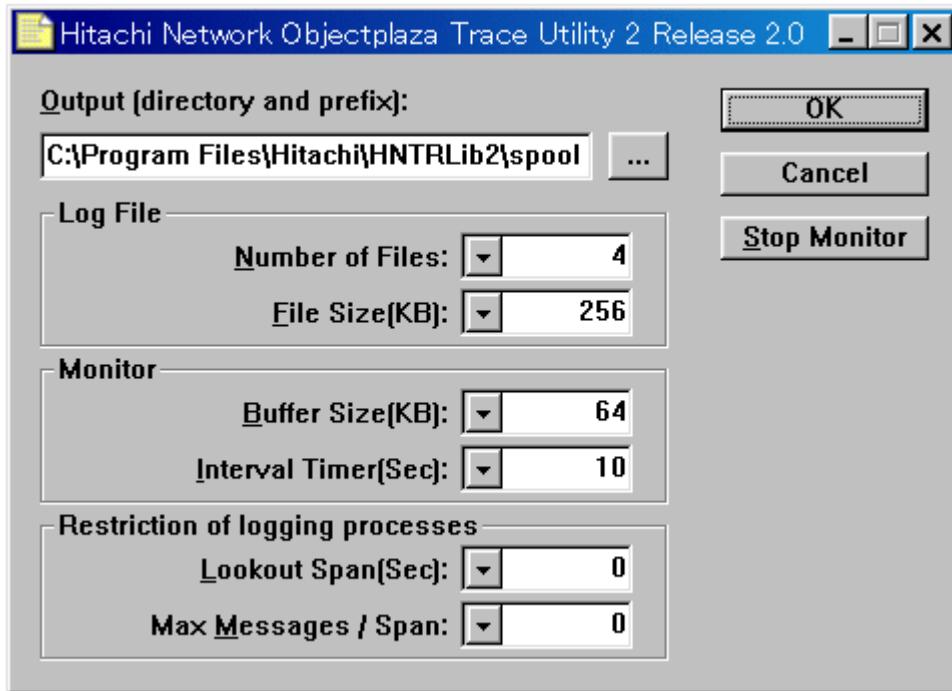


Figure 3-5 Hitachi Network Objectplaza Trace Utility 2 Release 2.0 Dialog Box.

2. In **Number of Files**, change the number of integrated trace files. The default is 4. You can specify a value from 1 to 16. The value you specify here will apply to *n* in *program-installation-destination-drive*: \Program Files\HITACHI\HNTRLib2\spool \Hntr2n.log (*n* indicates a file number).
3. In **File Size(KB)**, change the size of an integrated trace file. The default is 256 (kilobytes). You can specify a value from 8 to 8192. Specify a value greater than or equal to the setting of **Buffer Size(KB)**.
4. In **Buffer Size(KB)**, change the buffer size. Change the buffer size for the monitoring cycle. The default is 64 (kilobytes). You can specify a value from 8 to 2048. Specify a value smaller than or equal to the setting of **File Size(KB)**.
5. In **Interval Timer(Sec)**, enter a value to shorten the monitoring cycle. The default is 10 (seconds). You can specify a value from 1 to 300.
6. In **Lookout Span(Sec)**, enter a value to specify the interval for monitoring the number of messages to be output to the integrated trace file. The default is 0 (seconds). You can specify a value from 0 to 3600. If you specify 0, you cannot adjust the number of messages to be output because the system ignores the setting of **Max Messages / Span**.
7. In **Max Messages / Span**, enter a value to specify the maximum number of messages to be output to the integrated trace file at the monitoring interval specified in **Lookout Span(Sec)**.

The default is 0. You can specify a value from 0 to 500. If you specify 0, you cannot adjust the number of messages to be output. If you specify 0 for **Lookout Span(Sec)**, you cannot adjust the number of messages to be output because the system ignores the **Max Messages / Span** setting.

8. After you finish changing the settings, click the **OK** button. The dialog box closes.
9. Close all of the Hitachi program products that are using Hitachi Network Objectplaza Trace Library, or restart the host. If you choose to restart the host, you do not need to perform step 10.
10. Restart the services of the HDLM manager and Hitachi Network Objectplaza Trace Library for the Hitachi Network Objectplaza Trace Library settings to take effect.

From **Control Panel**, choose **Administrative Tools** and then **Services** to open the Services window.

From the list of services, select **DLMManager**. Then, from the **Action** menu, choose **Restart** to restart the service.

Next, from the list of services, select **Hitachi Network Objectplaza Trace Monitor 2**. Then, from the **Action** menu, choose **Restart** to restart the service.

Removing HDLM

This section explains how to return the operating environment to the way it was before HDLM was installed.

Preparations for HDLM Removal

- Back up all the data on the host where HDLM is installed. Also, if necessary, back up the data on the management target device.
- If firewall exceptions have been registered by using the `firewall_setup` command, remove them. Make sure that you do not use another Hitachi Command Suite product to manage the host after removing HDLM. For details about the `firewall_setup` command, see [firewall_setup command syntax on page 3-70](#) in [Firewall Settings for Managing HDLM by Using Global Link Manager on page 3-70](#).

Notes on Removing HDLM

Note the following when removing HDLM:

- Depending on the environment, removing HDLM might take some time. Do not terminate the removal process while a progress bar for removal is displayed. The following is an approximate calculation of the time required for an removal:

$$(1 \times \text{number-of-connected-paths}) \text{ seconds} \#$$

#

To remove HDLM, you must reconfigure the system to a single-path configuration. The time for doing this does not affect the time required for an removal. Since the removal time depends on the value of the maximum number of paths that can be configured in your environment, use this value for an approximate calculation.

- Before removing HDLM 5.5 or later, make sure that no other application is using an HDLM management-target LU.
- Removing HDLM 05-00 or later also removes Hitachi Network Objectplaza Trace Library (HNTRLib2). If, however, any program other than HDLM is using HNTRLib2, only HDLM will be removed. Before removing HNTRLib2, see the relevant manuals and documentation provided for each program to check whether any other program is using it. Remove HNTRLib2 only when no programs, other than HDLM, are using it. For details on removing HNTRLib2, see [Removing Hitachi Network Objectplaza Trace Library \(HNTRLib2\) on page 3-93](#).
- When removing HDLM on a host where a Device Manager Agent 5.0 or later is installed, do not execute any of the following Device Manager Agent commands during removal. Also, do not remove HDLM while executing any of the following Device Manager Agent commands:
hbsasrv, HiScan, hdvmagt_account, hdvmagt_schedule, hldutil, TIC
- If the Data Execute Prevention (DEP) function on the host is enabled, perform the following procedure:
 - a. Choose **Start, Settings, Control Panel**, and then double-click **System**.
The **System Properties** window is displayed.
 - b. Select the **Advanced** tab. Click the **Settings** button under **Performance**.
The **Performance Option** window is displayed.
 - c. Select the **Data Execution Prevention** tab.
 - d. Clear the **java** check box
 - e. Click the **OK** button.
The DEP function affects the Java runtime environment used by the HDLM GUI.
- If you remove HDLM while resident software such as an antivirus program is running, HDLM might not properly remove. Before removing HDLM, make sure that you have stopped any resident software programs.
- Executing the `removehdlm` utility for removing HDLM requires 20 KB of unused capacity in the folder that was specified by the `-w` parameter (or the folder specified in the `TMP` or `TEMP` environment variable, if the `-w` parameter was not specified).

Removing HDLM

After HDLM is removed, sometimes the files below will not be deleted. The following files will be deleted when you restart the host:

HDLM-installation-folder\DLMTools\perfhdml\provhdml.dll
HDLM-installation-folder\lib\libhdlm.dll
HDLM-installation-folder\lib\hdlmhcc60.dll

The default installation folder for HDLM is *Windows-installation-drive:\Program Files#\HITACHI\DynamicLinkManager*.

#

For Windows Server 2003 (excluding the x86 edition), Windows Server 2008 (excluding the x86 edition), or Windows Server 2012, Program Files is Program Files (x86).

Removal Procedures - in a Non-Cluster Environment

To remove HDLM:

1. Log on to Windows.
Log on as a member of the Administrators group.
2. Stop all the processes and services that use the HDLM management-target paths.
Stop any processes or application services, such as a DBMS, that are using the HDLM management-target paths.
3. If the host and the storage system are connected via multiple paths, reconfigure it so that only one path connects the host to the storage system.
After removing HDLM, if you start the host in a multi-path configuration, the disk contents might become corrupted.

The following figure shows a single path configuration and a multi-path configuration.

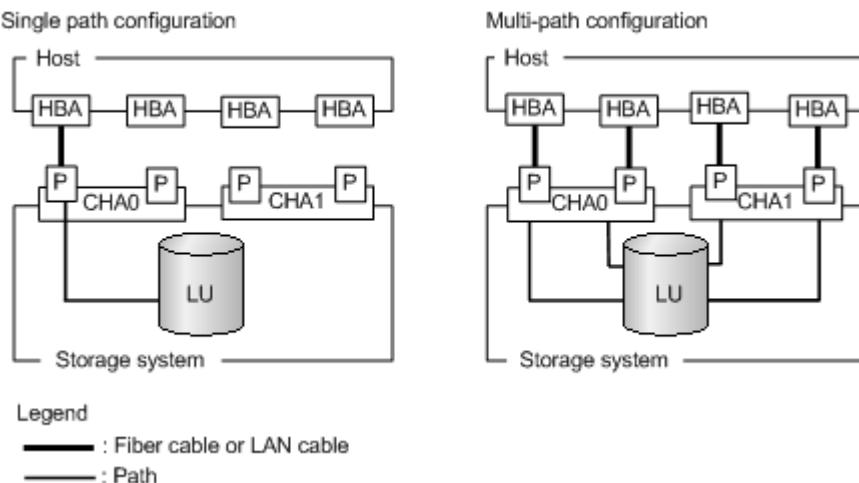


Figure 3-6 Single Path Configuration and Multi-path Configuration

If you have selected an EMC CX series or an HP EVA series LU as the HDLM management-target device, perform the following steps to unregister it. Otherwise, go to step 7.

4. From **Control Panel**, choose **MPIO**.
The MPIO Properties dialog box opens.
5. On the **MPIO-ed Devices** page, select the **hardware ID**, and then click the **Delete** button.
 - For an EMC CX series:
The hardware ID is DGC RAID.
 - For an HP EVA series:
The hardware ID is HP HSV.
6. Click the **OK** button to close the MPIO Properties dialog box.
7. Start the removal program.

In Windows Server 2003:

From **Control Panel**, choose **Add or Remove Programs**, and then **Change or Remove Programs**. From the list of programs, select **Dynamic Link Manager**, and click the **Change/Remove** button.

In Windows Server 2008 (excluding Windows Server 2008 R2):

From **Control Panel**, choose **Programs and Features**. From the list of programs, select **Dynamic Link Manager**, and click the **Uninstall** button. However, if you are using the Server Core environment, see "Server Core environment".

In Windows Server 2008 R2 or Windows Server 2012:

From **Control Panel**, choose **Add or Remove Programs**. From the list of programs, select **Dynamic Link Manager**, and click the **Uninstall** button. However, if you are using the Server Core environment, see "Server Core environment".

Server Core environment:

From the Command Prompt window, execute the `removehdml` utility for removing HDLM.

For details about the `removehdml` utility, see [The removehdml Utility for Removing HDLM on page 7-28](#).

8. The `dlmchkpath` utility is automatically executed. If a warning dialog box appears, follow the procedure below:
 - Cancel the removal. Reconfigure the system into a single-path configuration, and then perform the removal again. For details about the `dlmchkpath` utility, see [The dlmchkpath Utility for Checking HDLM Paths on page 7-14](#).
 - If a warning dialog box is not displayed, go to the next step.
9. Follow the instructions shown in the messages that appear in the window. If the KAPL09005-E message appears, stop the HDLM manager according to the procedure in [Stopping the HDLM Manager on page 4-16](#). After stopping the HDLM manager, restart the removal program.

- When removal finishes, a dialog box appears, prompting you to restart the host.
Click the **OK** button to restart the host.

Removal Procedures - MSCS or VCS Environment

To remove HDLM:

- Log on to Windows.
Log on as a member of the Administrators group.
- Stop all the processes and services that use the HDLM management-target paths.
Stop any processes or application services, such as a DBMS, that are using the HDLM management-target paths.
- Stop MSCS or VCS on all the hosts that make up the cluster.
When MSCS is used, follow the procedure described below.
Choose **Administrative Tools** and then **Services**. In the list of services, right-click **Cluster Service**, and then from the **Action** menu choose **Stop** to stop the service.
A message prompting you to restart the system might be displayed. If this happens, choose **No**.
- If a host and a storage system are connected via multiple paths, reconfigure it so that only one path connects the host to the storage system.
Removing HDLM in a multi-path configuration, might cause the disk contents to become corrupted when the host restarts. Make sure that you remove HDLM from a single path configuration only.

The following figure shows a single path configuration and a multi-path configuration.

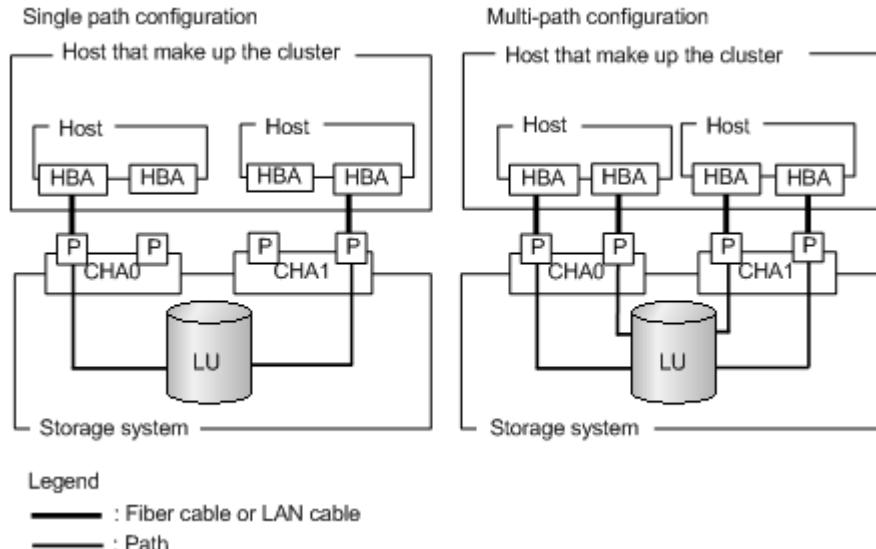


Figure 3-7 Single Path Configuration and Multi-path Configuration

In Windows Server 2008, if you have selected an EMC CX series or an HP EVA series LU as the HDLM management-target device, perform the following steps to unregister it. Otherwise, go to step 8.

5. From **Control Panel**, choose **MPIO**.
The MPIO Properties dialog box opens.
6. On the **MPIO-ed Devices** page, select the **hardware ID**, and then click the **Delete** button.
 - For an EMC CX series:
The hardware ID is DGC RAID.
 - For an HP EVA series:
The hardware ID is HP HSV.
7. Click the **OK** button to close the MPIO Properties dialog box.
8. Start the removal program.

In Windows Server 2003:

From **Control Panel**, choose **Add or Remove Programs**, and then **Change or Remove Programs**. From the list of programs, select **Dynamic Link Manager**, and click the **Change/Remove** button.

In Windows Server 2008 (excluding Windows Server 2008 R2):

From **Control Panel**, choose **Programs and Features**. From the list of programs, select **Dynamic Link Manager**, and click the **Uninstall** button. However, if you are using the Server Core environment, see "Server Core environment".

In Windows Server 2008 R2 or Windows Server 2012:

From **Control Panel**, choose **Add or Remove Programs**. From the list of programs, select **Dynamic Link Manager**, and click the **Uninstall** button. However, if you are using the Server Core environment, see "Server Core environment".

Server Core environment:

From the Command Prompt window, execute the `removehdlm` utility for removing HDLM.

For details about the `removehdlm` utility, see [The removehdlm Utility for Removing HDLM on page 7-28](#).

9. The `dlmchkpath` utility is automatically executed. If a warning dialog box appears, follow the procedure below:
 - Cancel the removal. Reconfigure the system into a single-path configuration, and then perform the removal again. For details about the `dlmchkpath` utility, see [The dlmchkpath Utility for Checking HDLM Paths on page 7-14](#).
 - If a warning dialog box is not displayed, go to the next step.
10. Follow the instructions shown in the messages that appear in the window. Remove HDLM from all the hosts that make up the cluster.

If the KAPL09005-E message appears, stop the HDLM manager according to the procedure in [Stopping the HDLM Manager on page 4-16](#). After stopping the HDLM manager, restart the removal program.

11. When removal finishes, shut down all the hosts that make up the cluster.
12. Confirm that all hosts are turned off, and are in a single-path configuration.
13. Restart all of the hosts that make up the cluster.

Removal Procedures - Oracle RAC Environment

To remove HDLM:

1. Log on to Windows as a member of the Administrators group.
2. Stop the Oracle RAC instance of the host where HDLM is to be removed.
3. If a host and a storage system are connected via multiple paths, reconfigure it so that only one path connects the host to the storage system.

Removing HDLM in a multi-path configuration, might cause the disk contents to become corrupted when the host restarts. Make sure that you remove HDLM in a single path configuration only.

[Figure 3-7 Single Path Configuration and Multi-path Configuration on page 3-90](#) shows a single path configuration and a multi-path configuration.

In Windows Server 2008, if you have selected an EMC CX series or an HP EVA series LU as the HDLM management-target device, perform the following steps to unregister it. Otherwise, go to step 7.

4. From **Control Panel**, choose **MPIO**.
The MPIO Properties dialog box opens.
5. On the **MPIO-ed Devices** page, select the **hardware ID**, and then click the **Delete** button.
 - For an EMC CX series:
The hardware ID is `DGC RAID`.
 - For an HP EVA series:
The hardware ID is `HP HSV`.
6. Click the **OK** button to close the MPIO Properties dialog box.
7. Start the removal program.
From **Control Panel**, choose **Add or Remove Programs**, and then **Change or Remove Programs**. From the list of programs, select **Dynamic Link Manager**, and click the **Change/Remove** button.
8. The `dlmchkpath` utility is automatically executed. If a warning dialog box appears, follow the procedure below:
 - Cancel the removal. Reconfigure the system into a single-path configuration, and then perform the removal again. For details about the `dlmchkpath` utility, see [The dlmchkpath Utility for Checking HDLM Paths on page 7-14](#).
 - If a warning dialog box is not displayed, go to the next step.

9. Follow the instructions shown in the messages that appear in the window. If the KAPL09005-E message appears, stop the HDLM manager according to the procedure in [Stopping the HDLM Manager on page 4-16](#). After stopping the HDLM manager, restart the removal program.
10. After removal finishes, restart the host.
11. Start the Oracle RAC instance of the host.
12. For all the hosts that make up the cluster system, perform steps 1 through 11.
13. When using Oracle RAC 10g 10.1.0.3.0 or later, or Oracle RAC 11g, you must return the values of `MISSCOUNT` and `DISKTIMEOUT` (the I/O timeout thresholds of the voting disk) to the values that they were set to before HDLM was installed.
For details on how to set the value of the `MISSCOUNT` and `DISKTIMEOUT`, contact the company with which you have an Oracle support service contract.

Removing Hitachi Network Objectplaza Trace Library (HNTRLib2)

When you remove HDLM, if the KAPL09019-E or KAPL09020-E message is output, follow the directions below to remove HNTRLib2:

1. Log on to Windows as a member of the Administrators group.
If the KAPL09019-E message appears during the removal of HDLM, go to step 2.
If the KAPL09020-E message appears during the removal of HDLM, go to step 3.
2. Execute the following command^{#1} to unregister program products that include HNTRLib2:

```
"C:\Program Files#2\HITACHI\HNTRLib2\bin\hntr2cancel.exe"
"Hitachi Dynamic Link Manager"
```
3. Execute the following command^{#1} to check if any program is using HNTRLib2:

```
"C:\Program Files#2\HITACHI\HNTRLib2\bin\hntr2getname.exe"
```

If the name of a program using HNTRLib2 is displayed, a program other than HDLM is using HNTRLib2. If this happens, do not delete HNTRLib2. No further steps are required.
If no names of programs using HNTRLib2 are displayed, go to the next step.
4. Execute the following command^{#1} to remove HNTRLib2:

```
"C:\Program Files#2\HITACHI\HNTRLib2\unsetup\unsetup.exe"
```
5. After the removal of HNTRLib2 finishes, restart the host.

#1

If you are using Windows Server 2008 or Windows Server 2012, execute the command from the **Administrator: Command Prompt** window.

#2

For Windows Server 2003 (excluding the x86 edition), Windows Server 2008 (excluding the x86 edition), or Windows Server 2012, Program Files is Program Files (x86).

Notes:

- If HNTRLib2 is being used by another program, the KAPL09026-I message will appear and HNTRLib2 will not be removed.
If you are unable to complete removal even though no programs other than HDLM are using HNTRLib2, contact your HDLM vendor or, if you have a maintenance contract for HDLM, contact maintenance company.
- If the log output folder in HNTRLib2 is not the default folder, the log files will not be deleted during the removal. If this happens, delete these files manually after the removal finishes.
- For Windows Server 2003 (x86), removing HDLM does not delete the HNTRLib2 common library file hntr2t.dll. Even if this file remains undeleted, other applications will not be affected. To delete this file, perform the following procedure:
 - a. Start the registry editor (regedit.exe) and check that the following registry key does not exist:

HKEY_LOCAL_MACHINE\SOFTWARE\HITACHI\COMMON_DLL\HNTRLIB2

If this key exists, it means another application is using the hntr2t.dll file. If this is the case, do not delete the hntr2t.dll file.

- b. Open the folder specified in the following registry:

HKEY_LOCAL_MACHINE\SOFTWARE\HITACHI\COMMON_DLL\PathName\Path00

The default is C:\Program Files\Common Files\Hitachi.

- c. Check that the hntr2t.dll file exists and the hntr2sys.dll and hntr2tj.dll files do not exist in the folder, and then delete the hntr2t.dll file.

Clearing the Persistent Reservation

If the persistent reservation remains in an LU after HDLM is removed, use the utility for clearing HDLM persistent reservations (dlmpr) to clear the persistent reservation. However, if you follow the removal procedure in this manual, the persistent reservation will not remain and will not need to be deleted manually.

For details about how to clear the persistent reservation in the LU, see [The dlmpr Utility for Clearing HDLM Persistent Reservations on page 7-10](#).

Note:

- If HDLM is removed in one of the following situations, the persistent reservation in the LU will remain:

- When MSCS or VCS is running

- When a cable is not connected to the host

To remove HDLM, follow the procedure in [*Removal Procedures - MSCS or VCS Environment on page 3-90*](#) in [*Removing HDLM on page 3-88*](#).

- You can execute this utility if the following conditions are satisfied:
 - HDLM has been removed.
 - The services and drivers in the cluster system are not running.

HDLM Operation

This chapter describes the operating procedures for HDLM, including how to operate HDLM and the HDLM manager, and how to change the configuration of the operating environment.

- [Notes on Using HDLM](#)
- [HDLM Operations Using the HDLM GUI](#)
- [Using Commands for HDLM Operations](#)
- [Using the Windows Administrative Tool \(Performance\) to Check Path Information](#)
- [Starting and Stopping the HDLM Manager](#)
- [HDLM Resident Processes](#)
- [Reconfiguring the HDLM Operating Environment](#)

Notes on Using HDLM

This section contains notes that are important for running HDLM operations.

Using a Storage Management Program

You must not change the vendor ID and product ID of a storage system. If you change these IDs, HDLM will not be able to recognize the storage system.

Upgrading Windows

Always remove HDLM before upgrading or re-installing Windows, or before installing a Windows Server 2003 service pack. If you upgrade or re-install Windows without removing HDLM, HDLM might not be able to properly manage paths after that because OS device drivers related to HDLM operation are updated.

Note that once service packs become available for Windows Server 2012, you will not need to uninstall HDLM before installing a Windows Server 2012 service pack.

Using MSCS

When the Number of Displayed Paths Is Less than the Actual Number of Paths

When displaying path information, the number of paths displayed might be less than the actual number of paths. This occurs when one host uses an LU exclusively, preventing other hosts from obtaining information about the devices for that LU. When this is resolved and the information can be obtained, the host will be able to display all the paths.

When a System Event Occurs in an MSCS Environment

When you start up a standby node, or when a standby node has recovered from a path error, the following event is issued and output to the system event log. However, this will not affect system operations:

Source: mpio
Event ID: 20
Description: A Path Verification request to a device on \Device \MPIODiskn that is controlled by Hdlm Device-Specific Module has failed. This may indicate a Path Failure.

This event occurs when the MPIO checks the disk before initializing it and the standby node cannot use the LU because the active node is using it.

Using the EMC DMX series, EMC CX series, and HP EVA series

- The EMC DMX series, EMC CX series, and HP EVA series can be managed by using the HDLM versions listed below.
 - If the OS is Windows Server 2003:

- EMC DMX series and EMC CX series: HDLM 5.7 or later
- HP EVA series: HDLM 5.9.1 or later
- If the OS is Windows Server 2008:
 - EMC CX series: HDLM 6.4 or later
- You can display and use the HDLM GUI windows for the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, Universal Storage Platform V/VM series, and Virtual Storage Platform series. If you specify the EMC DMX series, EMC CX series, or HP EVA series as an HDLM management-target device, use HDLM commands to display information and set the operating environment. For details about the various command operations, see [Chapter 6, Command Reference on page 6-1](#).
- When using the EMC CX series, connect only one storage port to the switch, and then connect the switch to the server in a multi-path configuration.

Using Symantec Backup Exec for Windows and the Veritas NetBackup Intelligent Disaster Recovery Function

When you use Symantec Backup Exec for Windows and the Veritas NetBackup Intelligent Disaster Recovery function, the following might occur:

- If all the paths experience a failure, and then Windows is able to recognize some or all of the paths, the disk numbers might end up changing from the ones that were used when the host first started up. If that happens, restarting the host will restore the original disk numbers. After restoring the original disk numbers, use Symantec Backup Exec for Windows or the Veritas NetBackup Intelligent Disaster Recovery function.
- If you restore Windows Server 2003, the `STOP:c0000135` error message will appear and the system will stop. If that happens, restart the host. If the Windows Management Instrumentation information cannot be restored, then the HDLM performance monitor can no longer be used. If that happens, re-install HDLM.

Using Windows Server 2008 or Windows Server 2012

Windows Server 2008 or Windows Server 2008 supports user account control (UAC). You can use any of the following methods to execute HDLM functions (the `dlnkmgr` command, utilities, the HDLM GUI, and so on) in Windows Server 2008 or Windows Server 2008:

- Perform the HDLM operation using the Administrator account.
- To execute the `dlnkmgr` command or an HDLM utility as a non-administrator user, use the **Administrator: Command Prompt** window.
- To access the HDLM GUI or acquire error information with an account as a non-administrator user, use the **Run as administrator**.

If you attempt to perform an HDLM operation by any other method, a dialog box will appear, requesting confirmation that you have administrator permissions.

Notes on Using Replication Manager

If you use Replication Manager to hide secondary volumes, Windows will no longer be able to access the disks. Because the HDLM path is blocked, the path status changes to Offline(E) or Online(E). As a result, a path failure message might be output to the application event log, but this does not affect operations.

HDLM Operations Using the HDLM GUI

This chapter explains the procedures for operating the HDLM GUI window components. For details on the components of each window, see the HDLM GUI Help.

Notes on Using the HDLM GUI

This subsection provides notes on using the HDLM GUI window. Be sure to read this section.

- Make sure to start the HDLM GUI on a computer whose screen resolution is XGA or better. You cannot use the HDLM GUI on a computer whose screen resolution is VGA.
- Make sure that the screen display is in full color. If the display color is set to 256 colors, when you start the HDLM GUI, the shades of colors will be rendered incorrectly.
- The HDLM GUI is unavailable in the Server Core environment of Windows Server 2008 or Windows Server 2012.
- You cannot use an HDLM GUI shortcut that was copied from a version of HDLM earlier than 5.8. Create a new HDLM GUI shortcut.

Viewing the GUI Help

To view the HDLM GUI Help:

1. Log on to Windows.
Log on as a member of the Administrators group.
2. From the **Start** menu, select **Programs**, **Dynamic Link Manager**, and then **HDLM GUI**.
The **Path List** view of the Path Management window is displayed.
In Windows Server 2008 or Windows Server 2012, if you have logged on as a non-administrator user, use the **Run as administrator** to run the HDLM GUI.
3. Click the **Help** button.
The Web browser displays the HDLM GUI Help in the Help window.

Using Commands for HDLM Operations

This section explains how to use the HDLM command. For details on the various command operations, see [Chapter 6, Command Reference on page 6-1](#).

Notes on Using Commands

- Execute the HDLM command as a member of the Administrators group. Windows Server 2008 or Windows Server 2012 supports user account control (UAC). For this reason, use either of the following procedures to execute HDLM commands:
 - Execute the HDLM command using the Administrator account.
 - To execute an HDLM command with a non-administrator account, use the **Administrator: Command Prompt** window.
- If you attempt to execute an HDLM command by any other method, you might be asked whether you have administrator permissions.
- To specify a parameter value containing one or more spaces, enclose the entire value in double quotation marks ("").
- If the I/O load on the dynamic disk is heavy, it might take a long time to execute the `view` operation.

Viewing Path Information

This section explains how to display path information by using an HDLM command.

To display path information, execute the `dlnkmgr` command's `view` operation with the `-path` parameter specified. The following example shows how to execute the command:

```

PROMPT>dlnkmgr view -path
Paths:000016 OnlinePaths:000016
PathStatus IO-Count IO-Errors
Online 1199 0

PathID PathName          DiskName          ILO
ChaPort Status Type IO-Count IO-Errors DNum HDevName
000000 0002.0000.000000000000.0008 BMC .SYMMETRIX .-
6006048000018...
- Online - 131 0 0 L
000001 0002.0000.000000000000.000C BMC .SYMMETRIX .-
6006048000018...
- Online - 132 0 0 M
000002 0002.0000.000000000000.000D BMC .SYMMETRIX .-
6006048000018...
- Online - 131 0 0 N
000003 0002.0000.000000000000.000E BMC .SYMMETRIX .-
6006048000018...
- Online - 133 0 0 O
000004 0002.0000.000000000001.0000 DGC .RAID 10 .-
6006016099C50...
- Online - 203 0 0 F
000005 0002.0000.000000000001.0001 DGC .RAID 5 .-
6006016099C50...
- Online - 174 0 0 G
000006 0002.0000.000000000002.0000 HITACHI .DF600P .0329 0000
0A Online Own 138 0 0 P
000007 0002.0000.000000000002.0001 HITACHI .DF600P .0329 0001
0A Online Non 0 0 0 Q
000008 0003.0000.000000000001.0000 DGC .RAID 10 .-
6006016099C50...
- Online - 0 0 0 F
000009 0003.0000.000000000001.0001 DGC .RAID 5 .-
6006016099C50...
- Online - 0 0 0 G
000010 0003.0000.000000000001.0000 BMC .SYMMETRIX .-
6006048000018...
- Online - 4 0 0 L
000011 0003.0000.000000000001.0001 BMC .SYMMETRIX .-
6006048000018...
- Online - 5 0 0 M
000012 0003.0000.000000000001.0002 BMC .SYMMETRIX .-
6006048000018...
- Online - 4 0 0 N
000013 0003.0000.000000000001.0003 BMC .SYMMETRIX .-
6006048000018...
- Online - 6 0 0 O
000014 0003.0000.000000000002.0000 HITACHI .DF600P .0329 0000
LA Online Non 0 0 0 P
000015 0003.0000.000000000002.0001 HITACHI .DF600P .0329 0001
LA Online Own 138 0 0 Q
KAPL01001-i The HDLM command completed normally. Operation name = view, completion time = yyyy/mm/dd
hh:mm:ss
PROMPT>

```

For details on the displayed items and their descriptions, see [view \(Displays Information\) on page 6-33](#).

Changing the Status of Paths

This section explains how to change path statuses.

Changing the Status of Paths to Online

To change the status of paths to online:

1. Check the current status of the paths.

To place paths online by specifying an HBA port, CHA port, single path, or HBA port WWN, check the path name or PATH_ID used to manage the path.

The following example shows how to execute the command:

```
dlnkmgr view -path
```

2. To change the status of paths to online, execute the dlnkmgr command's `online` operation.

The paths to be placed online can be specified by using an HBA port, CHA port, single path, or HBA port WWN. For details on how to specify paths, see [online \(Places Paths Online\) on page 6-11](#).

For example, if you want to place all the paths that pass through a specific HBA port online, execute the dlnkmgr command's `online`

operation with the `-hba` parameter specified. The following shows an example of executing this command:

```
PROMPT>dlnkmgr online -hba 1.1
KAPL01057-I All the paths which pass the specified HBA will be
changed to the Online status. Is this OK? [y/n]:y
KAPL01061-I 3 path(s) were successfully placed Online; 0 path(s)
were not. Operation name = online
PROMPT>
```

3. Check to see if the statuses of all the applicable paths have changed. The following example shows how to execute the command:

```
dlnkmgr view -path
```

Changing the Status of Paths to Offline(C)

To change the status of paths to Offline(C):

1. Check the current status of the paths.

To change the status of a path to Offline(C) by specifying an HBA port, CHA port, single path, or HBA port WWN, check the path name or PATH_ID used to manage the path.

The following example shows how to execute the command:

```
dlnkmgr view -path
```

2. To change the status of paths to Offline(C), execute the `dlnkmgr` command's `offline` operation.

The paths to be placed offline can be specified by using an HBA port, CHA port, single path, or HBA port WWN. For details on how to specify paths, see [offline \(Places Paths Offline\) on page 6-6](#).

For example, if you want to place all the paths that pass through a specific HBA port offline, execute the `dlnkmgr` command's `offline` operation with the `-hba` parameter specified. The following shows an example of executing this command:

```
PROMPT>dlnkmgr offline -hba 1.1
KAPL01055-I All the paths which pass the specified HBA port will
be changed to the Offline(C) status. Is this OK? [y/n]:y
KAPL01056-I If you are sure that there would be no problem when
all the paths which pass the specified HBA are placed in the
Offline(C) status, enter y. Otherwise, enter n. [y/n]:y
KAPL01061-I 3 path(s) were successfully placed Offline(C); 0
path(s) were not. Operation name = offline
PROMPT>
```

3. Check to see if the statuses of all the applicable paths have changed. The following example shows how to execute the command:

```
dlnkmgr view -path
```

Viewing LU Information

This section explains how to display LU information by using an HDLM command.

To display LU information, execute the `dlnkmgr` command's `view` operation with the `-lu` parameter specified. The following shows an example in which the command is executed:

```
PROMPT>dlnkmgr view -lu
Product      : HUS_VM
SerialNumber : 210945
LUs          : 3

iLU  HDevName PathID Status
0960 -      000000 Online
                  000003 Online
0961 -      000001 Online
                  000004 Online
0962 -      000002 Online
                  000005 Online

Product      : VSP_G1000
SerialNumber : 10051
LUs          : 3

iLU  HDevName PathID Status
001836 -      000006 Online
                  000009 Online
001837 -      000007 Online
                  000010 Online
001838 -      000008 Online
                  000011 Online
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

For details on the displayed items and their descriptions, see [view \(Displays Information\) on page 6-33](#).

Initializing Statistical Information for Paths

This section explains how to initialize statistical information (I/O counts and I/O errors) for all the paths managed by HDLM.

This procedure is useful when you want to check the number of I/O operations and I/O errors that have occurred since the last time the I/O counts and I/O errors were initialized to 0.

To initialize statistical information for paths:

1. Check the current status of the path.

The following shows how to execute the command:

```
dlnkmgr view -path
```

2. To initialize statistical information for all the paths managed by HDLM, execute the `dlnkmgr` command's `clear` operation with the `-pdst` parameter specified.

The following shows an example in which the command is executed:

```
PROMPT>dlnkmgr clear -pdst
KAPL01049-I Would you like to execute the operation? Operation
name = clear [y/n]:y
KAPL01001-I The HDLM command completed normally. Operation name
= clear, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

3. Check to see whether the statistical information for all the paths has been initialized.

The following shows how to execute the command:

```
dlnkmgr view -path
```

Viewing and Setting Up the Operating Environment

This section explains how to display and set up the HDLM operating environment.

Viewing the Operating Environment

To display the operating environment, execute the `dlnkmgr` command's `view` operation with the `-sys` and `-sfunc` parameters specified.

The following shows an example in which the command is executed:

```
PROMPT>dlnkmgr view -sys -sfunc
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on(extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size(KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Failback : on(1)
Remove LU : on
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
```

PROMPT>

To display the operating environment of the audit log, execute the HDLM command's **view** operation with the **-sys** and **-audlog** parameters specified.

```
PROMPT>dlnkmgr view -sys -audlog
Audit Log : off
Audit Log Category : -
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

For details on the displayed items and their descriptions, see [view \(Displays Information\) on page 6-33](#).

Setting Up the Operating Environment

To set up the HDLM operating environment, execute the `dlnkmgr` command's **set** operation. This operation allows you to set up the following functions:

- Load balancing
- Path health checking
- Automatic fallback
- Intermittent error monitoring
- Dynamic I/O path control
- Displaying the physical storage system information
- LU dynamic deletion
- Error log collection level
- Trace level
- Error log file size
- The number of error log files
- Trace file size
- The number of trace files
- Number of times the same path can be used for load balancing
- Number of times the same path can be used for extended load balancing (sequential I/O)
- Number of times the same path can be used for extended load balancing (random I/O)

For details on how to set up each function, see [set \(Sets Up the Operating Environment\) on page 6-16](#).

For example, to set up the error log collection level, execute the `dlnkmgr` command's **set** operation with the **-ellv** parameter specified. When the confirmation message is displayed, enter **y** to execute, or **n** to cancel the command.

The following shows an example in which the command is executed:

```
PROMPT>dlnkmgr set -ellv 1
KAPL01049-I Would you like to execute the operation? Operation name
= set [y/n]: y
KAPL01001-I The HDLM command completed normally. Operation name =
set, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

To check whether the settings have been applied, perform the procedure described in [Viewing the Operating Environment on page 4-9](#).

Viewing License Information

This section explains how to display license information.

To display license information, execute the `dlnkmgr` command's `view` operation with the `-sys` and `-lic` parameters specified.

The following shows an example in which the command is executed.

```
PROMPT>dlnkmgr view -sys -lic
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

For details on the displayed items and their descriptions, see [view \(Displays Information\) on page 6-33](#).

Updating the License

This section explains how to update the license.

To update the license, execute the `dlnkmgr` command's `set` operation with the `-lic` parameter specified. When the confirmation message is displayed, enter `y` to execute, or `n` to cancel the command. If the license key file does not exist, a message asking you to enter the license key appears, so enter the license key.

Note:

When you are executing the `dlnkmgr` command's `set` operation with the `-lic` parameter to install the license, you can only execute it once at a time. If you attempt to execute more than one `dlnkmgr` command containing the `set` operation with the `-lic` parameter, the following message might appear and HDLM might terminate abnormally:

KAPL01075-E A fatal error occurred in HDLM. The system environment is invalid.

If this message appears, execute the `dlnkmgr` command's `view` operation with the `-sys -lic` parameter to make sure that the license is installed correctly.

The following shows an example in which the command is executed:

```
PROMPT>dlkmgr set -lic
KAPL01049-I Would you like to execute the operation? Operation name
= set [y/n]: y
KAPL01071-I A permanent license was installed.
PROMPT>
```

Viewing HDLM Version Information

This section explains how to display HDLM version information.

To display HDLM version information, execute the `dlkmgr` command's `view` operation with the `-sys` parameter specified. The following shows an example in which the command is executed:

```
PROMPT>dlkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on(extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Fallback : on(1)
Remove LU : on
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver
Alive x.x.x-xx WakeupTime yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver
Alive x.x.x-xx WakeupTime yyyy/mm/dd hh:mm:ss ElogMem Size 128
HDLM Driver Ver
Alive x.x.x-xx WakeupTime yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

The value displayed in `HDLM Version` indicates the HDLM version.

Viewing HDLM Component Information

This section explains how to display HDLM component information.

To display HDLM component information, execute the `dlkmgr` command's `view` operation with the `-sys` parameter specified. The following shows an example in which the command is executed:

```
PROMPT>dlkmgr view -sys
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on(extended lio)
Support Cluster : off
```

```

Elog Level : 3
Elog File Size (KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Fallback : on(1)
Remove LU : on
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Among the displayed items, **HDLM Manager**, **HDLM Alert Driver**, and **HDLM Driver** indicate the HDLM component information.

Also, you can view information for each HDLM component. Execute the **dlnkmgr** command's **view** operation with the **-sys** and subsequent parameter specified. The following shows an example in which the command is executed:

```

dlnkmgr view -sys -msrv
dlnkmgr view -sys -adrv
dlnkmgr view -sys -pdrv

```

Using the Windows Administrative Tool (Performance) to Check Path Information

The HDLM Performance Monitor uses the Windows administrative tool **Performance** to display path information.

Note:

- The function for checking path information using the Windows administrative tool is not supported in a non-x86 edition of Windows Server 2003, Windows Server 2008, or Windows Server 2012.
- If an error occurs in the HDLM performance monitor, performance information is not collected after the error. To restart the acquisition of performance information, restart the host.

To add a counter that HDLM provides:

1. Click **Start**, **Settings**, and then **Control Panel**. Double click **Administrative Tools**, and then double click **Performance**.

The Performance window appears.

2. Right-click the window showing the system monitor details, and then choose **Add Counters**.
The Add Counters window appears.
3. Select the performance object, counter, and instance.
In the **Performance object** drop-down list, select **HDLM**.
In the list box on the lower-left side of the window, select the counter you want to monitor. To monitor all counters, select the **All counters** check box. [Table 4-1 List of Counters on page 4-14](#) lists the counters you can select.
In the list box on the lower-right side of the window, select the instance you want to monitor. To monitor all instances and the total number value, select the **All instances** check box. [Table 4-2 Selectable Items for Instances on page 4-14](#) lists and describes selectable items for the instances displayed in the list box.
4. Click the **Add** button.
Monitoring of path information will start.

Table 4-1 List of Counters

Counter name	Description
Avg.Disk Bytes/Transfer	The average number of bytes transferred between disks during one operation.
Avg.Disk Bytes/Read	The average number of bytes transferred from the disk during one operation.
Avg.Disk Bytes/Write	The average number of bytes transferred to the disk during one operation.
Disk Bytes/Sec	The amount of data transferred per second between disks during read or write operations.
Disk Read Bytes/Sec	The amount of data transferred per second from the disk during read operations.
Disk Write Bytes/Sec	The amount of data transferred per second to the disk during write operations.

Table 4-2 Selectable Items for Instances

Selectable items#	Description
_Total	Selecting this item displays the total value of each instance.
<i>pathid</i> disk-number drive-letter	Selecting this item displays the instance of the selected path. The following items are displayed for each path (sorted in ascending order of <i>pathid</i>): <ul style="list-style-type: none"> • <i>pathid</i>

Selectable items#	Description
	<p>Displays AutoPATH_ID. This is the same value as when PathID is displayed by executing the <code>dlnkmgr</code> command's <code>view</code> operation with the <code>-path</code> parameter.</p> <ul style="list-style-type: none"> • <i>disk-number</i> Displays the disk number of disks displayed in the Disk Management window of Windows. If acquisition of a disk number fails, a hyphen (-) is displayed. • <i>drive-letter</i> This item displays Windows drive letters. This is the same value as when <code>HDevName</code> is displayed by executing the <code>dlnkmgr</code> command's <code>view</code> operation with the <code>-path</code> parameter. If you are using a dynamic disk, or if the drive letter is not assigned, a hyphen (-) is displayed.

#

If no LUs are being managed by HDLM, `<No Instances>` will be displayed.

Starting and Stopping the HDLM Manager

If an error occurs in the system, such as in an HDLM program, you might need to manually stop or start HDLM to recover from the error.

Starting the HDLM Manager

During installation, the HDLM manager is registered as a Windows service and the startup type is set to **Automatic**. This means that when Windows starts, the HDLM manager will also start automatically.

If, for some reason, the HDLM manager does not automatically start, do the following:

Log on to Windows as a member of the Administrators group. From **Control Panel**, choose **Administrative Tools**, and then **Services**. In Windows Server 2008 or Windows Server 2012, log on using the Administrator account, and then from the **Control Panel**, choose **Administrative Tools** and **Services**. From the list of services, double-click **DLMManager**, and then click the **Start** button.

Use the following `dlnkmgr` command's `view` operation to confirm that the HDLM manager has started.

```
PROMPT>dlnkmgr view -sys -msrv
HDLM Manager Ver           WakeupTime
Alive          x.x.x-xx    yyyy/mm/dd hh:mm:ss
```

```
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

When the HDLM Manager column shows **Alive**, the HDLM manager is active.

Stopping the HDLM Manager

When you remove, upgrade, or re-install HDLM, the HDLM manager will automatically stop.

If, for some reason, the HDLM manager does not automatically stop, stop it as follows:

Log on to Windows as a member of the Administrators group. In **Control Panel**, choose **Administrative Tools**, and then **Services**. In Windows Server 2008 or Windows Server 2012, log on using the Administrator account, and then from the **Control Panel**, choose **Administrative Tools**, and then **Services**. From the list of services, double-click **DLMManager**, and then click the **Stop** button.

Use the following `dlnkmgr` command's `view` operation to confirm that the HDLM manager has stopped.

```
PROMPT>dlnkmgr view -sys -msrv
HDLM Manager Ver      WakeupTime
Dead
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

When the HDLM Manager column shows **Dead**, the HDLM manager is inactive.

HDLM Resident Processes

The table below lists and describes the resident processes in HDLM. To monitor these processes, use the names below.

Table 4-3 HDLM resident processes

Process	Service	Description
dlmmgr.exe	DLMManager	HDLM manager process
hbsa_service.exe	HBsA Service	Hitachi Command Suite Common Agent Component# process
hntr2mon.exe hntr2srv.exe	Hitachi Network Objectplaza Trace Monitor 2	Hitachi Network Objectplaza Trace Library (HNTRLib2) process

#

You only need to monitor this process when HDLM is linked to Global Link Manager.

This process does not exist if you install only the HDLM Core components.

Reconfiguring the HDLM Operating Environment

You can add or delete LUs and paths while the host installing HDLM is running by utilizing the Windows plug-and-play functionality. This operation is called dynamic reconfiguration.

Setting Up an Added LU and Path as an HDLM Management-target

This section explains the procedure for setting up an added LU and path as an HDLM management-target.

The procedure explained below to set up an added LU as an HDLM management-target applies to both adding an LU in new storage and adding an LU in existing storage.

If you add a new LU, leave the system in a single-path configuration until you can verify whether HDLM has successfully identified the new LU.

When using HDLM, you need to write a signature, create partitions, and format all LUs that have been added.

Setting Up an Added LU as an HDLM Management-target

When MSCS is not used

1. Add an LU.

Some storage systems need to be restarted. Consult the corresponding manual for the particular storage system you are using.

2. Open **Disk Manager**.

3. If the LU is not displayed in the Disk Management window, perform the following operations to add the LU as an HDLM management-target.

- From the Device Manager window of Windows, select **Disk drives**, and then click **Scan for hardware changes**.

- From the Disk Management window of Windows, click **Rescan Disks**.

4. Use the `dlnkmgr view -path` command or the HDLM GUI to confirm that the PathID has been added.

The figure below shows an example of how to use the command to confirm that an LU has been added. For details about the HDLM GUI, see the HDLM GUI Help.

Before addition of LU

```
PROMPT>dnlinkmgr view -path
Paths:000002  OnlinePaths:000002
PathStatus  IO-Count  IO-Errors
Online     1486      0

PathID  PathName          DiskName          iLU  ChaPort Status  Type  IO-Count IO-Errors  DNum  HDevName
000000  0004.0001.0000000000000000.0001  HITACHI .DF600F .0051  0010 0A  Online  Own   1427    0      0      F
000001  0005.0001.000000000000007A.0001  HITACHI .DF600F .0051  0011 1A  Online  Non   59     0      0      D

KAPL01001-I The HDLM command completed normally. Operation name =view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

After addition of LU

```
PROMPT>dnlinkmgr view -path
Paths:000003  OnlinePaths:000003
PathStatus  IO-Count  IO-Errors
Online     1609      0

PathID  PathName          DiskName          iLU  ChaPort Status  Type  IO-Count IO-Errors  DNum  HDevName
000000  0004.0001.0000000000000000.0001  HITACHI .DF600F .0051  0010 0A  Online  Own   1427    0      0      F
000001  0005.0001.000000000000007A.0001  HITACHI .DF600F .0051  0011 1A  Online  Non   59     0      0      D
000002  0008.0001.000000000000007A.0001  HITACHI .DF600F .0051  0020 1A  Online  Non   123    0      0      -

KAPL01001-I The HDLM command completed normally. Operation name =view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

LU information that was added

Figure 4-1 Using the command to confirm that an LU has been added

5. For the new LU, write a signature, create partitions, and then format it.

Note:

The PathID is determined by the system choosing the smallest, available number that is not already in use for another path. For example, when a path is deleted and then a new path is added, the PathID for the added path might not be the same number as the deleted PathID.

When MSCS is used

1. Add an LU.
2. Stop node B.
3. On node A, perform the steps shown in *When MSCS is not used*.
4. Stop node A, and then start node B.
5. On node B, perform the steps shown in *When MSCS is not used*.
When you create a partition, assign the same drive letter as the one assigned for node A in step 3.
6. Stop node B, and then restart node A.
7. On node A, register the new LU in MSCS, and set it up.
8. Restart node B.

Checking an Added Path

You can add a path, by inserting a cable into an existing LU, even while the host (on which HDLM is installed) is running.

When you add a path without adding an LU, what is displayed in the disk management window does not change.

You can confirm that a path has been added by using the HDLM command `view` operation, or the HDLM GUI. The figure below shows an example of how to use the command to confirm that a path has been added. For an example of how to use the HDLM GUI to confirm that a path has been added, see the HDLM GUI Help.

Before addition of path

```
PROMPT>dlkmgr view -path
Paths:000002  OnlinePaths:000002
PathStatus  IO-Count  IO-Errors
Online     1486      0

PathID  PathName          DiskName          iLU  ChaPort Status  Type  IO-Count IO-Errors  DNum  HDevName
000000  0004.0001.0000000000000000.0001  HITACHI .DF600F .0051  0010 1A  Online  Own  1427  0      0      F
000001  0005.0001.0000000000000007A.0001  HITACHI .DF600F .0051  0011 1A  Online  Non  59    0      0      D
KAPL01001-I The HDLM command completed normally. Operation name =view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

After addition of path

```
PROMPT>dlkmgr view -path
Paths:000003  OnlinePaths:000003
PathStatus  IO-Count  IO-Errors
Online     1609      0

PathID  PathName          DiskName          iLU  ChaPort Status  Type  IO-Count IO-Errors  DNum  HDevName
000000  0004.0001.0000000000000000.0001  HITACHI .DF600F .0051  0010 1A  Online  Own  1427  0      0      F
000001  0005.0001.0000000000000007A.0001  HITACHI .DF600F .0051  0011 1A  Online  Non  59    0      0      D
000002  0006.0001.0000000000000007A.0001  HITACHI .DF600F .0051  0010 0A  Online  Non  123   0      0      F
KAPL01001-I The HDLM command completed normally. Operation name =view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Path information that was added

Figure 4-2 Using the command to confirm that a path has been added

Note:

- The PathID is determined by the system choosing the smallest, available number that is not already in use for another path. For example, when a path is deleted, and then a new path is added, the PathID for the added path might not be the same number as the deleted PathID.
- When a path not recognized by Windows is added to an LU for the first time, the following messages might appear:
 - KAPL08019-E and KAPL08022-E
 - KAPL05301-E

Note that these messages are output by Windows activities, and not by an error in HDLM.

Deleting an LU Dynamically

The LU deletion function automatically removes an LU from HDLM management when all the paths to that particular LU are disconnected.

You can set up the LU deletion function by specifying the `dlkmgr` command's `set` operation together with the `-rmlu` on parameter. You can also set up this function in the Options window of the HDLM GUI. For details on the `set`

operation, see [Setting Up the HDLM Functions on page 3-73](#). For details on the Options window, see the HDLM GUI Help.

Requirements to Delete the LU Dynamically

An LU is deleted when all the paths to that LU are disconnected. This means that an LU is deleted when HLU is deleted.

When using the `dlinkmgr` command's `set` operation to dynamically delete an LU, depending on the settings the following differences exist:

- When the `-rmlu on` parameter is specified, the LU is not removed from HDLM management if the disconnected paths include a path in the Offline (C) status.
- When the `-rmlu on -force` parameter is specified, the LU will be removed from HDLM management, even if the disconnected paths include a path in the Offline (C) status.

Checking that the LU or Path Has Been Dynamically Deleted

This section explains the two operations that can be used to confirm that the LU or path has been deleted by using the LU deletion function. One operation is performed when the user intentionally deletes an LU or path, and the other operation is automatically performed when an LU or path is deleted because all the paths are disconnected.

When the user deletes the LU or path intentionally:

Use the disk administrator, HDLM command, or HDLM GUI to confirm that LU or path has been deleted.

When an LU or path is automatically deleted due to all the paths being disconnected:

If an LU is deleted because all the paths are disconnected, HDLM outputs the KAPL05301-E message to the event log.

Note:

When an LU is deleted from the HDLM management target by using the LU deletion function, the KAPL08022-E message might not be output to the event log. In this case, refer to the KAPL05301-E message to check the path information.

The figure below shows an example display of the KAPL05301-E message.

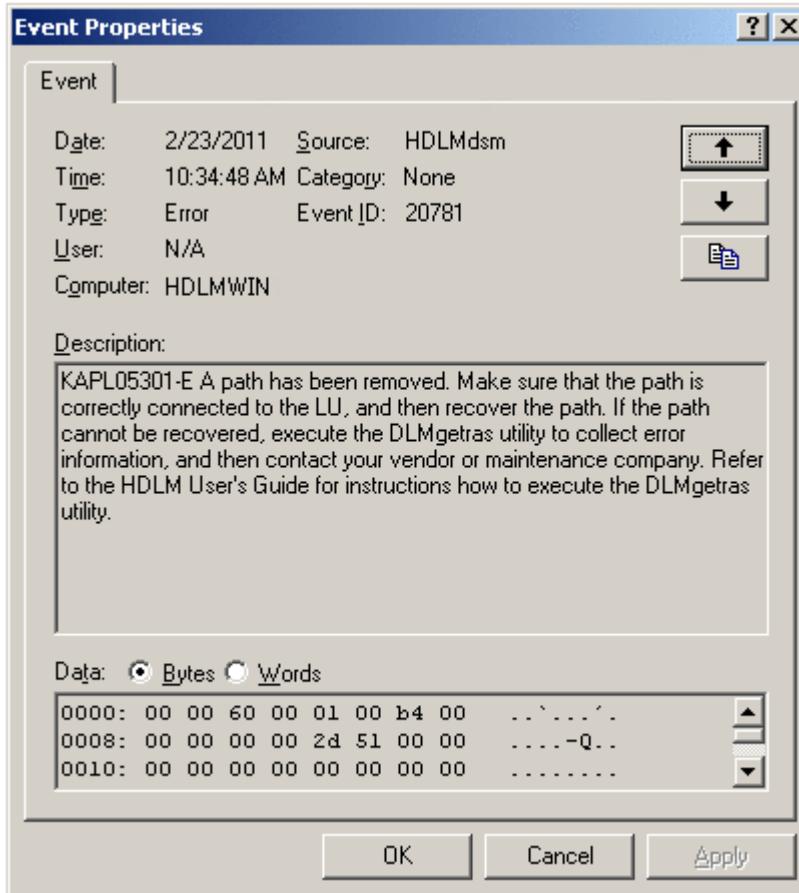


Figure 4-3 An example display of the KAPL05301-E message

In the event viewer, deleted path information is displayed in the following format: *PathID PathName DskName iLU ChaPort*.

The following is an example of output data to the KAPL05301-E message.

PathID	Host port number	Bus number
0010: 00 00 00 00 00 00 00 00	
0018: 00 00 00 00 00 00 00 00	
0020: 00 00 00 00 00 00 00 00	
0028: 00 00 00 00 00 01 00 02	
0030: 00 00 00 00 00 00 00 03	
0038: 00 04 48 49 54 41 43 48		HITACH
0040: 49 20 2E 44 46 36 30 30		.DF600
0048: 46 20 20 20 20 20 20 20	F	
0050: 20 20 20 2E 35 34 35 37		,5457
0058: 20 20 20 20 20 20 20 20		0000
0060: 20 20 20 20 30 30 30 30		iLU
0068: 20 20 20 20 20 20 20 20		IA
0070: 20 20 20 20 20 20 20 20		ChaPort
0078: 20 20 20 20 20 20 20 20		
0080: 20 20 20 20 31 41		

The following table shows the items and descriptions for the path information, which are displayed in the KAPL05301-E message.

Table 4-4 Items and Descriptions for the Path Information Displayed in the KAPL05301-E Message

Item	Description
PathID	An AutoPATH_ID.
Host port number	Elements of a PathName.
Bus number	
Target ID	
Host LU number	
DskName	The displayed contents differ depending on whether the HDLM management-target device is the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, Universal Storage Platform V/VM series, Virtual Storage Platform series, or some other product. For details, see Table 7-17.
iLU	
ChaPort	

View the path information, and then check to confirm that the LU was deleted. The path error can be referenced, in order to help resolve a problem. For details on how to resolve path error problems, see [What To Do for a Path Error on page 5-4](#).

Recovering a Deleted LU or Path

To restore a deleted LU, recover it from the physical failure, and then perform the operations below. Note that sometimes, LUs are automatically recovered, without having to perform the following operations:

- From the Device Manager window of Windows, select **Disk drives**, and then click **Scan for hardware changes**.
- From the Disk Management window of Windows, click **Rescan Disks**.

Troubleshooting

This chapter describes how to properly use HDLM error information, and then how to resolve the problem, if an error occurs in HDLM. The resolutions for path errors, HDLM program errors, and other types of errors are all described separately. This chapter describes how to use the HDLM commands to use HDLM error information and utilize various workarounds. For details about how to use the HDLM GUI, see the Hitachi Dynamic Link Manager GUI Help. If you need technical support, see [Getting help on page xv](#).

- [Information Collected by the DLMgetras Utility for Collecting HDLM Error Information](#)
- [Checking Error Information in Messages](#)
- [What To Do for a Path Error](#)
- [What To Do for a Program Error](#)
- [What To Do for Other Errors](#)

Information Collected by the DLMgetras Utility for Collecting HDLM Error Information

Immediately after an error occurs, execute the `DLMgetras` utility for collecting HDLM error information, since restarting the machine might delete error information before the information is collected by `DLMgetras`. For details about the `DLMgetras` utility and the error information it collects, see [The `DLMgetras` Utility for Collecting HDLM Error Information on page 7-2](#).

Checking Error Information in Messages

You can check path errors by referring to the KAPL08xxx messages that are output to the event log.

To obtain detailed information about a path failure, check the execution results of the `view` operation as indicated by the error message.

For details on the `view` operation, see [view \(Displays Information\) on page 6-33](#).

The following is an example of a message:

- Message that is output when a path error occurs.

KAPL08022-E A path error occurred. ErrorCode = aa....aa, PathID = bb....bb, PathName = cc....cc.dd....dd.ee....ee.ff....ff, DNum = gg....gg, HDevName = hh....hh
KAPL08019-E The path (aa....aa) detected an error (bb....bb). (cc....cc)

- Message that is output when there is no online paths to an LU.

KAPL08026-E An error occurred on all the paths of the LU. PathID = aa....aa

- Message that is output when there is no online paths to an LU when the LU dynamic removal function is used.

KAPL05301-E A path has been removed. Make sure that the path is correctly connected to the LU, and then recover the path. If the path cannot be recovered, execute the `DLMgetras` utility to collect error information, and then contact your vendor or maintenance company.

Refer to the HDLM User's Guide for instructions how to execute the `DLMgetras` utility.

Notes:

- When a path not recognized by Windows is added to an LU for the first time, the following messages might appear:
 - KAPL08019-E and KAPL08022-E
 - KAPL05301-ENote that these messages are output by Windows activities, and not by an error in HDLM.
- When an LU is deleted from the HDLM management target by using the LU deletion function, the KAPL08022-E message might not be

output to the event log. If this happens, refer to the KAPL05301-E message to check the path information.

The message elements are explained below:

For details about the KAPL05301-E message, see *When an LU or path is automatically deleted due to all the paths being disconnected in [Checking that the LU or Path Has Been Dynamically Deleted on page 4-20](#) in [Deleting an LU Dynamically on page 4-19](#).*

ErrorCode

The error number generated when Windows detects a path error.

When the Windows plug-and-play functionality deletes a SCSI device from Windows, the path of the SCSI device changes to the offline status, and the error number 0x00000000 is used. If this happens, by recovering the path without using the automatic failback function, and letting Windows recognize the SCSI device, the path will automatically change to the online status.

PathID

The ID assigned to a path. This ID is called the AutoPATH_ID.

AutoPATH_IDs are re-assigned every time the host is restarted.

This path ID is the same as the path ID displayed in the **Path List** view in the Path Management window.

The path ID is also the same as PathID displayed by the command's view operation. For details on the view operation, see [view \(Displays Information\) on page 6-33](#).

PathName

The path name indicates a physical path. When you modify the system configuration or replace a piece of hardware, you should check the path names to identify the physical paths that will be affected by the change.

A path name consists of the following four elements, separated by periods:

- Host port number (hexadecimal)
- Bus number (hexadecimal)
- Target ID (hexadecimal)
- Host LU number (hexadecimal)

The path name is also the same as PathName displayed by the command's view operation. For details on the path name, see [view \(Displays Information\) on page 6-33](#).

DNum

A Dev number. A 0 is displayed for a Dev that takes up the entire LU.

This is the same as the DNum that is displayed by the view operation. For details on the view operation, see [view \(Displays Information\) on page 6-33](#).

HDevName

The name of the host device.

A drive letter is used. If no drive letter has been assigned, a hyphen (-) will be displayed.

This is the same as the `HDevName` that is displayed by the `view` operation. For details on the `view` operation, see [view \(Displays Information\) on page 6-33](#).

What To Do for a Path Error

When a path error is detected by HDLM, you must immediately resolve the error and restore the path.

A path error check is performed every time an I/O is issued, or the Windows plug-and-play functionality detects that a path is disconnected. If there are any paths through which I/Os are not normally issued, such as a non-owner path, you should enable path health checking in order to detect any possible errors. For details about path health checking, see [Detecting Errors by Using Path Health Checking on page 2-32](#).

When a path error is detected, HDLM performs a failover on the path and outputs the `KAPL08022-E` message. This message indicates that an error has occurred in the components, shown in the following figure, that make up the path.

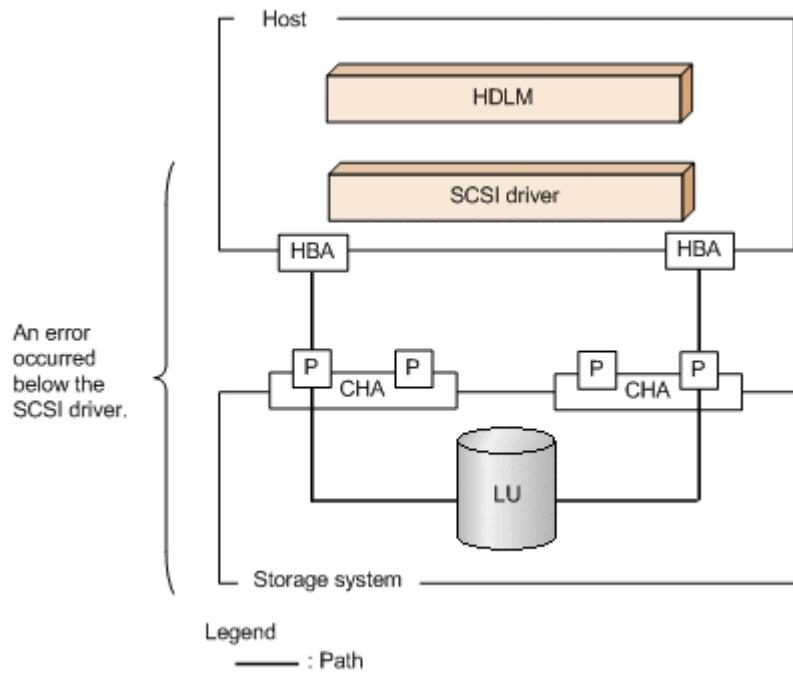


Figure 5-1 Error Location When the KAPL08022-E Message Is Output

The following figure shows the troubleshooting procedure when the `KAPL08022-E` message is output.

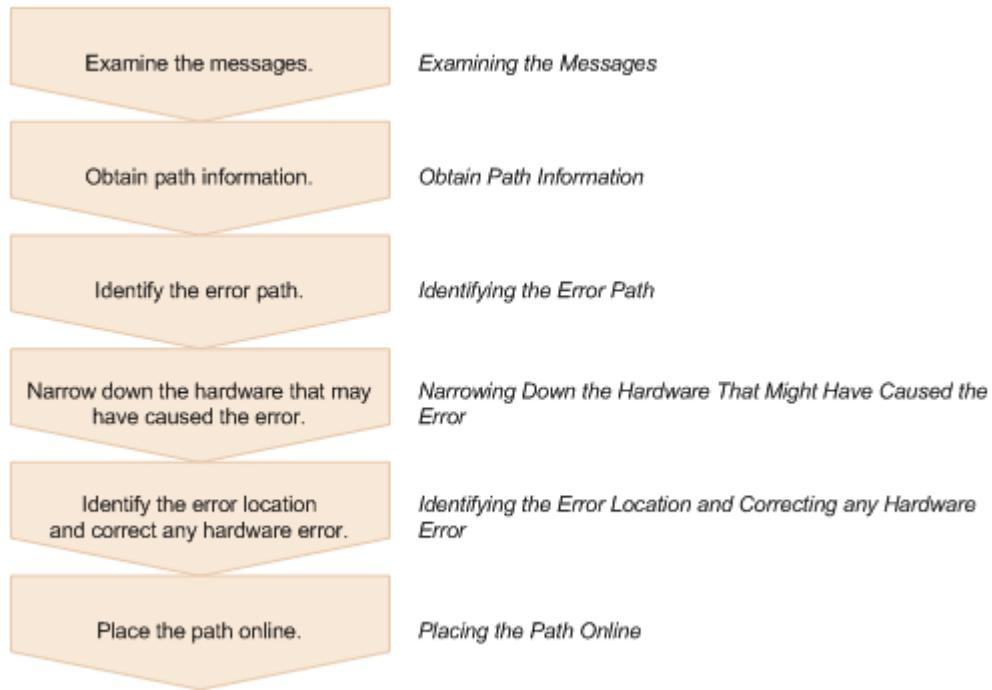


Figure 5-2 Troubleshooting Procedure When a Path Error Occurs

The following shows the procedure for using the HDLM command (dlnkmgr) to handle a path error.

Examining the Messages

Examine the messages that are output to the host event log. If the KAPL08022-E message is output, view the message to check the path in which the error has occurred. For details on each item displayed in messages, see [Checking Error Information in Messages on page 5-2](#).

If errors have occurred on all the paths to an LU, the KAPL08022-E message will appear, in addition to the KAPL08026-E message.

When using the LU dynamic deletion function, the KAPL05301-E message will appear if all the paths are deleted.

Obtaining Path Information

Obtain path information.

Execute the following command:

```
dlnkmgr view -path -iem -hbaportwwn > pathinfo.txt
```

pathinfo.txt is the redirection-output file name. Use a file name that matches your environment.

Identifying the Error Path

Check the obtained path information to find the path with the error. In the Status column, the error path has the status Offline (E) or Online (E).

Narrowing Down the Hardware That Might Have Caused the Error

Check the DskName, iLU, ChaPort, and HBAPortWWN columns of the path with the error to narrow down the hardware that may be the cause of the error. To physically identify the hardware corresponding to DskName, iLU, and ChaPort, use the information provided by the storage system management program.

Identifying the Error Location and Correcting any Hardware Errors

Use the Windows and hardware management tools to identify the error location, and then resolve the problem. If an error occurs in a path, HDLM will output an error message to the host event log. Information about the path in which the error has occurred is also output to the event log. For hardware maintenance, contact your hardware vendor or maintenance company, if there is a maintenance contract.

Placing the Path Online

After the path has recovered from the error, use the `dlnkmgr` command's `online` operation to place the path back online. For details on the `online` operation, see [online \(Places Paths Online\) on page 6-11](#). Execute the following command:

```
dlnkmgr online
```

Executing this command places all the offline paths online.

If any path cannot be placed online due to an error, the KAPL01039-W message will appear. To ignore such paths and to continue processing, type `y`. Type `n` to cancel processing.

Check the statuses of the paths that cannot be placed online, and resolve the problem.

Notes:

If path errors occur on all of the paths, and Windows recognizes some or all of the paths, disk numbers might be changed over from the ones that were being used before. If this happens, restarting the host will cause the disk numbers to be returned to their original values. After the disk numbers have changed back, use Symantec Backup Exec for Windows or the Intelligent Disaster Recovery function of Veritas NetBackup.

What To Do for a Program Error

The following describes what to do to handle errors that occur in an HDLM program. The following figure shows the troubleshooting procedure.

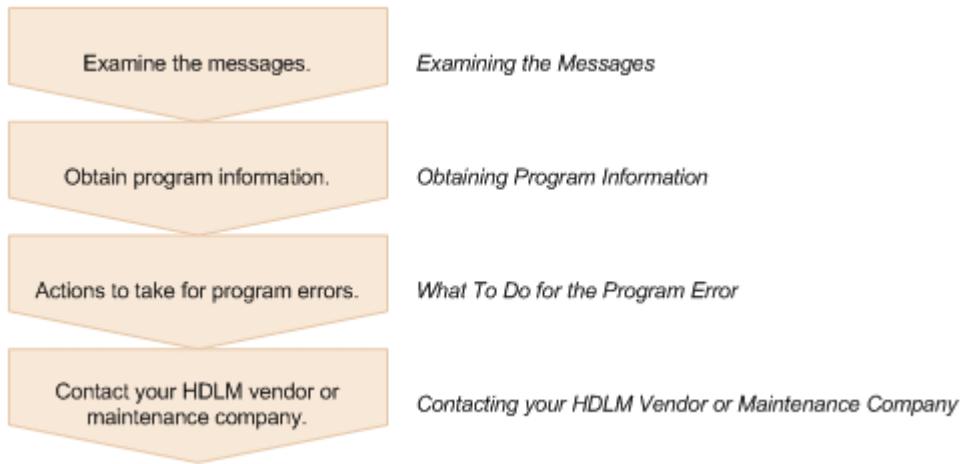


Figure 5-3 Troubleshooting Procedure When a Program Error Occurs

The following shows the procedure for handling a program error by using the HDLM command (`dlnkmgr`).

Examining the Messages

Examine the messages that are output to the host event log. If an error occurs in an HDLM program, a message other than KAPL08xxx is output to the event log. Examine the content of the message. Messages with error level E (Error) or higher require corrective action.

Obtaining Program Information

Obtain the information that you need to report to your HDLM vendor or maintenance company.

Use the `DLMgetras` utility for collecting HDLM error information. For details on the `DLMgetras` utility and the information it collects, see [The `DLMgetras` Utility for Collecting HDLM Error Information on page 7-2](#).

Some of the information collected by the `DLMgetras` utility might be cleared when the host is restarted. Because of this, whenever an error occurs, execute the `DLMgetras` utility as soon as possible.

When an error occurs in the HDLM GUI, take a screenshot at the time the error occurred.

What To Do for the Program Error

Follow the recommended actions for messages in [Chapter 8, Messages on page 8-1](#).

If the error occurs again after you thought that you had resolved the problem, use the `dlnkmgr` command's `view` operation to check the status of the HDLM program, and then do whatever is necessary to resolve the

problem. For details on the `view` operation, see [view \(Displays Information\) on page 6-33](#).

Execute the following command:

Example:

```
dlnkmgr view -sys
```

If the KAPL01012-E message appears as a result of executing the command

The following shows the KAPL01012-E message:

```
KAPL01012-E Could not connect the HDLM manager. Operation name = view
```

Start the HDLM manager.

For details about how to start the HDLM manager, see [Starting the HDLM Manager on page 4-15](#).

If the KAPL01013-E message appears as a result of executing the command

The following shows the KAPL01013-E message:

```
KAPL01013-E An error occurred in internal processing of the HDLM command. Operation name = view details = aa...aa
```

aa...aa indicates character string. Restart the host.

If the same error re-occurs after you thought you had resolved the problem, go to the subsection [Contacting your HDLM Vendor or Maintenance Company on page 5-8](#).

Contacting your HDLM Vendor or Maintenance Company

If the error cannot be resolved, contact your HDLM vendor or maintenance company, and report the information that was collected by the `DLMgetras` utility.

What To Do for Other Errors

When the cause of an error may be related to HDLM but is neither a path error nor an HDLM program error, execute the `DLMgetras` utility to collect the HDLM error information, and then report the collected information to the HDLM vendor or maintenance company. For details about the `DLMgetras` utility and the information it collects, see [The DLMgetras Utility for Collecting HDLM Error Information on page 7-2](#).

Command Reference

This chapter describes the HDLM command (`dlnkmgr`) and its operations.

- [Overview of the HDLM Command dlnkmgr](#)
- [clear \(Returns the Path Statistics to the Initial Value\)](#)
- [help \(Displays the Operation Format\)](#)
- [offline \(Places Paths Offline\)](#)
- [online \(Places Paths Online\)](#)
- [set \(Sets Up the Operating Environment\)](#)
- [view \(Displays Information\)](#)
- [delete \(Deletes a Path Dynamically\)](#)
- [refresh \(Applies Storage System Settings to HDLM\)](#)

Overview of the HDLM Command dlnkmgr

This section describes how to specify the HDLM command `dlnkmgr` and its subcommands (called *operations* in HDLM).

Command format

Enter the command using the following format:

`dlnkmgr operation [parameter [parameter-value]]`

`dlnkmgr`

The command name.

`operation`

The type of operation entered after `dlnkmgr`.

`parameter`

A value required for an operation.

`parameter-value`

A value required for an operation parameter.

Operations of the dlnkmgr command

[Table 6-1 Operations of the dlnkmgr Command on page 6-2](#) shows the operations of `dlnkmgr` and their functions.

Table 6-1 Operations of the dlnkmgr Command

Operation	Functions
clear	Initializes (0) the statistics (I/O count and I/O errors) of all paths managed by the HDLM system. For details, see clear (Returns the Path Statistics to the Initial Value) on page 6-3 .
help	Displays the format of the operations used for HDLM. For details, see help (Displays the Operation Format) on page 6-4 .
offline	Places offline an online path or paths. For details, see offline (Places Paths Offline) on page 6-6 .
online	Places online an offline path or paths. For details, see online (Places Paths Online) on page 6-11 .
set	Sets the HDLM operating environment. For details, see set (Sets Up the Operating Environment) on page 6-16 .
view	Displays HDLM program information, path information, LU information, and HDLM management-target device information. For details, see view (Displays Information) on page 6-33 .
delete	Dynamically deletes a path that is an HDLM-management target. For details, see delete (Deletes a Path Dynamically) on page 6-77 .
refresh	Applies the storage system settings to HDLM. For details, see refresh (Applies Storage System Settings to HDLM) on page 6-78 .

Note:

- If you are using Windows Server 2003 , execute HDLM commands as a member of the Administrators group.
If you are executing HDLM commands in Windows Server 2008 or Windows Server 2012, see [Using Windows Server 2008 or Windows Server 2012 on page 4-3](#).
- To specify a value that contains a space in its parameter, enclose the entire value in double quotes (").

clear (Returns the Path Statistics to the Initial Value)

The `dlnkmgr` command's `clear` operation clears the statistics (I/O count and I/O errors) of all paths that are managed by HDLM, and returns them to their initial value.

Format

To Set the Path Statistics to 0

```
dlnkmgr clear -pdst [-s]
```

To Display the Format of the clear Operation

```
dlnkmgr clear -help
```

Parameters

To Set the Path Statistics to 0

`-pdst`

Clears statistics (I/O count and I/O errors) of all paths managed by HDLM to the initial value (0).

Example

```
PROMPT>dlnkmgr clear -pdst
KAPL01049-I Would you like to execute the operation?
Operation name = clear [y/n]:y
KAPL01001-I The HDLM command completed normally. Operation
name = clear, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

`-s`

Executes the command without displaying a message asking for confirmation of command execution from the user. Specify this parameter if you want to skip the response to the confirmation message: for example, when you want to execute the command in a shell script or batch file.

Example

```
PROMPT>dlnkmgr clear -pdst -s
KAPL01001-I The HDLM command completed normally. Operation
name = clear, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

To Display the Format of the clear Operation

`-help`

Displays the format of the `clear` operation.

Example

```
PROMPT>dlnkmgr clear -help
clear:
  Format
    dlnkmgr clear -pdst [-s]
KAPL01001-I The HDLM command completed normally. Operation
name = clear, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

help (Displays the Operation Format)

The `dlnkmgr` command's `help` operation displays the list of operations available for the HDLM command, or the format of individual operations.

Format

```
dlnkmgr help [operation] [operation] ...
```

Parameter

operation

Specify the HDLM command operation whose format you want to know.

You can specify one of the following operations:

- `clear`
- `help`
- `offline`
- `online`
- `set`
- `view`
- `delete`
- `refresh`

If you do not specify any operations, the `help` operation displays all operations available for the HDLM command.

Examples

Example 1

The following example shows how to display all the operations available in the HDLM command.

```
PROMPT>dlnkmgr help
dlnkmgr:
  Format
    dlnkmgr { clear | help | offline | online | set | view |
    delete | refresh}
KAPL01001-I The HDLM command completed normally. Operation name
= help, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 2

The following example shows how to display the formats of multiple operations.

```
PROMPT>dlnkmgr help online offline help
online:
  Format
    dlnkmgr online [-path] [-s]
    dlnkmgr online [-path] -hba HBAPortNumber.BusNumber [-s]
    dlnkmgr online [-path] -cha -pathid AutoPATH_ID [-s]
    dlnkmgr online [-path] [-pathid AutoPATH_ID] [-s]
    dlnkmgr online [-path] [-hbaportwwn HBA_Port_WWN
                           [-tid Target_ID -hlun Host_LUN]] [-s]
    dlnkmgr online [-path] -hapath [-lu -pathid AutoPATH_ID] [-s]
    dlnkmgr online [-path] -dfha [-lu -pathid AutoPATH_ID] [-s]

  Valid value
    AutoPATH_ID    { 000000 - 999999 } (Decimal)
    Host_LUN       { 0000 - FFFF } (Hexadecimal)
offline:
  Format
    dlnkmgr offline [-path] -hba HBAPortNumber.BusNumber [-s]
    dlnkmgr offline [-path] -cha -pathid AutoPATH_ID [-s]
    dlnkmgr offline [-path] -pathid AutoPATH_ID [-s]
    dlnkmgr offline [-path] -hbaportwwn HBA_Port_WWN
                           [-tid Target_ID -hlun Host_LUN] [-s]

  Valid value
    AutoPATH_ID    { 000000 - 999999 } (Decimal)
    Host_LUN       { 0000 - FFFF } (Hexadecimal)
help:
  Format
    dlnkmgr help { clear | offline | online | set | view |
    delete | refresh }
KAPL01001-I The HDLM command completed normally. Operation name
= help, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 3

The following example shows how to display the operations that can be specified by the help operation

```
PROMPT>dlnkmgr help help
```

```
help:
  Format
    dlnkmgr help { clear | offline | online | set | view |
    delete | refresh}
KAPL01001-I The HDLM command completed normally. Operation name
= help, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

offline (Places Paths Offline)

The `dlnkmgr` command's `offline` operation places online paths offline. Specify the paths to be placed offline by specifying an HBA port, CHA port, single path, or HBA port WWN.

There must always be at least one online path accessing each LU.

Note that, for a path that is placed offline by the `offline` operation and whose status changes to Offline(C), the path status will not be inherited when the host is restarted. If the path is in a normal condition when the host is restarted, the path will become active and its status will be Online.

Placing too many paths offline might prevent paths from being able to switch if an error occurs. Before placing a path offline, use the `view` operation to check how many online paths remain. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#).

In a cluster configuration, an `offline` operation requested during reserve processing is put into the waiting-to-execute state (Online(P), Online(EP), or Offline(P)), and does not execute until the reserve processing finishes.

Format

To Place Paths Offline

```
dlnkmgr offline
  [-path]
  {-hba host-port-number.bus-number
  |-cha -pathid AutoPATH_ID
  |-pathid AutoPATH_ID
  |-hbaportwwn HBA-port-WWN [-tid target-ID -hlun host-LU-
  number] }
  [-s]
```

To Display the Format of the offline Operation

```
dlnkmgr offline -help
```

Parameters

To Place Paths Offline

`-path`

Indicates that the target of the operation is a path managed by HDLM. This parameter is optional because `offline` is always used for paths, so it is assumed. Make sure that you specify the paths to be taken offline by using the `-hba`, `-cha`, `-pathid`, or `-hbaportwwn` parameter.

`-hba host-port-number.bus-number`

Use this parameter to place offline, at one time, all the paths that pass through a specific HBA port. The command will place offline all the paths connected to the HBA port that has the specified host port number and bus number.

Specify the host port number and bus number of the target HBA port: the numbers are found in the `PathName` field displayed using the `view` operation. Enter a period between these two parameter values. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#). Leading zeros of each parameter value can be omitted; however, when the host port number or bus number of the target HBA port is 0000, enter 0000 or 0 for the corresponding parameter value.

Example

The following example shows how to place offline all paths connected to the HBA port whose host port number is 0001 and bus number is 0001:

```
PROMPT>dlnkmgr offline -hba 1.1
KAPL01055-I All the paths which pass the specified HBA will
be changed to the Offline(C) status. Is this OK? [y/n]:y
KAPL01056-I If you are sure that there would be no problem
when all the paths which pass the specified HBA are placed in
the Offline(C) status, enter y. Otherwise, enter n. [y/n]:y
KAPL01061-I 3 path(s) were successfully placed Offline(C); 0
path(s) were not. Operation name = offline
PROMPT>
```

`-cha -pathid AutoPATH_ID`

Use this parameter to place offline, at one time, all the paths that pass through a specific channel adapter port. The command will place offline all the paths that pass through the channel adapter port to which the path with the specified `AutoPATH_ID` is connected. Paths that pass through a physical CHA port on a physical storage system will be offline. You can specify this parameter only when the HDLM management-target device is the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series.

Specify the current `AutoPATH_ID` of the target path, which is displayed by using the `view` operation. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#). Leading zeros can be omitted

(000001 and 1 indicate the same *AutoPATH_ID*); however, when the target *AutoPATH_ID* is 000000, enter 000000 or 0 for the parameter value.

AutoPATH_IDs are re-assigned every time the host is restarted. Always make sure that you use the *view* operation to find the current *AutoPATH_ID* of the target path, before executing the *offline* operation.

Example

The following example shows how to place offline all the paths connected to the channel adapter port 0A. In this example, a path whose *AutoPATH_ID* is 000001 is connected to the target channel adapter port:

```
PROMPT>dlkmgr offline -cha -pathid 000001
KAPL01055-I All the paths which pass the specified CHA port
will be changed to the Offline(C) status. Is this OK? [y/n]:y
KAPL01056-I If you are sure that there would be no problem
when all the paths which pass the specified CHA port are
placed in the Offline(C) status, enter y. Otherwise, enter
n. [y/n]: y
KAPL01061-I 2 path(s) were successfully placed Offline(C); 0
path(s) were not. Operation name = offline
PROMPT>
```

-pathid AutoPATH_ID

Use this parameter to place a single path offline.

Specify the current *AutoPATH_ID* of the target path, which is displayed by using the *view* operation. For details about the *view* operation, see [view \(Displays Information\) on page 6-33](#). Leading zeros can be omitted (000001 and 1 indicate the same *AutoPATH_ID*); however, when the target *AutoPATH_ID* is 000000, enter 000000 or 0 for the parameter value.

AutoPATH_IDs are re-assigned every time the host is restarted. Always make sure that you use the *view* operation to find the current *AutoPATH_ID* of the target path, before executing the *offline* operation.

-hbaportwwn HBA-port-WWN [-tid target-ID -hlun host-LU-number]

Use this parameter to place offline all paths connected to the HBA port indicated by the specified HBA port WWN. If neither the *-tid* parameter nor the *-hlun* parameter are specified, all paths that pass through the specified HBA port WWN will be placed offline. Only one set of values can be specified for the *-hbaportwwn* parameter.

For *HBA-port-WWN*, specify the value of *HBAPortWWN*. The parameter is not case sensitive.

For *target-ID*, specify the target ID portion of *PathName*. Leading zeroes can be omitted from the target ID (0000000000000001 and 1 are the same value). The parameter is not case sensitive.

For *host-LU-number*, specify the host LU number portion of *PathName*. Leading zeroes can be omitted from the host LU number (0001 and 1 are the same value).

To display HBAPortWWN and PathName, execute the view operation as follows:

```
dlnkmgr view -path -hbaportwwn
```

For details on how to execute the view operation and display the HBA port WWN and path name, see [Parameters Used When Displaying Path Information on page 6-44](#) in [Parameters on page 6-35](#).

Example

The following shows an example of placing offline the paths for which the HBA port WWN is 10000000C93213BA, target ID is 0000000000000001, and host LU number is 0000 while confirming command operation.

```
PROMPT>dlnkmgr offline -path -hbaportwwn 10000000C93213BA -  
tid 1 -hlun 0  
KAPL01052-I The currently selected paths will be changed to  
the Offline(C) status. Is this OK? [y/n]: y  
KAPL01053-I If you are sure that there would be no problem  
when the path is placed in the Offline(C) status, enter y.  
Otherwise, enter n. [y/n]: y  
KAPL01061-I 1 path(s) were successfully placed Offline(C); 0  
path(s) were not. Operation name = offline  
PROMPT>
```

-s

Executes the command without displaying the message asking for confirmation of command execution from the user. Specify this parameter if you want to skip the response to the confirmation message: for example, when you want to execute the command in a shell script or batch file.

Example

The following example shows how to place a path, whose AutoPATH_ID is 000001, offline without asking for confirmation of command execution from the user:

```
PROMPT>dlnkmgr offline -pathid 1 -s  
KAPL01061-I 1 path(s) were successfully placed Offline(C); 0  
path(s) were not. Operation name = offline  
PROMPT>
```

To Display the Format of the Offline Operation

-help

Displays the format of the offline operation.

Example

The following example shows how to display the format of the offline operation:

```
PROMPT>dlnkmgr offline -help  
offline:  
Format  
dlnkmgr offline [-path] -hba HBAPortNumber.BusNumber [-s]
```

```

dlnkmgr offline [-path] -cha -pathid AutoPATH_ID [-s]
dlnkmgr offline [-path] -pathid AutoPATH_ID [-s]
dlnkmgr offline [-path] -hbaportwn HBA_Port_WWN
                  [-tid Target_ID -hlun Host_LUN] [-s]
Valid value
  AutoPATH_ID      { 000000 - 999999 } (Decimal)
  Host_LUN        { 0000 - FFFF } (Hexadecimal)
KAPL01001-I The HDLM command completed normally. Operation
name = offline, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Reference

Using the `view` operation together with Windows commands enables you to filter the path information listed for a specific HBA port or channel adapter port. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#).

We recommend that you use the following command and verify the information on the target paths before you execute the `offline` operation to place offline all the paths connected to a specific HBA port or channel adapter port.

Example 1

The following example shows how to filter and display the information on all paths that pass through the HBA port whose host port number is 0004 and bus number is 0001:

```
dlnkmgr view -path | find "0004.0001"
```

The above command will display information on all the paths that pass through the specified HBA port.

Example 2

The following example shows how to filter and display the information on all the paths that pass through the channel adapter port 1B of the VSP G1000 Series:

```
dlnkmgr view -path -stname | find "VSP_G1000" | find "1B"
```

The above command will display information pertaining to only those paths that pass through the specified channel adapter port.

Note:

When the LU dynamic deletion function is used, a path might be deleted due to an error. If this happens, when you attempt to change the path status, an error will occur. Confirm that the path of which you attempt to change the status has been deleted, and then resolve the path error. For details, see [Deleting an LU Dynamically on page 4-19](#).

online (Places Paths Online)

The `dlnkmgr` command's `online` operation places offline paths online. To specify the paths to be placed online, specify an HBA port, CHA port, single path, or HBA port WWN.

Format

To Place Paths Online

```
dlnkmgr online
  [-path]
  [-hba host-port-number.bus-number
  |-cha -pathid AutoPATH_ID
  |-pathid AutoPATH_ID
  |-hbaportwwn HBA-port-WWN [-tid target-ID -hlun host-LU-number]
  |-hapath [-lu -pathid AutoPATH_ID]
  |-dfha [-lu -pathid AutoPATH_ID] ]
  [-s]
```

To Display the Format of the Online Operation

```
dlnkmgr online -help
```

Parameters

To Place Paths Online

`-path`

Indicates that the target of the operation is a path managed by HDLM. This parameter is optional because the `online` is always used for paths, so it is assumed.

Specify the paths to be taken online by using the `-hba`, `-cha`, `-pathid`, or `-hbaportwwn` parameter. If you do not specify any of these parameters, the command will place all the offline paths online. If there is a path that cannot be placed online, a message asks whether you would like to continue processing. To ignore the offline path that cannot be placed online and to continue processing, enter `y`. To stop the processing, enter `n`.

`-hba host-port-number.bus-number`

Use this parameter to place online, at one time, all the paths that pass through a specific HBA port. The command will place online all the paths connected to the HBA port that has the specified host port number and bus number.

Specify the host port number and bus number of the target HBA port: the numbers are found in the `PathName` field displayed using the `view`

operation. Enter a period between these two parameter values. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#). Leading zeros of each parameter value can be omitted; however, when the host port number or bus number of the target HBA port is 0000, enter 0000 or 0 for the corresponding parameter value.

Example

The following example shows how to place online all paths connected to an HBA port whose host port number is 0001 and bus number is 0001:

```
PROMPT>dlnkmgr online -hba 1.1
KAPL01057-I All the paths which pass the specified HBA will
be changed to the Online status. Is this OK? [y/n]:y
KAPL01061-I 3 path(s) were successfully placed Online; 0
path(s) were not. Operation name = online
PROMPT>
```

`-cha -pathid AutoPATH_ID`

Use this parameter to simultaneously place online all paths that pass through a specific CHA port. The command will place online all paths that pass through the CHA port in the path specified by the `-pathid` parameter. Paths that pass through a specific physical CHA port on a physical storage system will be online. You can specify this parameter only when the HDLM management-target device is the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series.

Specify the current AutoPATH_ID of the target path, which is displayed by using the `view` operation. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#). Leading zeros can be omitted (000001 and 1 indicate the same AutoPATH_ID); however, when the target AutoPATH_ID is 000000, enter 000000 or 0 for the parameter value.

AutoPATH_IDs are re-assigned every time the host is restarted. Always make sure that you use the `view` operation to find the current AutoPATH_ID of the target path, before executing the `online` operation.

Example

The following example shows how to place online the paths connected to the channel adapter port 0A. In this example, a path whose AutoPATH_ID is 000002 is connected to the target channel adapter port:

```
PROMPT>dlnkmgr online -cha -pathid 000002
KAPL01057-I All the paths which pass the specified CHA port
will be changed to the Online status. Is this OK? [y/n]:y
KAPL01061-I 2 path(s) were successfully placed Online; 0
path(s) were not. Operation name = online
PROMPT>
```

`-pathid AutoPATH_ID`

Use this parameter to place a single path online.

Specify the current AutoPATH_ID of the target path, which is displayed by using the `view` operation. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#) Leading zeros can be omitted (000001 and 1 indicate the same AutoPATH_ID); however, when the target AutoPATH_ID is 000000, enter 000000 or 0 for the parameter value.

AutoPATH_IDs are re-assigned every time the host is restarted. Always make sure that you use the `view` operation to find the current AutoPATH_ID of the target path, before executing the `online` operation.

```
-hbaportwwn HBA-port-WWN [-tid target-ID -hlun host-LU-number]
```

Specify this parameter to place online all paths connected to the HBA port indicated by the specified HBA port WWN. If the `-tid` and `-hlun` parameters are not specified, all paths on the specified HBA port WWN are placed online. Only one set of values can be specified for the `-hbaportwwn` parameter.

For *HBA-port-WWN*, specify the value of `HBAPortWWN`. The parameter is not case sensitive.

For *target-ID*, specify the target ID portion of `PathName`. Leading zeroes can be omitted from the target ID (0000000000000001 and 1 are the same value). The parameter is not case sensitive.

For *host-LU-number*, specify the host LU number portion of `PathName`. Leading zeroes can be omitted from the host LU number (0001 and 1 are the same value).

To display `HBAPortWWN` and `PathName`, execute the `view` operation as follows:

```
dlnkmgr view -path -hbaportwwn
```

For details on how to execute the `view` operation and display the HBA port WWN and path name, see [Parameters Used When Displaying Path Information on page 6-44](#) in [Parameters on page 6-35](#).

Example

The following shows an example of placing online the paths for which the HBA port WWN is 10000000C93213BA, target ID is 0000000000000001, and host LU number is 0000 while confirming command operation.

```
PROMPT>dlnkmgr online -path -hbaportwwn 10000000C93213BA -tid 1 -hlun 0
KAPL01050-I The currently selected paths will be changed to the Online status. Is this OK? [y/n]: y
KAPL01061-I 1 path(s) were successfully placed Online; 0 path(s) were not. Operation name = online
PROMPT>
```

```
-hapath
```

Use this parameter to change to the `Online` status when the paths to the primary volume (P-VOL) in an HAM environment are in the `Online(S)` or `Online(D)` status. To change the status of a specific LU, use the `-lu` and `-pathid` parameters to specify the path to the LU. To change the status

of all the paths in the `Online(S)` and `Online(D)` statuses, specify only `-hapath`.

`-dfha`

Use this parameter to change the paths to the primary volume (P-VOL) in an HAM environment to `Online(D)`. The `Online(S)` status changes to the `Online(D)` status. When you do not specify this parameter, the status of the P-VOL paths in the HAM environment will be changed to the `Online(S)` status. If I/O operations to the secondary volume (S-VOL) have never occurred and only the paths to the P-VOL recover from an error, the path to the P-VOL will be in the `Online` status regardless of this parameter specification. To change the status of a specific LU, use the `-lu` and `-pathid` parameters to specify the path to the LU. To change the status of all the paths, specify only `-dfha`. A regular `online` operation is executed on the paths other than the P-VOL in an HAM environment.

`-lu -pathid AutoPATH_ID`

Specify management-target paths for each LU (P-VOL). The target LUs are the LUs that belong to a path ID that you specify in the `-pathid AutoPATH_ID` parameter.

`-s`

Executes the command without displaying the message asking for confirmation of command execution from the user. Specify this parameter if you want to skip the response to the confirmation message: for example, when you want to execute the command in a shell script or batch file.

Example

The following example shows how to place a path, whose `AutoPATH_ID` is `000002`, `online` without asking for confirmation of command execution from the user:

```
PROMPT>dlkmgr online -pathid 2 -s
KAPL01061-I 1 path(s) were successfully placed Online; 0
path(s) were not. Operation name = online
PROMPT>
```

To Display the Format of the Online Operation

`-help`

Displays the format of the `online` operation.

Example

The following example shows how to display the format of the `online` operation:

```
PROMPT>dlkmgr online -help
online:
  Format
    dlkmgr online [-path] [-s]
    dlkmgr online [-path] -hba HBAPortNumber.BusNumber [-s]
```

```

dlnkmgr online [-path] -cha -pathid AutoPATH_ID [-s]
dlnkmgr online [-path] [-pathid AutoPATH_ID] [-s]
dlnkmgr online [-path] [-hbaportwwn HBA_Port_WWN
                     [-tid Target_ID -hlun Host_LUN]] [-s]
dlnkmgr online [-path] -hapath [-lu -pathid AutoPATH_ID]
[-s]
dlnkmgr online [-path] -dfha [-lu -pathid AutoPATH_ID] [-s]

Valid value
AutoPATH_ID      { 000000 - 999999 } (Decimal)
Host_LUN         { 0000 - FFFF } (Hexadecimal)
KAPL01001-I The HDLM command completed normally. Operation
name = online, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Reference

Using the `view` operation together with Windows commands enables you to filter the path information listed for a specific HBA port or channel adapter port. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#).

We recommend that you use the following command and verify the information on the target paths before you execute the `online` operation to place online all the paths connected to a specific HBA port or channel adapter port.

Example 1

The following example shows how to filter and display the information on all paths that pass through the HBA port whose host port number is 0004 and bus number is 0001:

```
dlnkmgr view -path | find "0004.0001"
```

The above command will display information on all the paths that pass through the specified HBA port.

Example 2

The following example shows how to filter and display the information on all paths that pass through the channel adapter port 1B of the VSP G1000 Series:

```
dlnkmgr view -path -stname | find "VSP_G1000" | find "1B"
```

The above command will display information pertaining to only those paths that pass through the specified channel adapter port.

Note:

When the LU dynamic deletion function is used, a path might be deleted due to an error. If this happens and you attempt to change the path status, an error will occur. Confirm that the path, which you attempt to change the

status of, has been deleted, and then resolve the path error. For details, see [Deleting an LU Dynamically on page 4-19](#).

set (Sets Up the Operating Environment)

The `dlnkmgr` command's `set` operation sets the HDLM operating environment.

Format

To Set Up the HDLM Operating Environment

```
dlnkmgr set {-lb {on [-lbtype {rr|exrr|lio|exlio|lbk|exlbk}]|off}
              |-ellv error-log-collection-level
              |-elfs error-log-file-size
              |-elfn number-of-error-log-files
              |-systfv trace-level
              |-systfs trace-file-size
              |-systfn number-of-trace-files
              |-pchk{on[-intvl check-interval]|off}
              |-afb {on [-intvl check-interval]|off}
              |-iem {on [-intvl error-monitoring-interval]
                     [-iemnum number-of-times-error-is-to-occur]|off}
              |-lic
              |-rmlu {on [-force]|off}
              |-audlog {on [-audlv audit-log-data-collection-level] [-category [[ss][a][ca]|all]]|off}
              |-lbpathusetimes number-of-path-use-times
              |-expathusetimes number-of-path-use-times
              |-exrndpathusetimes number-of-path-use-times
              |-dpc {on|off} [-pathid path-ID -lu|-pathid path-ID -storage]
              |-dpctintvl checking-interval
              |-pstv {on|off}
              }
              [-s]
```

To Display the Format of the Set Operation

```
dlnkmgr set -help
```

Parameters

To Set Up the HDLM Operating Environment

The table below shows the defaults and recommended values for each setting. If you change the value of the `set` operation, the new value takes effect immediately.

Table 6-2 Default and Recommended Values

Item name	Default value	Recommended value
Load balancing	on The Extended Least I/Os algorithm is used.	on The recommended algorithm depends on the operating environment.
Error log collection level	3 Collect error information for the Information level and higher.	3 Collect error information for the Information level and higher.
Error log file size	9900 (KB)	9900 (KB)
Number of error log files	2	2
Trace level	0 Do not output any trace.	0 Do not output any trace.
Trace file size	1000 (KB)	1000 (KB)
Number of trace files	4	4
Path health checking	on (30-minute checking interval)	on The recommended checking interval depends on the operating environment.
Automatic failback	on (1-minute checking interval)	The recommended checking interval depends on the operating environment.
Intermittent error monitoring	off	off
LU dynamic deletion	off	off
Collecting audit log data	off	The recommended value depends on the operating environment. Set <code>on</code> , if you want to collect audit log data.
Number of times the same path can be used for load balancing	1	The recommended value depends on the operating environment.
Number of times the same path can be used for	100	The recommended value depends on the operating environment.

Item name	Default value	Recommended value
extended load balancing (sequential I/O)		
Number of times the same path can be used for extended load balancing (random I/O)	1	The recommended value depends on the operating environment.
Dynamic I/O path control#	off (10-minute checking interval)	off The recommended checking interval depends on the operating environment.
Displaying the physical storage system information	off	The recommended value depends on the operating environment. Set to on if you want to display the physical storage system information.

#

This item is applied only when Hitachi AMS2000 series, Hitachi SMS series, or HUS100 series storage is used.

-lb {on [-lbtype {rr|exrr|lio|exlio|lbk|exlbk}]|off}

Enables or disables load balancing.

on: Enabled

off: Disabled

In a cluster environment, the load balancing function is only available for the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series. In a non-cluster environment, the load balancing function is available for the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, Virtual Storage Platform series, and the EMC DMX series. The conditions mentioned above will be used no matter what for the settings for the EMC DMX series, EMC CX series, and HP EVA series. For example, in a cluster environment, the load balancing function is disabled even if it is set to **on** for the EMC DMX series. For details on the cluster software supported by HDLM, see [Cluster Support on page 2-48](#).

-lbtype {rr|exrr|lio|exlio|lbk|exlbk}

Specify the algorithm to be used for load balancing.

rr: The Round Robin algorithm

exrr: The Extended Round Robin algorithm

lio: The Least I/Os algorithm

exlio: The Extended Least I/Os algorithm

lbk: The Least Blocks algorithm

exlbk: The Extended Least Blocks algorithm

The type of algorithm specified by the `-lbtype` parameter remains stored in the system, even when you disable the load balancing function by specifying `-lb off`. Therefore, if you re-enable the load balancing function without specifying an algorithm, load balancing will be performed according to the algorithm that is stored in the system.

`-ellv error-log-collection-level`

Specify the level of error information you want to collect for an error log. The following shows the log files in which an error log collection level can be set:

HDLM manager logs:

`dlmmgrn.log` (*n* indicates a file number from 1 to 16)

HDLM GUI logs:

`dlmguin.log` (*n* indicates a file number of 1 or 2)

Table 6-3 Values of the Error Log Collection Level on page 6-19

shows the values of the error log collection level. If an error occurs, you may have to set the error log collection level to 1 or higher to collect log information.

Table 6-3 Values of the Error Log Collection Level

Value	Description
0	Collects no error log.
1	Collects error information for the Error or higher level.
2	Collects error information for the Warning or higher level.
3	Collects error information for the Information or higher level.
4	Collects error information for the Information or higher level (including maintenance information).

The higher the error log collection level value, the more log information will be output. As the amount of log information that is output increases, the amount of time before existing information will be overwritten becomes shorter.

Example

```
PROMPT>dlnkmgr set -ellv 1
KAPL01049-I Would you like to execute the operation?
Operation name = set [y/n]: y
KAPL01001-I The HDLM command completed normally. Operation
name = set, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

`-elfs error-log-file-size`

Specify a value from 100 to 2000000 (KB) for the size of the error log files. The target log files for which a file size can be set are HDLM manager logs (`dlmmgrn.log` (*n* indicates a file number from 1 to 16)) and HDLM GUI logs (`dlmguin.log` (*n* indicates a file number of 1 or 2)). For

HDLM GUI logs, the valid file size range is from 100 to 9900. If you specify a value of 9901 or more, 9900 will be used. The specified value is used for HDLM manager logs.

When combined with the specification for the number of error log files, the maximum total size of error log files that can be collected is 32000000KB (approximately 30GB).

When the size of all the log files in a log file group reaches their maximum value, the new log data will overwrite the existing log data, starting with the oldest log data.

`-elfn number-of error-log-files`

Specify the number of error log files. Specify a value from 2 to 16.

When combined with the specification for the error log file size, the maximum total size of error log files that can be collected is 32000000KB (approximately 30GB).

Only the number of files for HDLM manager logs (`dlmmgrn.log` (*n* indicates a file number from 1 to 16)) can be set. For HDLM GUI logs (`dlmguin.log` (*n* indicates a file number of 1 or 2)), the number of log files is set at 2.

`-systflv trace-level`

Specify the trace output level.

The trace files for which trace levels can be set are `hdlmtrn.log` (*n* indicates a file number from 1 to 64).

[Table 6-4 Trace Level Values on page 6-20](#) shows the values of the trace level. The default is 0. If an error occurs, set the trace level to 1 or higher to collect the log information.

Table 6-4 Trace Level Values

Value	Description
0	Does not output any trace.
1	Only outputs error information.
2	Outputs a summary of program operation.
3	Outputs details of program operation.
4	Outputs all information.

The higher the error log collection level value, the more log information will be output. As the amount of log information that is output increases, the amount of time before existing information will be overwritten becomes shorter.

`-systfs trace-file-size`

Specify the size of the trace file in kilobytes. Specify a value from 100 to 16000.

When combined with the specification for the number of trace files, the maximum size of the trace files that can be collected is 1024000KB.

If the value is changed to something smaller than the value that is currently set, the execution confirmation message KAPL01097-W will be displayed and the trace file will be deleted temporarily.

The trace files for which a file size can be set are `hdlmtrn.log` (*n* indicates a file number from 1 to 64). The trace files are fixed in length. Thus, even if the amount of written trace information is less than the setting file size, the size of each output trace file is always the same. When all the trace files become full, the new trace data will overwrite the oldest trace data.

`-systfn number-of-trace-files`

Specify the number of trace files. Specify a value from 2 to 64.

When combined with the specification for the trace file size, the maximum total size of the trace files that can be collected is 1024000KB.

If the value is changed to something smaller than the value that is currently set, the execution confirmation message KAPL01097-W will be displayed and the trace file will be deleted temporarily.

The trace files for which the number of files can be set are `hdlmtrn.log` (*n* indicates a file number from 1 to 64).

`-pchk {on [-intvl checking-interval]|off}`

Enables or disables path health checking.

`on`: Enabled

`off`: Disabled

Path health checking checks all online paths.

For a standby host, or a host connected to the Hitachi AMS/WMS series storage system, we recommend that you activate path health checking so that you can detect errors in paths where I/Os operations do not occur.

When you specify `on`, specify the checking interval of path health checking by specifying the parameter immediately following `on`. If you do not specify a checking interval, path health checking is executed in the following interval:

- When the checking interval has not been specified before:
Every 30 minutes (default setting)
- When the checking interval has been specified before:
The previously specified interval

The explanation for the following sub-parameter describes how to specify the checking interval.

`-intvl checking-interval`

Specify the checking interval between path health checks. Specify a value from 1 to 1440 minutes depending on the user environment.

When you change the checking interval, the new setting takes effect immediately. When the checking interval is shortened and the checking interval after the change (from the end of the previous path health check) has already elapsed, the path health check will start over.

The path health check interval setting remains stored in the system even if you disable the function by changing the path health checking to `off`. Therefore, when you re-enable path health checking and do not change the interval, the path health interval stored in the system is used.

```
-afb {on [-intvl checking-interval] | off}
```

Enables or disables automatic failbacks.

`on`: Enabled

`off`: Disabled

Enabling automatic failbacks might automatically place paths online that were intentionally placed offline (for example, paths placed offline for maintenance work).

If you want to prevent such paths from automatically being placed online, disable this function. When intermittent errors occur in paths or storage systems, statuses of paths alternates between the online and offline status frequently, thus decreasing I/O performance.

Automatic failbacks are performed on the following types of paths:

- Paths where an error occurred and for which the KAPL08022-E message was displayed.
- Path where an error occurred during the startup of the HDLM manager.

To prevent intermittent errors from deteriorating I/O performance, we recommend that you also enable intermittent error monitoring when the automatic fallback function is enabled. Intermittent error monitoring is specifiable only when automatic failbacks are enabled.

See [Table 6-5 Relationship Between the Setting for the Automatic Failback Function and Intermittent Error Monitoring and the Executable Operations on page 6-25](#) for the relationship between automatic failbacks and intermittent error monitoring.

When you specify `on`, specify the checking interval by specifying the parameter immediately following `on`. If you do not specify a checking interval, path statuses will be checked in the following way:

- When the checking interval has not been specified before:
Every minute (default setting)
- When the checking interval has been specified before:
The previously used interval

The explanation for the following sub-parameter describes how to specify the interval between path status checks.

```
-intvl checking-interval
```

Specify the interval between path status checks. Specify a value from 1 to 1440 minutes. Specify an interval appropriate for your operating environment.

If intermittent error monitoring is **on** and the number of times that the error is to occur is set to a value of 2 or more, the following condition must be satisfied:

```
error-monitoring-interval >= checking-interval-for-automatic-failback x number-of-times-error-is-to-occur-during-intermittent-error-monitoring
```

If this condition is not satisfied, the KAPL01080-W message will be output and an error will occur. If this happens, change any of the following settings: the checking interval for automatic failbacks, the intermittent error-monitoring interval, or the number of times that the error is to occur.

When you set the number of times that the error is to occur to **1**, the above condition does not need to be satisfied.

When you change the error monitor interval while intermittent error monitoring is running, the new settings will take effect immediately. When the checking interval is shortened and the checking interval time after the change has already elapsed during the current checking interval, the path status check will start over.

This setting remains stored in the system, even if you disable the function by changing the setting of automatic failbacks to **off**.

Therefore, if you re-enable automatic failbacks and do not change the interval, path status checks will be executed at the interval already stored in the system.

When you upgrade from HDLM 03-00 or 03-01 to 05-00 or later:

When you upgrade to HDLM 05-00 or later from HDLM 03-00 or 03-01, and the **-pchk** parameter was already set to **on** in the previous version, the **-afb** parameter will be set to **on** in the new version. The value of the **-intvl** parameter will be set to the same value as the previous checking interval of the **-pchk** parameter.

```
-iem { on [-intvl error-monitoring-interval] [-iemnum number-of-times-error-is-to-occur] | off }
```

Enables or disables intermittent error monitoring.

on: Enabled

off: Disabled

Intermittent error monitoring can be enabled only when automatic failback is set to **on**.

When you use automatic failback, we recommend that you set intermittent error monitoring to **on** to prevent an intermittent error from reducing I/O performance.

If **on** is specified, be sure to also specify the intermittent error monitoring interval and the number of times that the error is to occur. The system assumes that an intermittent error is occurring if the specified number of times that the error is to occur is reached during the monitoring interval. A path that is assumed to have an intermittent error is excluded from automatic failbacks. Intermittent error monitoring is performed on each

path. Intermittent error monitoring starts when a path is recovered from an error by performing an automatic failback.

If you omit the intermittent error monitoring interval or the number of times that the error is to occur, each setting is specified as follows:

- When the intermittent error monitoring interval or the number of times that the error is to occur has not been specified before:
The intermittent error monitoring interval is set to 30 minutes, and the number of times that the error is to occur is set to 3.
- When the intermittent error monitoring interval or the number of times that the error is to occur has been specified before:
The values specified from the last time are used.

When a value of 2 or more is specified for the number of times, the following condition must be satisfied:

```
error-monitoring-interval >= checking-interval-for-automatic-failback x number-of-times-error-is-to-occur-during-intermittent-error-monitoring
```

If this condition is not satisfied, the KAPL01080-W message will be output and an error will occur. If this happens, change any of the following settings: the checking interval for automatic failback, intermittent error monitoring interval, or the number of times that the error is to occur.

When you set the number of times that the error is to occur to 1, the above condition does not need to be satisfied.

The following shows the sub-parameters that should be specified: the error monitoring interval and the number of times that the error is to occur:

```
-intvl error-monitoring-interval
```

Specify the monitoring interval for an intermittent error. Use a value from 1 to 1440 minutes. The default is 30.

During intermittent error monitoring, if changes are made to the intermittent error monitoring interval setting or the setting for the number of times that an error is to occur, the error count and the elapsed time measured since monitoring has started are reset to 0.

When intermittent error monitoring is not being performed, if changes are made in the settings of the intermittent error monitoring interval or the number of times that an error is to occur, the new settings will take effect after the next time an automatic failback is successful. Because the errors and elapsed time are not counted or measured while intermittent errors are not being monitored, the values will not change.

The monitoring interval specified in this parameter is stored even though specifying *-iem off* disables intermittent error monitoring. Therefore, when you re-enable intermittent error monitoring and a monitoring interval is not specified, error monitoring will be performed by using the stored monitoring interval.

```
-iemnum number-of-times-error-is-to-occur
```

Specify the number of times the error is to occur. Valid values are from 1 to 99. The default is 3.

During intermittent error monitoring, if you change the number of times that the error is to occur in order for the system to determine that an intermittent error has occurred, the number of errors and the time that has passed since intermittent error monitoring has started are reset to 0. The changed setting will take effect immediately and intermittent error monitoring will restart.

When intermittent error monitoring is not being performed, if you change the number of times that the error is to occur in order for the system to determine that an intermittent error has occurred, the new value will take effect after the next automatic failback successfully completes. When intermittent error monitoring is not being performed, the number of errors that determine that an intermittent error has occurred is not counted and this value is not changed.

The number of times that the error is to occur is stored in the system, even when `-iem off` is specified and intermittent error monitoring is disabled. Therefore, when you re-enable intermittent error monitoring without specifying the number of times, the error monitoring will be executed using the value stored in the system.

When the `set -iem on` operation is executed during error monitoring, even if you do not change the conditions for intermittent error monitoring, the number of errors and the time that has passed since the error monitoring has started are reset to 0. Intermittent error monitoring will then resume with the changed settings.

If you set the automatic failback function to `off` while intermittent error monitoring is `on`, intermittent error monitoring will be disabled. Note, however, that if you use the `view -sys` operation to display the HDLM functionality configuration, `Intermittent Error Monitor` will be shown as `on`. When the automatic failback function is returned to `on`, intermittent error monitoring will once again be enabled.

The executable operations for the automatic failback function and intermittent error monitoring depend on the settings for those functions. The table below shows the relationship between the settings and available operations for automatic failback and intermittent error monitoring.

Table 6-5 Relationship Between the Setting for the Automatic Failback Function and Intermittent Error Monitoring and the Executable Operations

Setting		Available operation	Result of operation
AFB	IEM		
on	on	Set AFB to <code>on</code> .	The operations of AFB and IEM do not change.
		Change the AFB setting.	AFB is performed under the new settings. ^{#1}
		Set AFB to <code>off</code> .	<ul style="list-style-type: none">AFB and IEM are disabled.

Setting		Available operation	Result of operation
AFB	IEM		
			<ul style="list-style-type: none"> The error count, elapsed monitoring time, and information about paths not subject to automatic failback are cleared.
		Set IEM to on.	<ul style="list-style-type: none"> When a path is being monitored (during a period of conditional intermittent error monitoring), the value of the error count and the elapsed monitoring time are reset to 0, and then intermittent error monitoring will restart. When a path is not being monitored, nothing changes.
		Change the IEM settings.	<ul style="list-style-type: none"> While a path is being monitored, the value of the error count and the elapsed monitoring time are reset to 0, and then intermittent error monitoring will restart. #1 When a path is not being monitored, the IEM settings will take effect again when the path is recovered from the error status by performing an automatic failback.
		Set IEM to off.	<ul style="list-style-type: none"> IEM is disabled. The error count, elapsed monitoring time, and information about paths not subject to automatic failbacks are cleared.
	off	Set AFB to on.	The operations of AFB and IEM do not change.
		Change the AFB setting.	AFB operates using new settings.
		Set AFB to off.	AFB is disabled.
		Set IEM to on.	IEM is enabled. #1
	off	on #2	AFB and IEM are enabled. #1
			The operations of AFB and IEM do not change.
		off	AFB is enabled.
			The operations of AFB and IEM do not change.

Legend:

AFB: Automatic failback

IEM: Intermittent error monitoring

#1

When this condition is not satisfied, the KAPL01080-W message is output and an error occurs. The status of intermittent error monitoring does not change.

#2

Because automatic failback is `off`, intermittent error monitoring is disabled.

Example

The following example shows how to enable monitoring of intermittent errors:

```
PROMPT>dlnkmgr set -iem on -intvl 20 -iemnum 2
KAPL01049-I Would you like to execute the operation?
Operation name = set [y/n]: y
KAPL01001-I The HDLM command completed normally. Operation
name = set, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

`-lic`

Specify this option for when a license is updated. The HDLM license is provided via a license key or license key file. A license key file is a file that stores the HDLM license key.

If you use a license key file:

Store the license key file named `hdlm_license` directly under the Windows installation drive, and then execute the `set -lic` operation. A message confirming that the license key has been registered is displayed, depending on the license key type defined in the license key file. When a temporary license key or emergency license key has been registered, the expiration period is displayed (KAPL01071-I, KAPL01072-I).

If you do not use a license key file:

When the `set -lic` operation is executed, a message (KAPL01068-I) asking the user to enter a license key appears. Enter the license key. A message confirming that the license key has been registered is displayed, depending on the license key type described in the license key file. For a temporary license key or emergency license key, the expiration period is also displayed (KAPL01071-I, KAPL01072-I).

The following table lists and describes the license key types.

Table 6-6 License Key Types

Type	Description
Permanent license key	Permanent license keys are valid for using HDLM permanently.
Temporary license key [#]	Temporary license keys are used temporarily, for example, when a user needs to perform product evaluations. Temporary license keys are valid for 120 days after the installation. You cannot reuse a temporary license key.

Type	Description
Emergency license key	Emergency license keys are used temporarily, for example, when waiting for a permanent license key to be issued. Emergency license keys are valid for 30 days after they are entered. You cannot reuse an emergency license key.

#

A temporary license key cannot be installed by using the `dlnkmgr set` operation.

Example 1

The following example shows how to update the license key when the license key file exists:

```
PROMPT>dlnkmgr set -lic
KAPL01049-I Would you like to execute the operation?
Operation name = set [y/n]: y
KAPL01071-I A permanent license was installed.
PROMPT>
```

Example 2

The following example shows how to update the license key when the license key file does not exist:

```
PROMPT>dlnkmgr set -lic
KAPL01049-I Would you like to execute the operation?
Operation name = set [y/n]: y
KAPL01083-I There is no license key file. File name =Windows-
installation-destination-drive-name\hdlm_license
KAPL01068-I Enter a license key: ****
KAPL01071-I A permanent license was installed.
PROMPT>
```

`-rmlu { on [-force] | off }`

Enables or disables the LU dynamic deletion function.

`on`: Enabled

`off`: Disabled

The default is `off`.

The following sub-parameter can be used to specify how the LU dynamic deletion function operates.

`-force`

The LU is removed from under HDLM-management when all the paths to the LU are disconnected, even when an Offline (C) path is included in the paths connected to the LU.

For details on the LU dynamic deletion function, see [Deleting an LU Dynamically on page 4-19](#). The following table shows the values and descriptions of the LU dynamic deletion function.

Table 6-7 Values for the LU Dynamic Deletion Function

Value	Description
off	The LU will not be removed from under HDLM-management, even if an error occurs on all the paths to the LU, all the paths to the LU are disconnected, or the LU is deleted. The path statuses are Offline(E) and Online(E). This operation is the same as the in HDLM 05-01 or earlier. The off option is recommended when you want to use the same function as you used before in HDLM 05-01 or earlier, without using the LU dynamic deletion function.
on	The LU is removed from HDLM-management when all the paths to the LU are disconnected. However, if an Offline(C) path is among the disconnected paths, the LU will not be deleted from HDLM-management. The deleted LU is restored after it is recovered from the physical failure and the disk is re-scanned.
on -force	The LU is removed from HDLM-management when all the paths to the LU are disconnected, even when an Offline(C) path is included. The removed LU is restored after it is recovered from the physical failure and the disk is re-scanned.

`-audlog {on [-audlv audit-log-data-collection-level] [-category [[ss][a][ca]|all]]|off}`

Specifies whether to collect audit log data.

`on`: Audit log data is collected.

`off`: Audit log data is not collected.

`-audlv audit-log-data-collection-level`

Specifies the severity level that determines the selection of audit log data to be collected. The table below lists and describes the values used for this setting. The default is 6.

Table 6-8 Values Indicating Audit Log Data Collection Levels

Value (severity)	Explanation
0	Error-level audit log data is collected.
1	
2	
3	
4	Error-level and Warning-level audit log data is collected.
5	
6	Error-level, Warning-level, and Information-level audit log data is collected.
7	

`-category [[ss][a][ca]|all]`

Specifies the categories of audit log data to be collected. The table below lists and describes the values used for this setting. The default is `all`. Note that if you enter `-category` without specifying any category (`ss`, `a`, `ca`, or `all`), it is assumed that `all` is specified.

Table 6-9 Values Indicating Audit Log Data Categories

Value	Explanation
<code>ss</code>	Audit log events of the <code>StartStop</code> category are collected.
<code>a</code>	Audit log events of the <code>Authentication</code> category are collected.
<code>ca</code>	Audit log events of the <code>ConfigurationAccess</code> category are collected.
<code>all</code>	Audit log events of the <code>StartStop</code> , <code>Authentication</code> , and <code>ConfigurationAccess</code> categories are collected.

`-lbpathusetimes number-of-path-use-times`

Specifies the number of times the same path can be used for I/O operations when the Round Robin (`rr`), Least I/Os (`lio`), or Least Blocks (`lbk`) algorithm is used for load balancing.

You can specify a decimal (base 10) value from 0 to 999999. The default is 1.

If you specify 0, operation is the same as when load balancing is disabled.

`-expathusetimes number-of-path-use-times`

Specifies the number of times the same path can be used for sequential I/O operations when the extended Round Robin (`exrr`), Least I/Os (`exlio`), or Least Blocks (`exlbk`) algorithm is used for load balancing.

You can specify a decimal (base 10) value from 0 to 999999. The default is 100.

If you specify 0, the same path is used as long as the sequential I/O operations continue.

`-exrndpathusetimes number-of-path-use-times`

Specifies the number of times the same path can be used for random I/O operations when the extended Round Robin (`exrr`), Least I/Os (`exlio`), or Least Blocks (`exlbk`) algorithm is used for load balancing.

You can specify a decimal (base 10) value from 0 to 999999. The default is 1.

If you specify 0, the same path is used as long as the random I/O operations continue.

`-dpc {on|off} [-pathid path-ID -lu | -pathid path-ID -storage]`

Enables or disables the dynamic I/O path control function for each storage system or LU. The default value is "off".

`on`: Enabled

`off`: Disabled

`-pathid path-ID -lu`

Sets the dynamic I/O path control function to enabled or disabled for each LU. Specify one of the IDs of the paths connected to the target LU.

`-pathid path-ID -storage`

Sets the dynamic I/O path control function to enabled or disabled for each storage system. Specify one of the IDs of the paths connected to the target storage system.

If the `-pathid` parameter is not specified, the setting is performed for each system, and the setting for each storage system or LU is cleared.

`-dpcintvl checking-interval`

Specifies the checking interval (in minutes) for reviewing information about switching of controllers performed by the storage system which is used in the dynamic I/O path control function. Specify a value in the range from 1 to 1440. The default value is "10".

`-pstv {on|off}`

Enables or disables the display of the physical storage system information. The default value is "off".

`on`: Enabled

`off`: Disabled

If the display of the physical storage system information is enabled, information about the physical storage system is displayed. If the display of the physical storage system information is disabled, information about the storage system recognized by the operating system is displayed. For a virtualized storage system, virtual information is displayed, and for a non-virtualized storage system, physical information is displayed.

The display results of view operations depend on whether the display of the physical storage system information is enabled or disabled. The following table shows the display items for which the display results differ.

Table 6-10 Display items for which the display results of the view operation differ depending on the `-pstv` parameter specification

Operation	Display Item
<code>view -path</code>	DskName
	iLU
	ChaPort (CP)
<code>view -lu</code>	Product
	SerialNumber (S/N)
	iLU
	ChaPort

`-s`

Executes the command without displaying the message asking for confirmation of command execution from the user. Specify this parameter if you want to skip the response to the confirmation message: for example, when you want to execute the command in a shell script or batch file.

To Display the Format of the Set Operation

`-help`

Displays the format of the `set` operation.

Example

The following example shows how to display the format of the `set` operation:

```
PROMPT>dlnkmgr set -help
set:
  Format
    dlnkmgr set { -lb on [ -lbtype { rr | exrr | lio | exlio | blk | exblk } ]
      | -lb off
      | -ellv ElogLevel
      | -elfs ElogFileSize
      | -elfn Number-Of-ElogFiles
      | -systflv TraceLevel
      | -systfs TraceFileSize
      | -systfn Number-Of-TraceFiles
      | -pchk on [ -intvl Interval-Time ]
      | -pchk off
      | -afb on [ -intvl Interval-Time ]
      | -afb off
      | -iem on
        [ -intvl Error-Monitor-Interval ]
        [ -iemnum Number-Of-Times ]
      | -iem off
      | -lic
      | -rmlu on [ -force ]
      | -rmlu off
      | -audlog on
        [ -audlv AudlogLevel ]
        [ -category Category-Value ]
      | -audlog off
      | -lbpathusetimes Number-Of-PathUseTimes
      | -expathusetimes Number-Of-ExPathUseTimes
      | -exrndpathusetimes Number-Of-ExRndPathUseTimes
      | -dpc { on | off } [-pathid AutoPATH_ID { -lu | -
    storage } ]
      | -dpcintvl Dpc-Interval
      | -pstv { on | off }
    }
  [-s]

  Valid value
    ElogLevel           { 0 | 1 | 2 | 3 | 4 } (Default Value
3)
    ElogFileSize        { 100 - 2000000 } (KB) (Default Value
9900)
    Number-Of-ElogFiles { 2 - 16 } (Files) (Default Value
```

```

2)      TraceLevel           { 0 | 1 | 2 | 3 | 4 } (Default Value
0)
0)      TraceFileSize       { 100 - 16000 } (KB)      (Default Value
1000)
1000)   Number-Of-TraceFiles { 2 - 64 } (Files)      (Default Value
4)
4)      Interval-Time       { 1 - 1440 } (Minute)    (Default Value
30)
30)   (pchk)
      Interval-Time       { 1 - 1440 } (Minute)    (Default Value
1)
1)   (afb)
      Error-Monitor-Interval { 1 - 1440 } (Minute)    (Default Value
30)
30)   Number-Of-Times       { 1 - 99 } (Times)      (Default Value
3)
3)   AudLogLevel            { 0 - 7 }                  (Default Value
6)
6)   Category-Value         { [ss] [a] [ca] |           all } (Default Value
all)
all)  Number-Of-PathUseTimes { 0 - 999999 } (Times)  (Default Value
1)
1)  Number-Of-ExPathUseTimes { 0 - 999999 } (Times)  (Default Value
100)
100) Number-Of-ExRndPathUseTimes { 0 - 999999 } (Times)  (Default Value
1)
1)   AutoPATH_ID           { 000000 - 999999 } (Decimal)
      Dpc-Interval          { 1 - 1440 } (Minute)    (Default Value
10)
10) KAPL01001-I The HDLM command completed normally. Operation name =
set, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

view (Displays Information)

The `dlnkmgr` command's `view` operation displays HDLM program information, HDLM management-target device information, path information, and LU information. If the I/O load on the dynamic disk is heavy, it might take a while to execute the `view` operation.

Format

To Display Program Information

```

dlnkmgr view -sys
[-sfunc|-msrv|-adrv|-pdrv|-lic|-audlog|-lbpatherusetimes|-
expatherusetimes|-exrndpathersetimes|-pstv]
[-t]

```

To Display HDLM Management-target Device Information

```
dlnkmgr view -stinfo [-t]
```

To Display Path Information

To display path information

```
dlnkmgr view -path  
[-pstv|-vstv]  
[-hdev host-device-name]  
[-stname]  
[-iem]  
[-srt {pn|lu|cp}]  
[-exlu]  
[-hbaportwwn]  
[-t]
```

To display path information (by selecting a display item)

```
dlnkmgr view -path -item  
[pn] [dn] [lu] [cp] [type] [ic] [ie] [dnu] [hd] [iep]  
[hbaportwwn] [phys] [virt] [vid] [ha]  
[-pstv|-vstv]  
[-hdev host-device-name]  
[-stname]  
[-srt {pn|lu|cp}]  
[-exlu]  
[-t]
```

To display a summary of path information

```
dlnkmgr view -path -c  
[-pstv|-vstv]  
[-stname]  
[-srt {lu|cp}]  
[-t]
```

To Display LU Information

To display LU information

```
dlnkmgr view -lu  
[-pstv|-vstv]  
[-hdev host-device-name|-pathid AutoPATH_ID]  
[-exlu]  
[-t]
```

To display LU information (by adding items to be displayed)

```
dlnkmgr view -lu -item
  [ [slpr] [pn] [cp] [clpr] [type] [ic] [ie] [dnu] [iep] [dpc]
  [phys] [virt] [vid] [ha] [hastat] |all ]
  [-pstv|-vstv]
  [-hdev host-device-name|-pathid AutoPATH_ID]
  [-exlu]
  [-t]
```

To display a summary of LU information

```
dlnkmgr view -lu -c
  [-exlu]
  [-pstv|-vstv]
  [-t]
```

To display a summary of LU information (by adding items to be displayed)

```
dlnkmgr view -lu -c -item
  [slpr]
  [-pstv|-vstv]
  [-exlu]
  [-t]
```

To Display the Format of the view Operation

```
dlnkmgr view -help
```

Parameters

This section describes the parameters for the `view` operation, in the following order:

[Parameters Used When Displaying Program Information on page 6-35](#)

[Parameters Used When Displaying HDLM Management-target Device Information on page 6-43](#)

[Parameters Used When Displaying Path Information on page 6-44](#)

[Parameters Used When Displaying LU Information on page 6-60](#)

[Parameter Used When Displaying the Format of the view Operation on page 6-76](#)

Parameters Used When Displaying Program Information

```
-sys [-sfunc|-msrv|-adrv|-pdrv|-lic|-audlog|-lbpusetimes|-
expusetimes|-exrndpathusetimes|-pstv]
```

Displays the HDLM program information.

Use one of the sub-parameters (following `-sys`) to specify the program information that you want to display. If you do not specify a sub-parameter, the command displays all of the program information except the information about the audit log data collection settings, the number of times the same path can be used for load balancing, the number of times the same path can be used for extended load balancing, and the value of the display-of-the-physical-storage-system-information setting.

[Table 6-11 Displayed Program Information on page 6-36](#) describes the specifiable parameters, displayed information, displayed items, and a corresponding description.

`-t`

Does not display the title for each information item.

Table 6-11 Displayed Program Information

Parameter and program information to be displayed	Item	Description
<code>-sfunc</code> Information about the HDLM function settings	HDLM Version	HDLM version number
	Service Pack Version	HDLM SP version number. This item is blank if no SP is present.
	Load Balance	<p>Settings for load balancing</p> <ul style="list-style-type: none"> Setting status: <ul style="list-style-type: none"> on: Enabled off: Disabled Algorithm: <p>When the setting status of load balancing is on, one of the following types of algorithms is used for load balancing is displayed in the parentheses following on.</p> <ul style="list-style-type: none"> rr: The Round Robin algorithm extended rr: The Extended Round Robin algorithm lio: The Least I/Os algorithm extended lio: The Extended Least I/Os algorithm lbk: The Least Blocks algorithm extended lbk: The Extended Least Blocks algorithm
	Support Cluster	<p>Setting for cluster support[#] and the type of cluster server:</p> <ul style="list-style-type: none"> on MSCS: When MSCS is used for the cluster server off: When no cluster is used or a cluster other than MSCS is used

Parameter and program information to be displayed	Item	Description
	Elog Level	<p>Error logging level:</p> <ul style="list-style-type: none"> 0: Collects no error information. 1: Collects error information at the Error level or higher. 2: Collects error information at the Warning level or higher. 3: Collects error information at the Information level or higher. 4: Collects error information at the Information level or higher (including maintenance information).
	Elog File Size (KB)	Size of the error log file in kilobytes
	Number Of Elog Files	Number of error log files
	Trace Level	<p>Trace output level:</p> <ul style="list-style-type: none"> 0: Does not output any trace. 1: Only outputs error information. 2: Outputs a summary of program operation. 3: Outputs details of program operation. 4: Outputs all information.
	Trace File Size (KB)	Trace file size in kilobytes
	Number Of Trace Files	Number of trace files
	Path Health Checking	<ul style="list-style-type: none"> Settings for path health checking: on: Enabled off: Disabled Checking interval: When the setting of the path health checking is on, the checking interval of path health checking is displayed within the parentheses following on. The time is in minutes.
	Auto Failback	<ul style="list-style-type: none"> Settings for an automatic failback: on: Enabled off: Disabled Checking interval: When the setting of the automatic failback is on, the checking interval of automatic failback is displayed within the parentheses following on. The time is in minutes.

Parameter and program information to be displayed	Item	Description
	Remove LU	<p>Setting for Remove LU:</p> <p>on: Enabled</p> <p>off: Disabled</p>
	Intermittent Error Monitor	<ul style="list-style-type: none"> Setting for intermittent error monitoring: <p>on: Enabled</p> <p>off: Disabled</p> <p>When automatic failback is off, intermittent error monitoring is disabled although Intermittent Error Monitor will be shown as on. When the automatic failback function is on, intermittent error monitoring will be enabled.</p> Intermittent error monitoring interval and number of times that the error needs to occur <p>When intermittent error monitoring is on, the specified intermittent error monitoring interval and number of times that the error needs to occur are displayed within the parentheses following on. The format is <i>number-of-times-error-is-to-occur/monitoring-interval</i>. The time is in minutes.</p>
	Dynamic I/O Path Control	<p>Setting status of the dynamic I/O path control function</p> <ul style="list-style-type: none"> Setting status <p>on: Enabled off: Disabled</p> Checking interval <p>The parentheses following the setting status shows the checking interval for reviewing information about the switching of controllers performed by the storage system. "Minute" is used as the unit.</p> <p>If different settings have been specified for each storage system or LU, an asterisk (*) is added after the parentheses in which the checking interval is displayed.</p>
-msrv Information about the HDLM manager	HDLM Manager	<p>Status of the HDLM manager:</p> <p>Alive: Normal</p> <p>Dead: Stopped</p>
	Ver	Version number of the HDLM manager
	WakeupTime	Startup time of the HDLM manager
-adrv	HDLM Alert Driver	<p>Status of the HDLM alert driver:</p> <p>Alive: Normal</p> <p>Dead: Stopped</p>

Parameter and program information to be displayed	Item	Description
Information about the HDLM alert driver	Ver	Version number of the HDLM alert driver
	WakeupTime	Startup time of the HDLM alert driver
	ElogMem Size	Size of error log memory for the HDLM alert driver in kilobytes
-pdrv Information about the HDLM driver	HDLM Driver	Status of the HDLM driver: Alive: Normal Dead: Stopped
	Ver	Version number of the HDLM driver
	WakeupTime	Startup time of the HDLM driver
	License Type	License type • Permanent • Temporary • Emergency
-lic Information about the HDLM license	Expiration	License expiration: • When using a permanent license: - • When using a temporary license or emergency license: The license expiration period is displayed in the format: <i>yyyy/mm/dd (ndays after)</i> . When the <code>view -sys -lic</code> operation is executed, <i>(ndays after)</i> appears if there are <i>n</i> days left until the license period expires. For example, when there are 100 days left until the license period (2006/08/21) expires, the following appears: 2006/08/21 (100days after)
	Audit Log	Settings for audit log data collection:
-audlog Information about audit log data collection settings		<ul style="list-style-type: none"> Whether collection is enabled: on: Enabled off: Disabled Audit log data collection level: When audit log data collection is on, the collection level that has been set is displayed within the parentheses following on. The collection level indicates a severity level. A value from 0 to 7 is displayed as the collection value.
	Audit Log Category	The categories of audit log data to be output are displayed. When more than one category is displayed, commas (,) are used as separators. ss: StartStop

Parameter and program information to be displayed	Item	Description
		<p>a: Authentication ca: ConfigurationAccess</p> <p>If all the above categories are specified, all is displayed.</p> <p>If the collection of audit log data is disabled, a hyphen (-) is displayed.</p>
<p>-lbpusetimes</p> <p>The number of times the same path can be used for load balancing</p>	<p>Times Same Path Was Used</p>	<p>The number of times the same path can be used for I/O operations when the Round Robin (rr), Least I/Os (lio), or Least Blocks (lbk) algorithm is used for load balancing.</p> <p>If you used Global Link Manager to set the number of times the same path can be used in units of LUs, an asterisk (*) is added after the value.</p>
<p>-expusetimes</p> <p>The number of times the same path can be used for extended load balancing (sequential I/O)</p>	<p>Times Same ExPath Was Used</p>	<p>The number of times the same path can be used for sequential I/O operations when the extended Round Robin (exrr), Least I/Os (exlio), or Least Blocks (exlbk) algorithm is used for load balancing.</p> <p>If you used Global Link Manager to set the number of times the same path can be used in units of LUs, an asterisk (*) is added after the value.</p>
<p>-exrndpathsetimes</p> <p>The number of times the same path can be used for extended load balancing (random I/O)</p>	<p>Times Same ExPath Was Used (R)</p>	<p>The number of times the same path can be used for random I/O operations when the extended Round Robin (exrr), Least I/Os (exlio), or Least Blocks (exlbk) algorithm is used for load balancing.</p> <p>If you used Global Link Manager to set the number of times the same path can be used in units of LUs, an asterisk (*) is added after the value.</p>
<p>-pstv</p> <p>The display-of-the-physical-storage-system-information setting</p>	<p>Physical Storage View</p>	<p>The value of the display-of-the-physical-storage-system-information setting is displayed.</p> <p>on: Enabled off: Disabled</p>

#

When the HDLM manager starts, HDLM cluster servers are automatically recognized.

Examples

Example 1

The following example shows how to display information about the HDLM function settings:

```
PROMPT>dlnkmgr view -sys -sfunc
HDLM Version : x.x.x-xx
Service Pack Version :
Load Balance : on(extended lio)
Support Cluster : off
Elog Level : 3
Elog File Size(KB) : 9900
Number Of Elog Files : 2
Trace Level : 0
Trace File Size(KB) : 1000
Number Of Trace Files : 4
Path Health Checking : on(30)
Auto Failback : on(1)
Remove LU : on
Intermittent Error Monitor : off
Dynamic I/O Path Control : off(10)
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 2

The following example shows how to display information about the HDLM manager:

```
PROMPT>dlnkmgr view -sys -msrv
HDLM Manager Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 3

The following example shows how to display information about the HDLM alert driver:

```
PROMPT>dlnkmgr view -sys -adrv
HDLM Alert Driver Ver WakeupTime ElogMem Size
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss 128
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 4

The following example shows how to display information about the HDLM driver:

```
PROMPT>dlnkmgr view -sys -pdrv
HDLM Driver Ver WakeupTime
Alive x.x.x-xx yyyy/mm/dd hh:mm:ss
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 5

The following example shows how to display information about the HDLM license:

```
PROMPT>dlnkmgr view -sys -lic
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 6

The following example shows how to display information about the audit log settings:

```
PROMPT>dlnkmgr view -sys -audlog
Audit Log : off
Audit Log Category : -
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 7

The following example shows how to display the number of times the same path can be used for load balancing:

```
PROMPT>dlnkmgr view -sys -lbpathusetimes
Times Same Path Was Used : 1
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 8

The following example shows how to display the number of times the same path can be used for extended load balancing (sequential I/O):

```
PROMPT>dlnkmgr view -sys -expathusetimes
Times Same ExPath Was Used : 100
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 9

The following example shows how to display the number of times the same path can be used for extended load balancing (random I/O):

```
PROMPT>dlnkmgr view -sys -exrndpathusetimes
Times Same ExPath Was Used(R) : 1
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Example 10

The following example shows how to display the value of the display-of-the-physical-storage-system-information setting:

```

PROMPT>dlnkmgr view -sys -pstv
Physical Storage View      : off
KAPL01001-I The HDLM command completed normally. Operation name
= view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Parameters Used When Displaying HDLM Management-target Device Information

-stinfo

Use this parameter to display information about an HDLM management-target device (except the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series) that was specified when HDLM was installed.

[Table 6-12 HDLM Management-target Device Information on page 6-43](#) describes the displayed items.

Table 6-12 HDLM Management-target Device Information

Item	Description
HDLM management-target device	Name of the HDLM management-target device (except the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series)
Setting Status	<p>Setting status of the HDLM management-target device (except the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series).</p> <p>on: Enabled off: Disabled</p> <p>The HDLM management-target device (except the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series) can be set when the OS is one of the following. Otherwise, this item always displays <code>off</code>.</p> <ul style="list-style-type: none"> • Windows Server 2003 (x86) SP1 or later • Windows Server 2003 (IPF) SP1 or later • Windows Server 2003 (x64)^{#1} • Windows Server 2008^{#2} <p>If the OS is Windows Server 2008, this item always displays <code>on</code>.</p>

#1

The EMC DMX series cannot be managed.

#2

The EMC DMX series and the HP EVA series cannot be managed.

-t

Does not display the title for each information item.

Example

```
PROMPT>dlkmgr view -stinfo
EMC Symmetrix DMX Series, CLARiiON CX Series      : on
HP StorageWorks EVA Series                      : on
KAPL01001-I The HDLM command completed normally. Operation
name = view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Parameters Used When Displaying Path Information

When displaying path information, if you specify either the `-item` or `-c` parameter and also specify the `-path` parameter, you can select the items to display and display a summary of path information. This section describes each parameter, path information and displayed items.

Parameters to display path information:

`-path`

When you specify the `-path` parameter and do not specify either the `-c` or `-item` parameter, the information will be displayed about the HDLM managed paths without abbreviating or selecting items.

In the sub-parameters (following `-path`), you can filter the paths to be listed using `-hdev` and sort the list using `-srt`. When you omit both parameters, the command displays information for all the paths in order of ascending AutoPATH_IDs.

For details on what is displayed in each item, see [Table 6-14 Displayed Path Information on page 6-52](#).

AutoPATH_IDs displayed by the `-path` parameter depend on the sequence in which HDLM detects the paths after a host is started up. Because of this, make sure that you use the path name `PathName` to identify a path.

The sub-parameters are as follows:

`-pstv | -vstv`

If the `-pstv` parameter is specified, information about the physical storage system is displayed. If the `-vstv` parameter is specified, information about the storage system recognized by the operating system is displayed. If neither parameter is specified, information is displayed according to the value specified in the `-pstv` parameter of set operations.

For information about the items that are displayed differently depending on the specified `-pstv` and `-vstv` parameters, see [Table 6-10 Display items for which the display results of the view operation differ depending on the -pstv parameter specification on page 6-31](#) in [Parameters on page 6-17](#).

`-hdev host-device-name`

Displays information only for the paths accessing the specified host device.

Specify a drive letter to indicate the desired host device. You cannot specify the host device unless a drive letter has been assigned. The *host-device-name* string is case sensitive. If the command ends with the KAPL01064-W or KAPL01013-E message, follow the recommended action in the message.

`-stname`

Use this parameter for the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, or Virtual Storage Platform series to display the model ID of the storage system in the product ID element of the `DskName` field. When this parameter is omitted, the command displays the product ID or emulation type of the storage system instead.

For details about the information displayed for product IDs, see [Table 6-16 Product ID Displayed by the View -path Operation on page 6-59](#).

`-iem`

Use this parameter to add `IEP` to path information and display information about intermittent errors.

`-srt {pn|lu|cp}`

Use this parameter to sort the path information in ascending order, according to the specified sorting keys.

The sorting keys are as follows: the first sorting key is the name of the storage system (`DskName`), the second sorting key is the value specified by the `-srt` parameter, and the third sorting key is `AutoPATH_ID`.

The parameter values available to specify the second sorting key are:

- `pn`: Path name
- `lu`: LU number of the storage system
- `cp`: Port number of the channel adapter

When the `-srt` parameter is omitted, the path information is listed in ascending order of `AutoPATH_ID`s.

`-exlu`

- When an HDLM management-target device is the EMC DMX series, EMC CX series, or HP EVA series:
If this parameter is specified, all 32 digits of the `iLU` are displayed instead of truncating the `iLU` to 13 digits. If this parameter is not specified, any characters after the 13th digit of the `iLU` of the EMC DMX series, EMC CX series, and HP EVA series will not be displayed. Ellipsis (...) will be displayed instead.
- When the only HDLM management-target devices are the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100

series, Universal Storage Platform V/VM series, or Virtual Storage Platform series:

16 digits will be displayed for the iLU, even if this parameter is specified.

-hbaportwwn

Displays port WWN information for the HBAs connected to the storage system.

-t

Omits the title for each information item.

Example

When the **-exlu** parameter is not specified:

```
PROMPT>dlinkmgr view -path
Paths:000016 OnlinePaths:000016
PathStatus IO-Count IO-Errors
Online 1199 0

PathID PathName DiskName iLU
ChapPort Status Type IO-Count IO-Errors DNum HDevName .SYMMETRIX .-
000000 0002.0000.0000000000000000.0008 EMC 0 L 6006048000018...
- Online - 131 0 0 .SYMMETRIX .-
000001 0002.0000.0000000000000000.000C EMC 0 M 6006048000018...
- Online - 132 0 0 .SYMMETRIX .-
000002 0002.0000.0000000000000000.000D EMC 0 N 6006048000018...
- Online - 131 0 0 .SYMMETRIX .-
000003 0002.0000.0000000000000000.000E EMC 0 O 6006048000018...
- Online - 133 0 0 .SYMMETRIX .-
000004 0002.0000.0000000000000001.0001 DGC RAID 10 6006016099C50...
- Online - 203 0 0 F .RAID 5 .-
000005 0002.0000.0000000000000001.0001 DGC 0 G 6006016099C50...
- Online - 174 0 0 G .RAID 5 .-
000006 0002.0000.0000000000000002.0000 HITACHI .DF600F .0329 0000
DA Online Own 138 0 0 P .DF600F .0329 0001
DA Online Non 0 0 0 .RAID 10 .-
000008 0003.0000.0000000000000000.0001 DGC 0 F 6006016099C50...
- Online - 0 0 .RAID 5 .-
000009 0003.0000.0000000000000001.0001 DGC 0 G 6006016099C50...
- Online - 0 0 .SYMMETRIX .-
000010 0003.0000.0000000000000001.0000 EMC 0 L 6006048000018...
- Online - 4 0 0 M .SYMMETRIX .-
000011 0003.0000.0000000000000001.0001 EMC 0 M 6006048000018...
- Online - 5 0 0 N .SYMMETRIX .-
000012 0003.0000.0000000000000001.0002 EMC 0 O 6006048000018...
- Online - 4 0 0 .SYMMETRIX .-
000013 0003.0000.0000000000000001.0003 EMC 0 P 6006048000018...
- Online - 6 0 0 .DF600F .0329 0000
000014 0003.0000.0000000000000002.0000 HITACHI .DF600F .0329 0001
LA Online Non 0 0 .DF600F .0329 0000
000015 0003.0000.0000000000000002.0001 HITACHI .DF600F .0329 0001
LA Online Own 138 0 0 Q .DF600F .0329 0001
KAFL01001-1 The HDLM command completed normally. Operation name = view, completion time = yyyy/mm/dd
hh:mm:ss
PROMPT>
```

When the **-exlu** parameter is specified:

```

PROMPT>diskmgr view -path -exlu
Paths:000016 OnlinePaths:000016
PathStatus IO-Count IO-Errors
Online 1199 0

PathID PathName DskName
iLU ChaPort Status Type IO-Count IO-Errors CNum BDevName
000000 0002.0000.0000000000000000.0008 BMC ,SYMMETRIX ,-
6006048000187810001535940423031 - Online - 131 0 0 L
000001 0002.0000.0000000000000000.000C BMC ,SYMMETRIX ,-
6006048000187810001535940423032 - Online - 132 0 0 N
000002 0002.0000.0000000000000000.000D BMC ,SYMMETRIX ,-
6006048000187810001535940423033 - Online - 131 0 0 N
000003 0002.0000.0000000000000000.000E BMC ,SYMMETRIX ,-
6006048000187810001535940423034 - Online - 133 0 0 O
000004 0002.0000.0000000000000001.0000 EGC ,RAID 10 ,-
6006016099C50E0028C854C558CDD911 - Online - 203 0 0 F
000005 0002.0000.0000000000000001.0001 EGC ,RAID 5 ,-
6006016099C50E008C70FDB358CDD911 - Online - 174 0 0 G
000006 0002.0000.0000000000000002.0000 HITACHI .DF600F ,0329
000007 0002.0000.0000000000000002.0001 HITACHI .DF600F ,0329
0001 0003.0000.0000000000000000.0000 EGC ,RAID 10 ,-
6006016099C50E0028C854C558CDD911 - Online - 0 0 0 F
000009 0003.0000.0000000000000000.0001 EGC ,RAID 5 ,-
6006016099C50E008C70FDB358CDD911 - Online - 0 0 0 G
000010 0003.0000.0000000000000001.0000 BMC ,SYMMETRIX ,-
6006048000187810001535940423031 - Online - 4 0 0 L
000011 0003.0000.0000000000000001.0001 BMC ,SYMMETRIX ,-
6006048000187810001535940423032 - Online - 5 0 0 N
000012 0003.0000.0000000000000001.0002 BMC ,SYMMETRIX ,-
6006048000187810001535940423033 - Online - 4 0 0 N
000013 0003.0000.0000000000000001.0003 BMC ,SYMMETRIX ,-
6006048000187810001535940423034 - Online - 6 0 0 O
000014 0003.0000.0000000000000002.0000 HITACHI .DF600F ,0329
0000 0003.0000.0000000000000002.0001 HITACHI .DF600F ,0329
0001 0003.0000.0000000000000002.0000 HITACHI .DF600F ,0329
0001 0003.0000.0000000000000002.0001 HITACHI .DF600F ,0329
KAFL01001-I The HDLM command completed normally. Operation name = view, completion time = yyyy/mm/dd
hh:mm:ss
PROMPT>

```

Parameters to display path information, by selecting a display item:

-path -item

When you specify the `-path` parameter together with the `-item` parameter, the command only displays the items specified by the value of the `-item` parameter.

If you specify no value for the `-item` parameter, only the `PathID` and the `Status` fields are displayed.

The following table lists the correspondence between the display items that can be selected by using the `-item` parameter and the parameter values that can be specified after the `-item` parameter.

Table 6-13 Items That Can Be Selected by the `-path -item` Parameter and the Sub-parameters

Selectable items	Sub-parameters
PathID#	None
PathName	pn
DskName	dn
iLU	lu
ChaPort	cp

Selectable items	Sub-parameters
Status#	None
Type	type
IO-Count	ic
IO-Errors	ie
DNum	dnu
HDevName	hd
IEP	iep
HBAPortWWN	hbaportwwn
Physical-LDEV	phys
Virtual-LDEV	virt
Physical-DskName	vid
Physical-iLU	vid
Physical-ChaPort	vid
Org-DskName	ha
Org-iLU	ha

#

Because both PathID and Status are always displayed, you do not have to specify any parameters.

In the sub-parameters following `-path -item`, you can list the paths (`-hdev`) and sort the list (`-srt`). If you omit both parameters, the command displays information for all the paths in ascending order of AutoPATH_IDs. These sub-parameters are:

`-pstv | -vstv`

If the `-pstv` parameter is specified, information about the physical storage system is displayed. If the `-vstv` parameter is specified, information about the storage system recognized by the operating system is displayed. If neither parameter is specified, information is displayed according to the value specified in the `-pstv` parameter of set operations.

For information about the items that are displayed differently depending on the specified `-pstv` and `-vstv` parameters, see [Table 6-10 Display items for which the display results of the view operation differ depending on the -pstv parameter specification on page 6-31](#) in [Parameters on page 6-17](#).

`-hdev host-device-name`

Displays information only for the paths accessing the specified host device.

Specify a drive letter to indicate the desired host device. You cannot specify the host device unless a drive letter has been assigned. The *host-device-name* string is case sensitive.

When you specify this parameter, `HDevName` is displayed by default. It is not necessary to specify `hd` for the `-item` parameter. If the command ends with the KAPL01064-W or KAPL01013-E message, follow the recommended action in the message.

`-stname`

Use this parameter for the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, or Virtual Storage Platform series to display the model ID of the storage system in the product ID element of the `DskName` field. When this parameter is omitted, the command displays the product ID or emulation type of the storage system instead.

For details about the information to be displayed for product IDs, see [Table 6-16 Product ID Displayed by the View -path Operation on page 6-59](#).

When you use this parameter, `DskName` is displayed by default. It is not necessary to specify `dn` for the `-item` parameter.

`-srt {pn|lu|cp}`

Use this parameter to sort the path information in ascending order, according to the specified sorting key.

The sorting keys are as follows: the first sorting key is the name of the storage system (`DskName`), the second sorting key is the value specified by the `-srt` parameter, and the third sorting key is `AutoPATH_ID`.

The parameter values available to specify the second sorting key are:

- `pn`: Path name
- `lu`: LU number of the storage system
- `cp`: Port number of the channel adapter

When the `-srt` parameter is omitted, the path information is listed in order of ascending `AutoPATH_ID`s.

When you use this parameter, the items used for the sorting keys (`DskName`, `AutoPATH_ID`, and the item specified by this parameter) are displayed by default. Therefore, it is not necessary to specify these items for the `-item` parameter.

`-exlu`

- When an HDLM management-target device is in the EMC DMX series, EMC CX series, or HP EVA series:
If this parameter is specified, all 32 digits of the `iLU` are displayed instead of truncating the `iLU` to 13 digits. If this parameter is not specified, any characters after the 13th digit of the `iLU` of the EMC DMX series, EMC CX series, and HP EVA series will not be displayed. Ellipsis (...) will be displayed instead.

- When an HDLM management-target device is configured for only the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, or Virtual Storage Platform series:
16 digits are displayed for the iLU even if this parameter is specified.

-t

Omits the title for each information item.

Example

In the following example, IO-Count is selected as the display item and the path information is sorted in ascending order by LUs.

```
PROMPT>dlmgr view -path -item ic -srt lu -stname
Paths:000012 OnlinePaths:000012
PathStatus IO-Count IO-Errors
Online 0 0

PathID DskName iLU Status IO-Count
000000 HITACHI.HUS_VM .210945 0960 Online 0
000003 HITACHI.HUS_VM .210945 0960 Online 0
000001 HITACHI.HUS_VM .210945 0961 Online 0
000004 HITACHI.HUS_VM .210945 0961 Online 0
000002 HITACHI.HUS_VM .210945 0962 Online 0
000005 HITACHI.HUS_VM .210945 0962 Online 0
000006 HITACHI.VSP_G1000 .10051 001836 Online 0
000009 HITACHI.VSP_G1000 .10051 001836 Online 0
000007 HITACHI.VSP_G1000 .10051 001837 Online 0
000010 HITACHI.VSP_G1000 .10051 001837 Online 0
000008 HITACHI.VSP_G1000 .10051 001838 Online 0
000011 HITACHI.VSP_G1000 .10051 001838 Online 0
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
yyyy/mm/dd hh:mm:ss
PROMPT>
```

Parameters to display a summary of path information:

-path -c

If the -c parameter is specified at the same time as the -path parameter, only PathID, DskName, iLU, CP, Status, and Type are displayed for the path information. The displayed contents are also shortened, so that each path information item is displayed on a single line.

The items that are displayed are PathID, DskName, iLU, CP, Status, and Type.

For details on what is displayed for each item, see [Table 6-14 Displayed Path Information on page 6-52](#).

When you use the -c parameter, the number of characters that can be displayed in the product ID element of the DskName field is limited to 10. When there are 11 or more characters in the product ID, the 8th and following characters are abbreviated to ellipses (...).

The sub-parameters (following -path -c) are:

-pstv | -vstv

If the `-pstv` parameter is specified, information about the physical storage system is displayed. If the `-vstv` parameter is specified, information about the storage system recognized by the operating system is displayed. If neither parameter is specified, information is displayed according to the value specified in the `-pstv` parameter of set operations.

For information about the items that are displayed differently depending on the specified `-pstv` and `-vstv` parameters, see [Table 6-10 Display items for which the display results of the view operation differ depending on the -pstv parameter specification on page 6-31](#) in [Parameters on page 6-17](#).

`-stname`

Use this parameter for the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, or Virtual Storage Platform series to display the model ID of the storage system in the product ID element of the `DskName` field. When this parameter is omitted, the command displays the product ID or emulation type of the storage system instead.

For details about the information about product IDs, see [Table 6-16 Product ID Displayed by the View -path Operation on page 6-59](#).

`-srt {lu|cp}`

Use this parameter to sort the path information in ascending order, according to the specified sorting key.

The sorting keys are as follows: the first sorting key is the name of the storage system (`DskName`), the second sorting key is the value specified by the `-srt` parameter, and the third sorting key is `AutoPATH_ID`.

The parameter values available to specify the second sorting key are:

- `lu`: LU number of the storage system
- `cp`: Port number of the channel adapter

When the `-srt` parameter is omitted, the path information is listed in ascending order of `AutoPATH_ID`s.

`-t`

Omits the title for each information item.

Example

The following example shows how to display a summary of the path information in order of iLUs.

```

PROMPT>dlnmgr view -path -c -srt lu
Paths:000016 OnlinePaths:000016
PathStatus IO-Count IO-Errors
Online 1199 0

PathID DskName iLU CP Status Type
000006 HITACHI .DF600F .0329 0000 OA Online Own
000014 HITACHI .DF600F .0329 0000 1A Online Non
000007 HITACHI .DF600F .0329 0001 OA Online Non
000015 HITACHI .DF600F .0329 0001 1A Online Own
000004 DGC .RAID 10 .- 6006016099C50... - Online -
000008 DGC .RAID 10 .- 6006016099C50... - Online -
000005 DGC .RAID 5 .- 6006016099C50... - Online -
000009 DGC .RAID 5 .- 6006016099C50... - Online -
000000 EMC .SYMMETRIX .- 6006048000018... - Online -
000010 EMC .SYMMETRIX .- 6006048000018... - Online -
000001 EMC .SYMMETRIX .- 6006048000018... - Online -
000011 EMC .SYMMETRIX .- 6006048000018... - Online -
000002 EMC .SYMMETRIX .- 6006048000018... - Online -
000012 EMC .SYMMETRIX .- 6006048000018... - Online -
000003 EMC .SYMMETRIX .- 6006048000018... - Online -
000013 EMC .SYMMETRIX .- 6006048000018... - Online -
KAPL01001-I The HDLM command completed normally. Operation name = view,
completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Displayed path information

Table 6-14 Displayed Path Information on page 6-52 describes the displayed path information. The following explains the table headings:

- No summary displayed: The user specifies only the `-path` parameter or the `-path -item` parameter.
- Summary displayed: The user specifies the `-path -c` parameter.

Table 6-14 Displayed Path Information

Displayed Item		Description
No summary displayed	Summary displayed	
Paths		Total number of displayed paths, indicated by a decimal number.
OnlinePaths		Number of online paths from within the displayed paths, indicated by a decimal number. When the value of Paths equals the value of OnlinePaths, then all the paths are online. If the value of OnlinePaths is less than that of Paths, some paths might have an error status, in which case you should check the status of individual paths and resolve the problem for any paths that have an error status.
PathStatus		Status of the displayed paths. The displayed status indicates the following: <ul style="list-style-type: none"> • Online: All paths are available. • Reduced: Some paths are not available.

Displayed Item		Description
No summary displayed	Summary displayed	
		Reduced means that some paths might have an error status, in which case you should check the status of individual paths and resolve the problem for any paths that have an error status.
IO-Count		Total I/O count for all the displayed paths, indicated by a decimal number. The maximum value that can be displayed is $2^{32} - 1$ (4294967295). If the total I/O count reaches the maximum value, it will re-start from 0.
IO-Errors		Total I/O error count for all the displayed paths, indicated by a decimal number. The maximum value that can be displayed is $2^{32} - 1$ (4294967295). If the total I/O error count reaches the maximum value, it will re-start from 0.
PathID		The AutoPATH_ID indicated by a decimal number. The AutoPATH_ID is assigned every time the host is restarted.
PathName ^{#1}	-	<p>The path name, which indicates a path. When you modify the system configuration or replace a hardware item, you should check the path names to identify the physical path that will be affected by the change. Path name consists of the following four elements, separated by periods:</p> <ul style="list-style-type: none"> • Host port number (hexadecimal number) • Bus number (hexadecimal number) • Target ID (hexadecimal number) • Host LU number (hexadecimal number) <p>For details about each element of the path name and its representation in Windows, see Table 6-15 Elements of a Path Name on page 6-58.</p>
DskName ^{#1}	DskName	<p>The storage system name, which identifies the storage system that is accessed by a path.</p> <p>A storage system name consists of the following three elements, separated by periods:</p> <ul style="list-style-type: none"> • Vendor ID: The name of the storage system vendor (for example, HITACHI). • Product ID: Indicates the storage system product ID, emulation type, or model ID (for example, DF600F). • Serial number: For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series the serial number of the storage system. For example, 0051. <p>For the EMC DMX series, EMC CX series, and HP EVA series, a hyphen (-) is displayed.</p> <p>For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series you can identify an actual</p>

Displayed Item		Description
No summary displayed	Summary displayed	
		storage system by referencing the above information from the storage system management program.
ilU#1	ilU	<p>LU number of the storage system.</p> <p>This number combined with the storage system name (shown in <code>DskName</code>) identifies the LU that is accessed by a path.</p> <ul style="list-style-type: none"> For the Hitachi Universal Storage Platform 100, Hitachi Universal Storage platform 600, Hitachi Universal Storage Platform 1100, HUS VM, and Hitachi NSC55, the first two characters of <code>ilU</code> are the CU (Control Unit) number, and the last two characters are the internal LU number within the CU (indicated by a hexadecimal number). For SVS, the first three characters of <code>ilU</code> are the CU (Control Unit) number, and the last two characters are the internal LU number within the CU. The first character of a CU number is 0. For XP20000/XP24000, P9500, and XP7, indicated by a hexadecimal number. The first two characters of <code>ilU</code> are 00, the middle two numbers are the CU number, and the last two characters are the internal LU number within the CU. For the Hitachi AMS2000/AMS/WMS/SMS series, and HUS100 series, the entire value of <code>ilU</code> is the internal LU number within the storage system. You can identify an actual LU by referencing <code>ilU</code> from the storage system management program. Indicated by a decimal number. For Universal Storage Platform V/VM series, Hitachi Virtual Storage Platform, and VSP G1000, <code>ilU</code> is indicated by a hexadecimal number. The first two characters of <code>ilU</code> are the number of the logical DCK (Disk Controller), the middle two numbers are the CU (Control Unit) number, and the last two characters are the internal LU number within the CU. For the EMC DMX series, EMC CX series, and HP EVA series: <p>The ID that differs from the LU number in the storage system and that identifies the LU is indicated by a hexadecimal number. <code>ilU</code> consists of 32 digits. The first 13 digits of <code>ilU</code> are displayed, and the rest of the digits are displayed as an ellipsis (...). When the <code>-exlu</code> parameter is specified, the entire value of <code>ilU</code> is displayed.</p>
ChaPort#1	CP	<ul style="list-style-type: none"> For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series: <p>The port number of the channel adapter, which identifies the CHA port that is mounted on the storage system.</p> <p>You can identify an actual CHA port by referencing this number from the storage system management program.</p>

Displayed Item		Description
No summary displayed	Summary displayed	
		<ul style="list-style-type: none"> For the EMC DMX series, EMC CX series, and HP EVA series: A hyphen (-) is displayed.
Status		<p>Status of the path</p> <ul style="list-style-type: none"> Online: Online Offline (C) : Placed offline using the Path Management window of the HDLM GUI or by a command Offline (E) : Offline due to an error Online (E) : Failure has occurred (If none of the paths accessing one LU have an Online status, one of those paths is changed to the Online (E) status.) Online (S) : I/O operations to the primary volume (P-VOL) in an HAM environment are suppressed. Online (D) : The paths to the primary volume (P-VOL) in an HAM environment can be recovered automatically. Online (P) : offline operation on an Online path is waiting to execute^{#2} Offline (P) : offline operation on an Offline (E) path is waiting to execute^{#2} Online (EP) : offline operation on an Online (E) path is waiting to execute^{#2} <p>Paths that are Offline (E) or Online (E) require corrective action. The appropriate action can be determined by referring to What To Do for a Path Error on page 5-4 .</p>
Type ^{#1}	Type	<ul style="list-style-type: none"> For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, Virtual Storage Platform series, and VSP G1000 series: Attribute of the path Own: Owner path Non: Non-owner path When connecting to the Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000 series, Hitachi AMS2000 series^{#3}, Hitachi SMS series^{#3}, HUS100 series^{#3}, or HUS VM, all paths are owner paths. For the EMC DMX series, EMC CX series, and HP EVA series: A hyphen (-) is displayed.
IO-Count ^{#1}	-	Total I/O count for the path, indicated by a decimal number. The maximum value that can be displayed is $2^{32} - 1$ (4294967295). If the total I/O count reaches the maximum value, it will re-start from 0.

Displayed Item		Description
No summary displayed	Summary displayed	
		To reset the IO-Count value to 0, execute the <code>dlnkmgr</code> command's <code>clear</code> operation. Executing the <code>clear</code> operation also resets the number of I/O errors (IO-Errors) to 0. For details about the <code>clear</code> operation, see clear (Returns the Path Statistics to the Initial Value) on page 6-3 .
IO-Errors ^{#1}	-	<p>Total I/O error count for the path, indicated by a decimal number. The maximum value that can be displayed is $2^{32} - 1$ (4294967295). If the total I/O error count reaches the maximum value, it will re-start from 0.</p> <p>To reset the IO-Errors value to 0, execute the <code>dlnkmgr</code> command's <code>clear</code> operation. Executing the <code>clear</code> operation also clears the number of I/O operations (IO-Count) to 0.</p> <p>For details about the <code>clear</code> operation, see clear (Returns the Path Statistics to the Initial Value) on page 6-3.</p>
DNum ^{#1}	-	When Dev indicates an entire LU, 0 is displayed.
HDevName ^{#1#4}	-	<p>Host device name.</p> <p>A drive letter is displayed. If no drive letter has been assigned, a hyphen (-) is displayed.</p> <p>The drive letter is displayed in the <code>HDevName</code> field even if the value of the <code>DNum</code> field is 0. Note, however, that the displayed drive letter is the drive letter for one of the Devs included in the LU.</p>
IEP ^{#1}	-	<p>Information about the intermittent error.</p> <p>This item is displayed only when you specify the <code>-iem</code> parameter or when you specify <code>iep</code> for the <code>-item</code> parameter.</p> <p>One of the following values is displayed for each path:</p> <ul style="list-style-type: none"> - A value of at least 0 * <p>Indicates that intermittent error monitoring is disabled or the monitoring time for an intermittent error is out of range (the path status is <code>Online(E)</code>, <code>Offline(C)</code> or <code>Offline(E)</code>).</p> <p>Indicates the number of errors that occurred during intermittent error monitoring (the path status is <code>Online(E)</code>, <code>Offline(E)</code>, or <code>Online</code>).</p> <p>Indicates that an intermittent error occurred (automatic failbacks do not check the path) (the path status is <code>Online</code>, <code>Online(E)</code>, or <code>Offline(E)</code>).</p>
HBAPortWWN ^{#1}	-	A 16-digit hexadecimal number indicating the WWN information for an HBA connected to the storage system. This item is displayed only when you specify the <code>-hbaportwwn</code> parameter or when you specify <code>hbaportwwn</code> for the <code>-item</code> parameter.

Displayed Item		Description
No summary displayed	Summary displayed	
		<p>Note that a hyphen (-) is displayed in the following cases:</p> <ul style="list-style-type: none"> When using the EMC DMX, EMC CX, or HP EVA series When using iSCSI interfaces
Physical-LDEV	-	<p>The model ID, serial number, and iLU number of a physical volume are separated by periods and displayed.</p> <p>You can identify the physical volume from this information. If the volume is not virtualized, a hyphen (-) is displayed.</p>
Virtual-LDEV	-	<p>Displays the model ID, serial number, and iLU number of a virtual volume, separated by periods.</p> <p>You can identify the virtual volume from this information. If the volume is not virtualized, a hyphen (-) is displayed.</p>
Physical-DskName	-	<p>When a path is migrated using a virtual ID, displays the name of the storage system that is connected by the migration-destination path.</p> <p>A storage system name consists of the following three elements, separated by periods:</p> <ul style="list-style-type: none"> Vendor ID: The name of the storage system vendor. Product ID: Indicates the storage system product ID, emulation type, or model ID. Serial number: For Virtual Storage Platform series the serial number of the storage system. <p>For more details, see Table 6-16 Product ID Displayed by the View -path Operation on page 6-59.</p> <p>When a virtual ID is not used, a hyphen (-) is displayed.</p>
Physical-iLU	-	<p>When a path is migrated using a virtual ID, displays LU number in the storage system that is connected by the migration-destination path.</p> <ul style="list-style-type: none"> For HUS VM indicated by a hexadecimal number. The first two characters of <code>iLU</code> are the CU number, and the last two characters are the internal LU number within the CU. For Hitachi Virtual Storage Platform, indicated by a hexadecimal number. The first two characters of <code>iLU</code> are the number of the logical DCK (Disk Controller), the middle two numbers are the CU number, and the last two characters are the internal LU number within the CU. <p>When a virtual ID is not used, a hyphen (-) is displayed.</p>
Physical-ChaPort	-	<p>When a path is migrated using a virtual ID, displays port number of the CHA that is connected by the migration-destination path.</p> <p>When a virtual ID is not used, a hyphen (-) is displayed.</p>
Org-DskName	-	For HAM environments, the name of the storage system on the secondary volume (S-VOL) is displayed.

Displayed Item		Description
No summary displayed	Summary displayed	
		<p>A storage system name consists of the following three elements, separated by periods:</p> <ul style="list-style-type: none"> • Vendor ID: The name of the storage system vendor. • Product ID: Indicates the storage system product ID, emulation type, or model ID. • Serial number: The serial number of the storage system. <p>For more details, see Table 6-16 Product ID Displayed by the View -path Operation on page 6-59.</p> <p>If an HAM environment is not used, a hyphen (-) is displayed.</p>
Org-iLU	-	<p>For HAM environments, an LU number on the secondary volume (S-VOL) is displayed.</p> <ul style="list-style-type: none"> • For HUS VM, indicated by a hexadecimal number. The first two characters of <code>iLU</code> are the CU number, and the last two characters are the internal LU number within the CU. • For Hitachi Virtual Storage Platform, indicated by a hexadecimal number. The first two characters of <code>iLU</code> are the number of the logical DKC (Disk Controller), the middle two numbers are the CU number, and the last two characters are the internal LU number within the CU. <p>If an HAM environment is not used, a hyphen (-) is displayed.</p>

Legend:

- : Not displayed

#1

The path information is displayed only when a value is specified for the `-path -item` parameter.

#2

In a cluster configuration, an `offline` operation requested during reserve processing is put into the waiting-to-execute state, and does not execute until the reserve processing finishes.

#3

This storage system applies when the dynamic I/O path control function is disabled.

#4

The drive letter assigned to a dynamic disk volume is not displayed.

Table 6-15 Elements of a Path Name

Element	Windows representation
Host port number (hexadecimal) (example: 0004, 0005)	SCSI port number

Element	Windows representation
Bus number (example: 0001)	SCSI bus number
Target ID (example: 0000000000000000, 0000000000000007A)	Target Id
Host LU number (example: 0001)	Logical Unit ID or LUN

The path name corresponds to the following information:

- Information shown in the Computer Management window
- The information in the following registry:
HKEY_LOCAL_MACHINE\HARDWARE\DEVICEMAP\Scsi

Note:

When an FC connection is used, the target ID of a SCSI device is determined by the HBA configuration. For details on the target ID, see the relevant documentation, such as the HBA manual.

Table 6-16 Product ID Displayed by the View -path Operation

Model names of storage systems	Product ID	
	Without the -stname parameter	With the -stname parameter (Displays the following for the model ID)
EMC DMX series	Product identifier	
EMC CX series		
HP EVA series		
Hitachi AMS2000 series	Product identifier#	AMS
Hitachi AMS series		AMS
Hitachi SMS series		SMS
Hitachi WMS series		WMS
HUS100 series		HUS100
SVS	Emulation type#	SVS
<ul style="list-style-type: none"> Hitachi Universal Storage Platform 100 Hitachi Universal Storage Platform 600 Hitachi Universal Storage Platform 1100 Hitachi NSC55 		USP

Model names of storage systems	Product ID	
	Without the <code>-stname</code> parameter	With the <code>-stname</code> parameter (Displays the following for the model ID)
• Hitachi Universal Storage Platform V		USP_V
• Hitachi Universal Storage Platform VM		
Hitachi Virtual Storage Platform		VSP
VSP G1000		VSP_G1000
HUS VM		HUS_VM
P9500		P9500
XP7		XP7
XP10000		XP10000
XP12000		XP12000
XP20000		XP20000
XP24000		XP24000

#

- When a summary is displayed by specifying the `-path -c` parameter and there are 11 or more characters in the summary string, any characters after the 9th character are not displayed, and ellipsis (...) are displayed instead.
- For command devices, `-CM` is added to the end of the emulation type of the storage system (for example, `DF600F-CM`).

Parameters Used When Displaying LU Information

When displaying LU information, if the `-item` parameter, `-c` parameter, or the `-c -item` parameter is specified at the same time as the `-lu` parameter, you can add and display items and display a summary of LU information. This section describes each parameter and the LU information and displayed items.

Parameters to display LU information:

`-lu`

When neither the `-c` nor `-item` parameter is specified with the `-lu` parameter, the information about the LU recognized by HDLM is displayed. The sorting key is `iLU` and its configuration information is displayed for each LU.

Note that:

- For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series LU information is displayed for each storage system.
- For the EMC DMX series and EMC CX series, LU information is displayed for each vendor ID.
- For the HP EVA series, LU information is displayed for each *vendor_ID_product_ID*.

For details on the content of each displayed item, see [Table 6-19
Displayed LU Information on page 6-69](#).

The sub-parameters are:

`-pstv|-vstv`

If the `-pstv` parameter is specified, information about the physical storage system is displayed. If the `-vstv` parameter is specified, information about the storage system recognized by the operating system is displayed. If neither parameter is specified, information is displayed according to the value specified in the `-pstv` parameter of set operations.

For information about the items that are displayed differently depending on the specified `-pstv` and `-vstv` parameters, see [Table 6-10 Display items for which the display results of the view operation differ depending on the -pstv parameter specification on page 6-31 in Parameters on page 6-17](#).

`-hdev host-device-name|-pathid AutoPATH_ID`

Displays information only for the paths accessing the specified host device, if the `-hdev` parameter is specified.

Specify a drive letter to indicate the desired host device. You cannot specify the host device unless a drive letter has been assigned. If the command ends with the KAPL01064-W or KAPL01013-E message, follow the recommended action in the message.

If the `-pathid` parameter is specified, only information about the LU connected to the path with the specified `AutoPATH_ID` is displayed.

`-exlu`

- When an HDLM management-target device is the EMC DMX series, EMC CX series, or HP EVA series:
If this parameter is specified, all 32 digits of the `iLU` are displayed instead of truncating the `iLU` to 13 digits. If this parameter is not specified, any characters after the 13th digit of the `iLU` of the EMC DMX series, EMC CX series, and HP EVA series will not be displayed. Ellipsis (...) will be displayed instead.
- When an HDLM management-target device is only the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, or Virtual Storage Platform series:

16 digits or less are displayed for the **ilU** even if this parameter is specified.

-t

Omits the title for each information item.

Example

When the **-exlu** parameter is not specified:

```
PROMPT>dlnkmgr view -lu
Product      : HUS100
SerialNumber : 93010246
LUs          : 2

ilU  HDevName PathID Status
0023 P      000006 Online
                  000014 Online
0044 Q      000007 Online
                  000015 Online

Product      : DGC
SerialNumber : -
LUs          : 2

ilU          HDevName PathID Status
6006016099C50... F      000004 Online
                  000008 Online
6006016099C50... G      000005 Online
                  000009 Online

Product      : EMC
SerialNumber : -
LUs          : 4

ilU          HDevName PathID Status
6006048000018... L      000000 Online
                  000010 Online
6006048000018... M      000001 Online
                  000011 Online
6006048000018... N      000002 Online
                  000012 Online
6006048000018... O      000003 Online
                  000013 Online
KAPL01001-I The HDLM command completed normally. Operation
name = view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

When the **-exlu** parameter is specified:

```
PROMPT>dlnkmgr view -lu -exlu
Product      : HUS100
SerialNumber : 93010246
LUs          : 2

ilU  HDevName PathID Status
0023 -      000000 Online
```

```

0044 -          000002 Online
                  000001 Online
                  000003 Online

Product      : DGC
SerialNumber : -
LUs          : 2

iLU          HDevName PathID Status
6006016099C50E0028CB54C558CDD911 F      000004 Online
                                         000008 Online
6006016099C50E008C70FDB358CDD911 G      000005 Online
                                         000009 Online

Product      : EMC
SerialNumber : -
LUs          : 4

iLU          HDevName PathID Status
6006048000018781000153594D423031 L      000000 Online
                                         000010 Online
6006048000018781000153594D423032 M      000001 Online
                                         000011 Online
6006048000018781000153594D423033 N      000002 Online
                                         000012 Online
6006048000018781000153594D423034 O      000003 Online
                                         000013 Online
KAPL01001-I The HDLM command completed normally. Operation
name = view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Parameters to display LU information by adding items to be displayed:

-lu -item

The items specified with the `-item` option are displayed along with those displayed by the `-lu` option.

If `all` is specified for the `-item` parameter, all items that can be added are displayed except for `DPC`, `Physical-LDEV`, `Virtual-LDEV`, `Physical-Product`, `Physical-SerialNumber`, `Physical-iLU`, `Physical-ChaPort`, `Org-Product`, `Org-SerialNumber`, and `Org-iLU`.

The table below lists the correspondence between the display items that can be added by using the `-item` parameter and the parameter values that can be specified after the `-item` parameter.

Table 6-17 Items That Can Be Added by Using the `-lu -item` Parameter and Sub-parameters

Item that can be added	Sub-parameter
SLPR	slpr
PathName	pn

Item that can be added	Sub-parameter
ChaPort	cp
CLPR	clpr
Type	type
IO-Count	ic
IO-Errors	ie
DNum	dnu
IEP	iep
DPC	dpc
Physical-LDEV	phys
Virtual-LDEV	virt
Physical-Product	vid
Physical-SerialNumber	vid
Physical-iLU	vid
Physical-ChaPort	vid
Org-Product	ha
Org-SerialNumber	ha
Org-iLU	ha
HaStat	hastat
All items are displayed	all

For details on the contents of each displayed item, see [Table 6-19
Displayed LU Information on page 6-69](#).

The sub-parameters are:

`-pstv | -vstv`

If the `-pstv` parameter is specified, information about the physical storage system is displayed. If the `-vstv` parameter is specified, information about the storage system recognized by the operating system is displayed. If neither parameter is specified, information is displayed according to the value specified in the `-pstv` parameter of set operations.

For information about the items that are displayed differently depending on the specified `-pstv` and `-vstv` parameters, see [Table 6-10 Display items for which the display results of the view operation differ depending on the -pstv parameter specification on page 6-31 in Parameters on page 6-17](#).

`-hdev host-device-name | -pathid AutoPATH_ID`

Displays information only for the paths accessing the specified host device, if the `-hdev` parameter is specified.

Specify a drive letter to indicate the desired host device. You cannot specify the host device unless a drive letter has been assigned. If the command ends with the KAPL01064-W or KAPL01013-E message, follow the recommended action in the message.

If the `-pathid` parameter is specified, only information about the LU connected to the path with the specified *AutoPATH_ID* is displayed.

-exlu

- When an HDLM management-target device is the EMC DMX series, EMC CX series, or HP EVA series:

If this parameter is specified, all 32 digits of the *ilU* are displayed instead of truncating the *ilU* to 13 digits. If this parameter is not specified, any characters after the 13th digit of the *ilU* of the EMC DMX series, EMC CX series, and HP EVA series will not be displayed. Ellipsis (. . .) will be displayed instead.

- When an HDLM management-target device is only the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, or Virtual Storage Platform series:
16 digits or less are displayed for the *iLU* even if this parameter is specified.

- t

Omits the title for each information item.

Example 1:

The following example shows how to add SLPR, PathName, ChaPort, CLPR, Type IO-Count, IO-Errors, DNum, and IEP to the displayed items for LU information.

```

PROMPT>diskmng view -lu -item
Product      : USP
SerialNumber : 0014050
LUs          : 3

  ILU  SLPR HDevName PathID PathName                               ChaPort CLFR Status Type IO-Count
  IO-Errors  DNum IEP
  0110      1 E      000000 0002.0000.0000000000000000.0000 0A      2 Online Own   4
            0      0 0
            000003 0003.0000.0000000000000001.0000 0B      2 Online Own   4
            0      0 0
  0111      1 F      000001 0002.0000.0000000000000000.0001 0A      2 Online Own   4
            0      0 0
            000004 0003.0000.0000000000000001.0001 0B      2 Online Own   4
            0      0 0
  0112      1 G      000002 0002.0000.0000000000000000.0002 0A      2 Online Own   4
            0      0 0
            000005 0003.0000.0000000000000001.0002 0B      2 Online Own   4
            0      0 0

KAPI01001-I The HDLM command completed normally. Operation name = view, completion time =
yyyy/mm/dd hh:mm:ss
PROMPT>

```

Example 2:

When using Hitachi AMS2000 series, Hitachi SMS series , or HUS100 series storage and displaying LU information with DPC added to the display items:

```

PROMPT>dlkmgr view -lu -item dpc
Product : HUS100
SerialNumber : 9203008
LUs : 3
Dynamic I/O Path Control : on*

iLU HDevName DPC PathID Status
000006 E on 000000 Online
000007 F off 000001 Online
000008 G on 000002 Online
000009 H on 000003 Online
0000007 F off 000004 Online
000008 G on 000005 Online
KAPL01001-I The HDLM command completed normally. Operation
name = view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

Parameters to display a summary of LU information:

-lu -c

When the `-c` parameter is specified with the `-lu` parameter, a summary of LU configuration information is displayed on one line. The total number of paths recognized by HDLM and the number of online paths are displayed for each LU.

Note that:

- For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series LU information is displayed for each storage system.
- For the EMC DMX series and EMC CX series, LU information is displayed for each vendor ID.
- For the HP EVA series, LU information is displayed for each *vendor_ID_product_ID*.

You cannot specify the `-c` parameter together with the `-hdev` or `-pathid` parameter.

For details on the contents of each display item, see [Table 6-19 Displayed LU Information on page 6-69](#).

The sub-parameters are as follows:

`-pstv | -vstv`

If the `-pstv` parameter is specified, information about the physical storage system is displayed. If the `-vstv` parameter is specified, information about the storage system recognized by the operating system is displayed. If neither parameter is specified, information is displayed according to the value specified in the `-pstv` parameter of set operations.

For information about the items that are displayed differently depending on the specified `-pstv` and `-vstv` parameters, see [Table 6-10 Display items for which the display results of the view operation](#)

[differ depending on the -pstv parameter specification on page 6-31](#) in [Parameters on page 6-17](#).

-exlu

- When an HDLM management-target device is the EMC DMX series, EMC CX series, or HP EVA series:
If this parameter is specified, all 32 digits of the *iLU* are displayed instead of truncating the *iLU* to 13 digits. If this parameter is not specified, any characters after the 13th digit of the *iLU* of the EMC DMX series, EMC CX series, and HP EVA series will not be displayed. Ellipsis (...) will be displayed instead.
- When an HDLM management-target device is only the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, or Virtual Storage Platform series:
16 digits are displayed for the *iLU* even if this parameter is specified.

-t

Omits the title for each information item.

Example

When the -exlu parameter is not specified:

```
PROMPT>dlkmgr view -lu -c
Product  S/N  LUs  iLU          HDevName  Paths  OnlinePaths
9500V    0329  2  0000          P          2        2
                  0001          Q          2        2
DGC      -      2  6006016099C50... F          2        2
                  6006016099C50... G          2        2
EMC      -      4  6006048000018... L          2        2
                  6006048000018... M          2        2
                  6006048000018... N          2        2
                  6006048000018... O          2        2
KAPI01001-I The HDLM command completed normally. Operation name = view, completion time =
YYYY/mm/dd hh:mm:ss
PROMPT>
```

When the -exlu parameter is specified:

```
PROMPT>dlkmgr view -lu -c -exlu
Product  S/N  LUs  iLU          HDevName  Paths  OnlinePaths
9500V    0329  2  0000          P          2        2
                  0001          Q          2        2
DGC      -      2  6006016099C50E0028CB54C558CDD911 F
                  6006016099C50E00BC70FDB358CDD911 G
EMC      -      4  6006048000018781000153594D423031 L
                  6006048000018781000153594D423032 M
                  6006048000018781000153594D423033 N
                  6006048000018781000153594D423034 O
KAPI01001-I The HDLM command completed normally. Operation name = view, completion time =
YYYY/mm/dd hh:mm:ss
PROMPT>
```

Parameters to display a summary of LU information by adding items to be displayed:

-lu -c -item

The items displayed when the `-item` option is added to the `-lu -c` options.

If no value is specified for the `-item` parameter, all the items that can be added are displayed. See [Table 6-19 Displayed LU Information on page 6-69](#) for the contents of each displayed item.

The following table lists the correspondence between the display items that can be added by using the `-item` parameter and the parameter values that can be specified after the `-item` parameter.

Table 6-18 Items That Can Be Added by Using the `-lu -c -item` Parameter and Sub-parameters

Item that can be added	Sub-parameter
SLPR	slpr

The sub-parameter is:

`-pstv | -vstv`

If the `-pstv` parameter is specified, information about the physical storage system is displayed. If the `-vstv` parameter is specified, information about the storage system recognized by the operating system is displayed. If neither parameter is specified, information is displayed according to the value specified in the `-pstv` parameter of set operations.

For information about the items that are displayed differently depending on the specified `-pstv` and `-vstv` parameters, see [Table 6-10 Display items for which the display results of the view operation differ depending on the -pstv parameter specification on page 6-31](#) in [Parameters on page 6-17](#).

`-exlu`

- When an HDLM management-target device is the EMC DMX series, EMC CX series, or HP EVA series:
If this parameter is specified, all 32 digits of the `iLU` are displayed instead of truncating the `iLU` to 13 digits. If this parameter is not specified, any characters after the 13th digit of the `iLU` of the EMC DMX series, EMC CX series, and HP EVA series will not be displayed. Ellipsis (...) will be displayed instead.
- When an HDLM management-target device is only the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, or Virtual Storage Platform series:
16 digits are displayed for the `iLU` even if this parameter is specified.

`-t`

Omits the title for each information item.

Example

The following example describes how to add and display a summary of SLPR.

```
PROMPT>dlnkmgr view -lu -c -item
Product S/N LUs iLU SLPR HDevName Paths OnlinePaths
HUS_VM 210945 3 0960 -- 2 2
        0961 -- 2 2
        0962 -- 2 2
VSP_G1000 10051 3 001836 -- 2 2
        001837 -- 2 2
        001838 -- 2 2
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
yyyy/mm/dd hh:mm:ss
PROMPT>
```

Displayed LU information

[Table 6-19 Displayed LU Information on page 6-69](#) describes the displayed LU information. The following explains the table headings:

- No summary displayed: The user specifies the `-lu` parameter or `-lu -item` parameter.
- Summary displayed: The user specifies the `-lu -c` parameter or `-lu -cc -item` parameter.

Table 6-19 Displayed LU Information

Displayed item		Description
No summary displayed	Summary displayed	
Product		<ul style="list-style-type: none"> • For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series: Model name of the storage system • For the EMC DMX and series, EMC CX series: Vendor ID • For the HP EVA series: <i>Vendor-ID_Product-ID</i>
Serial Number	S/N	<ul style="list-style-type: none"> • For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series: Serial number of the storage system • For the EMC DMX series, EMC CX series, and HP EVA series: A hyphen (-) is displayed.
LUs		Total number of LUs managed by HDLM among the LUs in the storage system

Displayed item		Description
No summary displayed	Summary displayed	
Dynamic I/O Path Control	-	<p>The setting information about the dynamic I/O path control function is displayed for each storage system.</p> <p>on: The dynamic I/O path control function is enabled.</p> <p>off: The dynamic I/O path control function is disabled.</p> <p>-: The dynamic I/O path control function is not supported.</p> <p>If an LU whose settings differ from the settings based on the system storage unit is included, an asterisk (*) is added after the on or off being displayed.</p>
<i>iLU</i>		<p>LU number in the storage system</p> <p>This number combined with the storage system name (shown in <code>DskName</code>) identifies the LU that is accessed by a path.</p> <ul style="list-style-type: none"> For the Hitachi Universal Storage Platform 100, Hitachi Universal Storage Platform 600, Hitachi Universal Storage Platform1100, HUS VM, and Hitachi NSC55, the first two characters of <i>iLU</i> are the CU (Control Unit) number, and the last two characters are the internal LU number within the CU. Indicated by a hexadecimal number. For the SVS, the first three characters of <i>iLU</i> are the CU (Control Unit) number, and the last two characters are the internal LU number within the CU. The first character of a CU number is 0. For the XP20000/XP24000, P9500, and XP7, The first two characters of <i>iLU</i> are 00, the middle two numbers are the CU number, and the last two characters are the internal LU number within the CU. For the Hitachi AMS2000/AMS/WMS/SMS series, and HUS100 series, the entire value of <i>iLU</i> is the internal LU number within the storage system. You can identify an actual LU by referencing <i>iLU</i> from the storage system management program. For Universal Storage Platform V/VM series, Hitachi Virtual Storage Platform, and VSP G1000, <i>iLU</i> is indicated by a hexadecimal number. The first two characters of <i>iLU</i> are the number of the logical DKC (Disk Controller), the middle two numbers are the CU (Control Unit)

Displayed item		Description
No summary displayed	Summary displayed	
		<p>number, and the last two characters are the internal LU number within the CU.</p> <ul style="list-style-type: none"> For the EMC DMX series, EMC CX series, and HP EVA series: The ID that differs from the LU number in the storage system and that identifies the LU is indicated by a hexadecimal number. The value of <i>iLU</i> consists of 32 digits. The first 13 digits of <i>iLU</i> are displayed, and the rest of the digits are displayed as an ellipsis (...).
SLPR#1	SLPR#2	<p>The number of the SLPR to which an LU belongs, indicated by a number from 0 to 31. A hyphen (-) is displayed if the storage logical partition functionality for the storage system for the target LU is not supported.</p>
HDevName#1#3	-	<p>Host device name. A drive letter is displayed. If no drive letter has been assigned, a hyphen (-) is displayed. The drive letter is displayed in the <i>HDevName</i> field even if the value of the <i>DNum</i> field is 0. Note, however, that the displayed drive letter is the drive letter for one of the Devs included in the LU.</p>
DPC	-	<p>The setting information about the dynamic I/O path control function is displayed for each LU. on: The dynamic I/O path control function is enabled. off: The dynamic I/O path control function is disabled. -: The dynamic I/O path control function is not supported.</p>
PathID	-	<p>The AutoPATH_ID. AutoPATH_ID is assigned every time the host is restarted.</p>
PathName#1	-	<p>The path name. When you modify the system configuration or replace a hardware item, you should check the path names to identify the path that will be affected by the change. Path name consists of the following four elements, separated by periods:</p> <ul style="list-style-type: none"> Host port number (hexadecimal number) Bus number (hexadecimal number) Target ID (hexadecimal number) Host LU number (hexadecimal number)

Displayed item		Description
No summary displayed	Summary displayed	
		For details about each element of the path name and its representation in Windows, see Table 6-15 Elements of a Path Name on page 6-58
ChaPort ^{#1}	-	<ul style="list-style-type: none"> For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, Universal Storage Platform V/VM series, and Virtual Storage Platform series: Port number of the channel adapter, which identifies the CHA port that is mounted on the storage system. You can identify an actual CHA port by referencing this number from the storage system management program. For the EMC DMX series, EMC CX series, and HP EVA series: A hyphen (-) is displayed.
CLPR ^{#1}	-	<p>The number of the CLPR to which the CHA port belongs, indicated by a number from 0 to 31. Note that a hyphen (-) is displayed if the following items are subject to display:</p> <ul style="list-style-type: none"> CHA ports in the storage system that do not support the cache logical partition function Paths connected to the Snapshot Image of the Copy-on-write Snapshot of the Hitachi AMS2000/AMS/WMS/SMS series.
Status	-	<p>Status of the path</p> <ul style="list-style-type: none"> Online: Online Offline(C) : Placed offline by using the Path Management window of the HDLM GUI or by a command Offline(E) : Offline due to an error Online(E) : Failure has occurred (If none of the paths accessing one LU have an Online status, one of those paths is changed to the Online(E) status.) Online(S) : I/O operations to the primary volume (P-VOL) in an HAM environment are suppressed. Online(D) : The paths to the primary volume (P-VOL) in an HAM environment can be recovered automatically. Online(P) : offline operation on an Online path is waiting to execute^{#4} Offline(P) : offline operation on an Offline(E) path is waiting to execute^{#4}

Displayed item		Description
No summary displayed	Summary displayed	
		<ul style="list-style-type: none"> Online(EP): offline operation on an Online(E) path is waiting to execute^{#4} <p>Paths that are Offline(E) or Online(E) require corrective action. The appropriate action can be determined by referring to What To Do for a Path Error on page 5-4</p>
Type ^{#1}	-	<ul style="list-style-type: none"> For the Hitachi USP series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, and Universal Storage Platform V/VM series, and Virtual Storage Platform series: Attribute of the path Own: Owner path Non: Non-owner path When connected to the Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000 series, Hitachi AMS2000 series^{#5}, Hitachi SMS series^{#5}, HUS100 series^{#5}, or HUS VM, all paths are owner paths. For the EMC DMX series, EMC CX series, and HP EVA series: A hyphen (-) is displayed.
IO-Count ^{#1}	-	<p>Total I/O count for a path. The maximum value that can be displayed is $2^{32} - 1$ (4294967295). If the total I/O count reaches the maximum value, it is reset, and the count is re-started from 0.</p> <p>To reset the IO-Count value to 0, execute the <code>dlnkmgr</code> command's <code>clear</code> operation. Executing the <code>clear</code> operation also resets the number of I/O errors (IO-Errors) to 0. For details about the <code>clear</code> operation, see clear (Returns the Path Statistics to the Initial Value) on page 6-3.</p>
IO-Errors ^{#1}	-	<p>Total I/O error count for a path. The maximum value that can be displayed is $2^{32} - 1$ (4294967295). If the total I/O error count reaches the maximum value, it is reset, and the count is re-started from 0.</p> <p>To reset the IO-Errors value to 0, execute the <code>dlnkmgr</code> command's <code>clear</code> operation. Executing the <code>clear</code> operation also clears the number of I/O operations (IO-Count) to 0.</p> <p>For details about the <code>clear</code> operation, see clear (Returns the Path Statistics to the Initial Value) on page 6-3.</p>
DNum ^{#1}	-	When Dev indicates an entire LU, 0 is displayed.

Displayed item		Description
No summary displayed	Summary displayed	
IEP ^{#1}	-	<p>The displayed paths are assumed to be in an intermittent error status and checked whether those paths are to be operated for automatic failbacks.</p> <p>One of the following values is displayed for each path:</p> <ul style="list-style-type: none"> -: Indicates that intermittent error monitoring is disabled or the monitoring time for an intermittent error is out of range. A value of at least 0: Indicates the number of errors that occurred during intermittent error monitoring. *: Indicates that an intermittent error occurred (automatic fallback does not check the path).
Physical-LDEV	-	<p>The model ID, serial number, and iLU number of a physical volume are separated by periods and displayed.</p> <p>You can identify the physical volume from this information. If the volume is not virtualized, a hyphen (-) is displayed.</p>
Virtual-LDEV	-	<p>Displays the model ID, serial number, and iLU number of a virtual volume, separated by periods.</p> <p>You can identify the virtual volume from this information. If the volume is not virtualized, a hyphen (-) is displayed.</p>
Physical-Product	-	<p>When a path is migrated using a virtual ID, displays model ID of the storage system that is connected by the migration-destination path.</p> <p>When a virtual ID is not used, a hyphen (-) is displayed.</p>
Physical-SerialNumber	-	<p>When a path is migrated using a virtual ID, displays serial number of the storage system that is connected by the migration-destination path.</p> <p>When a virtual ID is not used, a hyphen (-) is displayed.</p>
Physical-iLU	-	<p>When a path is migrated using a virtual ID, displays LU number in the storage system that is connected by the migration-destination path.</p> <ul style="list-style-type: none"> For HUS VM indicated by a hexadecimal number. The first two characters of <i>iLU</i> are the CU number, and the last two characters are the internal LU number within the CU. For Hitachi Virtual Storage Platform, indicated by a hexadecimal number. The first two characters of <i>iLU</i> are the number of the logical DKC (Disk Controller), the middle two numbers

Displayed item		Description
No summary displayed	Summary displayed	
		are the CU number, and the last two characters are the internal LU number within the CU. When a virtual ID is not used, a hyphen (-) is displayed.
Physical-ChaPort	-	When a path is migrated using a virtual ID, displays port number of the CHA that is connected by the migration-destination path. When a virtual ID is not used, a hyphen (-) is displayed.
-	Paths	Total number of the paths recognized by HDLM for the LU to be displayed.
-	OnlinePaths	Number of online paths among the paths recognized by HDLM for the LU. When the value of Paths is equal to the value of OnlinePaths, all paths are online. If the value of OnlinePaths is less than that of Paths, some paths may have an error status, in which case you should check the status of individual paths and take resolve the problem for any paths that have an error status.
Org-Product	-	For HAM environments, the model ID of the storage system on the secondary volume (S-VOL) is displayed. If an HAM environment is not used, a hyphen (-) is displayed.
Org-SerialNumber	-	For HAM environments, the serial number of the storage system on the secondary volume (S-VOL) is displayed. If an HAM environment is not used, a hyphen (-) is displayed.
Org-iLU	-	For HAM environments, an LU number in the storage system on the secondary volume (S-VOL) is displayed. <ul style="list-style-type: none"> For HUS VM, indicated by a hexadecimal number. The first two characters of iLU are the CU number, and the last two characters are the internal LU number within the CU. For Hitachi Virtual Storage Platform, indicated by a hexadecimal number. The first two characters of iLU are the number of the logical DKC (Disk Controller), the middle two numbers are the CU number, and the last two characters are the internal LU number within the CU. If an HAM environment is not used, a hyphen (-) is displayed.

Legend:

- : Not displayed

#1

This information is displayed when one of the following conditions exist:

- The user selected the item to be displayed by using the `-lu -item` parameter.
- `all` was specified.
- No value was specified for the parameter.

#2

This information is displayed when one of the following conditions exist:

- The user selected the item to be displayed by using the `-lu -c -item` parameter.
- No value was specified for the parameter.

#3

The drive letter assigned to a dynamic disk volume is not displayed.

#4

In a cluster configuration, an `offline` operation requested during reserve processing is put into the waiting-to-execute state, and does not execute until the reserve processing finishes.

#5

This storage system applies when the dynamic I/O path control function is disabled.

Parameter Used When Displaying the Format of the `view` Operation

`-help`

Use this parameter to display the `view` operation format.

Example

```
PROMPT>dlnkmgr view -help
view:
Format
  dlnkmgr view -sys [ -sfunc | -msrv | -adrv | -pdrv | -lic | -
  audlog
                                | -lbpathusetimes | -expathusetimes | -
  exrndpathusetimes | -pstv ] [-t]
  dlnkmgr view -stinfo [-t]
  dlnkmgr view -path [-pstv | -vstv] [ -hdev HostDeviceName ] [-
  stname] [-item]
                                [-srt {pn | lu | cp}] [-exlu] [-
  hbaportwwn] [-t]
  dlnkmgr view -path
    -item [pn] [dn] [lu] [cp] [type] [ic] [ie] [dnu]
                                [hd] [iep] [hbaportwwn]
  [phys] [virt] [vid] [ha]
    [-pstv | -vstv] [-hdev HostDeviceName] [-stname] [-srt
  {pn | lu | cp}] [-exlu] [-t]
  dlnkmgr view -path -c [-pstv | -vstv] [-stname] [-srt {lu | cp}]
```

```

[-t]
    dlnkmgr view -lu [-pstv | -vstv] [ -hdev HostDeviceName | -pathid
AutoPATH_ID ] [-exlu] [-t]
    dlnkmgr view -lu
        -item [ [slpr] [pn] [cp] [clpr] [type] [ic] [ie]
[dnu]
                [iep] [dpc] [phys] [virt] [vid] [ha]
[hastat] | all ]
        [-pstv | -vstv] [ -hdev HostDeviceName | -
pathid AutoPATH_ID ] [-exlu] [-t]
    dlnkmgr view -lu -c [-pstv | -vstv] [-exlu] [-t]
    dlnkmgr view -lu -c -item [slpr] [-pstv | -vstv] [-exlu] [-t]
KAPL01001-I The HDLM command completed normally. Operation name =
view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

```

delete (Deletes a Path Dynamically)

The `dlnkmgr` command's `delete` operation batch-deletes disconnected paths whose statuses are Offline(C) from the HDLM-management targets. You can execute this command dynamically without any effects on existing paths.

Format

To Delete a Path Dynamically

```
dlnkmgr delete -path [-s]
```

To Display the Format of the delete Operation

```
dlnkmgr delete -help
```

Parameters

To Delete a Path Dynamically

`-path`

Indicates that the target of the operation is a path managed by HDLM.

Example

```

PROMPT>dlnkmgr delete -path
KAPL01161-I This operation will change the path configuration.
Do you want to continue? [y/n]:y
KAPL01165-I A path was deleted. (path ID = = 00010, storage =
HITACHI.HUS100.9100163, iLU = 0030)
:
KAPL01164-I Paths were deleted. (number of paths deleted = 2,
completion time = yyyy/mm/dd hh:mm:ss)

```

`-s`

Executes the command without displaying the message asking for confirmation of command execution from the user. Specify this parameter if you want to skip the response to the confirmation message: for example, when you want to execute the command in a shell script or batch file.

Example

```
PROMPT>dlnkmgr delete -path -s
KAPL01165-I A path was deleted. (path ID = = 00010, storage =
HITACHI.HUS100.9100163, iLU = 0030)
:
KAPL01164-I Paths were deleted. (number of paths deleted = 2,
completion time = yyyy/mm/dd hh:mm:ss)
```

Note:

Any paths excluded from the HDLM-management targets must be deleted from the OS before executing this command.

To Display the Format of the delete Operation

`-help`

Use this parameter to display the `delete` operation format.

Example

```
PROMPT>dlnkmgr delete -help
delete:
Format
  dlnkmgr delete -path [-s]
KAPL01001-I The HDLM command completed normally. Operation name
= delete, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

refresh (Applies Storage System Settings to HDLM)

The refresh operation applies the storage system settings to HDLM.

Format

To Apply Storage System Settings to HDLM

`dlnkmgr refresh -gad`

To Display the Format of the refresh Operation

`dlnkmgr refresh -help`

Parameters

To Apply Storage System Settings to HDLM

-gad

The non-preferred path option that is set to the paths to global-active device pair volumes is applied to the HDLM path attribute. A path for which the non-preferred path option is set becomes a non-owner path, and a path for which the non-preferred path option is not set becomes an owner path.

If you specify the `-gad` parameter for the `refresh` operation, make sure the statuses of all paths to global-active device pair volumes are `Online`.

If you restart the host, the settings at the time of restart are applied to the HDLM path attribute.

Example

To apply the attribute of a path to a global-active device volume:

```
PROMPT>dlnkmgr view -lu -item type phys
Product      : VSP_G1000
SerialNumber : 10051
LUs          : 1

iLU  HDevName PathID Status      Type  Physical-LDEV
001910 D      000000 Online   Own   VSP_G1000.10051.001910
                  000001 Online   Own   VSP_G1000.10051.001910
                  000002 Online   Own   VSP_G1000.10057.001A10
                  000003 Online   Own   VSP_G1000.10057.001A10
KAPL01001-I The HDLM command completed normally. Operation
name = view(-vstv), completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

```
PROMPT>dlnkmgr refresh -gad
KAPL01001-I The HDLM command completed normally. Operation
name = refresh, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

```
PROMPT>dlnkmgr view -lu -item type phys
Product      : VSP_G1000
SerialNumber : 10051
LUs          : 1

iLU  HDevName PathID Status      Type  Physical-LDEV
001910 D      000000 Online   Own   VSP_G1000.10051.001910
                  000001 Online   Own   VSP_G1000.10051.001910
                  000002 Online   Non   VSP_G1000.10057.001A10
                  000003 Online   Non   VSP_G1000.10057.001A10
KAPL01001-I The HDLM command completed normally. Operation
name = view(-vstv), completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

To Display the Format of the refresh Operation

-help

Use this parameter to display the format of the `refresh` operation.

Example

```
PROMPT>dlnkmgr refresh -help
refresh:
  Format
    dlnkmgr refresh -gad
KAPL01001-I The HDLM command completed normally. Operation
name = refresh, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>
```

Utility Reference

This chapter explains the utilities used by HDLM.

- [Overview of the Utilities](#)
- [The DLMgetras Utility for Collecting HDLM Error Information](#)
- [The dlmpr Utility for Clearing HDLM Persistent Reservations](#)
- [The dlmprvkey Utility for Registering an HDLM Persistent Reservation Key](#)
- [The dlmchkpath Utility for Checking HDLM Paths](#)
- [The dlmhostinfo Utility for Checking HDLM Installation Information](#)
- [The installhdlm Utility for Installing HDLM](#)
- [The removehdlm Utility for Removing HDLM](#)

Overview of the Utilities

HDLM provides the following utilities:

- The `DLMgetras` utility for collecting HDLM error information
When an error occurs, this utility collects the files that contain the information that you need to submit to your HDLM vendor or maintenance company. For details about the `DLMgetras` utility, see [The `DLMgetras` Utility for Collecting HDLM Error Information on page 7-2](#).
- The utility for clearing an HDLM persistent reservation (`dlmpr`)
This utility cancels remaining persistent reservations after a removal. For details about the `dlmpr` utility, see [The `dlmpr` Utility for Clearing HDLM Persistent Reservations on page 7-10](#).
- The utility for registering HDLM persistent reservation keys (`dlmpsvkey`)
This utility registers and displays PRSV keys. For details about the `dlmpsvkey` utility, see [The `dlmpsvkey` Utility for Registering an HDLM Persistent Reservation Key on page 7-13](#).
- The utility for checking the HDLM path (`dlmchkpath`)
This utility checks whether the system is in a single-path or multi-path configuration. For details about the `dlmchkpath` utility, see [The `dlmchkpath` Utility for Checking HDLM Paths on page 7-14](#).
- The utility for checking HDLM installation information (`dlmhostinfo`)
This utility either displays the HDLM installation information or outputs it to a file. For details on the `dlmhostinfo` utility, see [The `dlmhostinfo` Utility for Checking HDLM Installation Information on page 7-16](#).
- The utility for installing HDLM (`installhdlm`)
This utility performs a new installation, upgrade installation, or re-installation of HDLM in the unattended installation mode. In addition, information set during installation can be displayed. For details about the `installhdlm` utility, see [The `installhdlm` Utility for Installing HDLM on page 7-17](#).
- The utility for removing HDLM (`removehdlm`)
This utility removes HDLM in the unattended removal mode. For details about the `removehdlm` utility, see [The `removehdlm` Utility for Removing HDLM on page 7-28](#).

Note:

If you are using Windows Server 2003, execute the utilities as a member of the Administrators group.

If you are executing the utilities in Windows Server 2008 or Windows Server 2012, see [Using Windows Server 2008 or Windows Server 2012 on page 4-3](#).

The `DLMgetras` Utility for Collecting HDLM Error Information

This utility collects information that is needed to analyze HDLM errors that have occurred: information such as error logs, integrated trace files, trace

files, definition files, and OS information. The collected information is archived in a file and saved to a folder of your choosing.

Whenever the host is restarted, some of the information that is collected by the `DLMgetras` utility will be cleared. As a result, whenever an error occurs, immediately execute this utility to avoid losing any valuable information.

This utility is in the following locations:

`HDLM-installation-folder\bin`

and

`drive-where-the-installation-DVD-has-been-inserted:\HDLM_Windows\DLMTools#`

`#`

Use this utility only in an environment where the version of the installed HDLM and the version on the DVD are the same.

Format

When Executing the `DLMgetras` Utility from the Command Prompt

```
DLMgetras {[folder-to-which-collected-information-is-output] [-eventlogtime yyyy/mm/dd | -eventlogsize {all | maximum-file-length}] | -h}
```

You can also use lower-case characters as follows:

```
dlmgetras {[folder-to-which-collected-information-is-output] [-eventlogtime yyyy/mm/dd | -eventlogsize {all | maximum-file-length}] | -h}
```

When Executing the `DLMgetras` Utility from the Windows Start Menu

From the Windows **Start** menu, choose **Programs**, **Dynamic Link Manager**, and then **DLMgetras**.

You can change the `Windows-installation-destination-drive-name\hdmtemp` portion by changing the target in the **DLMgetras** properties.

Parameters

You can specify parameters for the `DLMgetras` utility only from the command prompt.

`folder-to-which-collected-information-is-output`

Specify the output folder for the information that is to be collected by the `DLMgetras` utility. The output-destination folders shown in [Table 7-1 List of Error Information Collected by the `DLMgetras` Utility for Collecting Error Information on page 7-4](#) are created in a folder of your choosing, and the information is then stored in the output-destination folders.

`-eventlogtime yyyy/mm/dd`

The utility obtains logs from each application, system, and security event log. The logs obtained are those output after 00:00 on the date *yyyy/mm/dd*. Specify the date in the *yyyy/mm/dd* format.

`-eventlogsize {all | maximum-file-length}`

`all`

Logs from all applications, systems, and security event logs are obtained.

`maximum-file-length`

The utility obtains logs from each application, system, and security event log. The logs are obtained, starting from the most recent log, until the log size reaches *maximum-file-length*. Specify the log size in MB. The specifiable value ranges from 1 to 4096.

`-h`

Displays the format of the `DLMgetras` utility.

Note:

- You cannot specify the `-eventlogsize {all | maximum-file-length}` parameter together with the `-eventlogtime yyyy/mm/dd` parameter.
- If neither the `-eventlogsize {all | maximum-file-length}` parameter nor the `-eventlogtime yyyy/mm/dd` parameter are specified, the utility's default is to obtain a maximum of 8 MB of event log data.

List of Collected Error Information

The following table lists the types of error information that are collected by the `DLMgetras` utility in the target error information collection folder.

Table 7-1 List of Error Information Collected by the `DLMgetras` Utility for Collecting Error Information

Folder that stores collected files ^{#1}	Files	Explanation
Just under the folder to which collected information is output	<code>getrasn.log</code>	The log file generated when <code>DLMgetras</code> is executed.
<code>folder-to-which-collected-information-is-output\HDLM-installation-destination-drive-name_Program Files_HITACHI_DynamicLinkManager^{#2}</code>	<code>hdlmservicepack</code>	HDLM SP version number
	<code>hdlmversion</code>	HDLM version number
<code>folder-to-which-collected-information-is-output\HDLM-installation-destination-drive-name_Program Files_HITACHI\DynamicLinkManager\log^{#2}</code>	<code>dlmmgrn.log</code>	HDLM manager log (including the driver log)

Folder that stores collected files ^{#1}	Files	Explanation
	dlmstnn.log	Log file of the function for setting storage system names.
	hcmdslicense2.log	Log when updating the license
	hdlmtrn.log	Trace file
	hs_err_pidnnnn.log	Java execution log (nnnn indicates a process ID)
	dlmguin.log dlmgui_launcher.log dlmwebgui_setup.log	HDLM GUI log
	dlmwebagent[1-N].log ^{#5}	Hitachi Command Suite Common Agent Component log
	installhdlm.log	Unattended installation log
<i>folder-to-which-collected-information-is-output\folder-to-which-Windows-is-introduced (%SystemRoot%)^{#3}</i>	setupact.log setupapi.log setuperr.log setupapi.app.log ^{#4} setupapi.dev.log ^{#4} setupapi.offline.log ^{#4}	Windows log
<i>folder-to-which-collected-information-is-output\HDLM-installation-destination-drive-name_Program_Files_HITACHI\DynamicLinkManager\log\mmap^{#2}</i>	hdlmtr.mm	Trace management file
<i>folder-to-which-collected-information-is-output\HDLM-installation-destination-drive-name_Program_Files_HITACHI\DynamicLinkManager\config^{#2}</i>	dlmgui.properties	Properties file for storage system names
	dlmgui_version	HDLM GUI version and build numbers
	dlmguiconfig.properties	Information about the field-width setting in the path list view of the HDLM GUI
	dlmmgr.xml	HDLM configuration file
	dlmwebagent.properties	Configuration file for Hitachi Command Suite Common Agent Component
<i>folder-to-which-collected-information-is-output\Windows-installation-destination-</i>	cluster.log	MSCS log

Folder that stores collected files ^{#1}	Files	Explanation
drive-name\Windows\Cluster		
folder-to-which-collected-information-is-output\Volume-Manager-installation-destination-drive-name_\Program Files\VERITAS\Volume Manager M.N\logs ^{#6}	All files under logs	Volume Manager log
folder-to-which-collected-information-is-output\VCS-installation-destination-drive-name_\Program Files\VERITAS\Cluster Server\log	All files under log	VCS log
Integrated trace file output folder specified in the Hitachi Network Objectplaza Trace Library utility (Default: folder-to-which-collected-information-is-output\installation-destination-drive-name_\Program Files ^{#7} \HITACHI\HNTRLib2\spool)	hntrn.log ^{#8}	Integrated trace file (HNTRLib2)
Integrated trace file output folder specified in the Hitachi Network Objectplaza Trace Library utility (Default: folder-to-which-collected-information-is-output\installation-destination-drive-name_\Program Files\HITACHI\HNTRLib\spool)	hntr[1-16].log	Integrated trace file (HNTRLib) output when HDLM version 04-00 or earlier was being used
folder-to-which-collected-information-is-output\getrasinfo	application-list.txt	List of installation information
	Cluster-reg.txt	Cluster registry information
	cluster-sys.txt	MSCS information
	dirHdlmRoot.txt	All the folders and the list of files in the HDLM installation destination folder
	dirSystemRoot.txt	All the folders and the list of files in the Windows installation destination folder
	dlm_iscsims.txt ^{#9}	iSCSI information
	dlm-reg.txt	Contents of the HDLM registry

Folder that stores collected files ^{#1}	Files	Explanation
	dlmmemorytraces.txt	HDLM memory trace information
	dlmmgr-lic.txt	Result of the <code>dlkmgr view -sys -lic</code> command
	dlmmgr-lu.txt	Result of the <code>dlkmgr view -lu -item pn cp type ic ie dnu slpr clpr dpc vid -exlu</code> command
	dlmmgr-lu-all.txt	Result of the <code>dlkmgr view -lu -item all -exlu</code> command
	dlmmgr-path.txt	Result of the <code>dlkmgr view -path -exlu</code> command
	dlmmgr-path-iem.txt	Result of the <code>dlkmgr view -path -iem</code> command
	dlmmgr-sys.txt	System information, and driver information for each SCSI port
	driverquery.txt	List of detailed driver information and digital signature information for drivers
	evApplication.evt ^{#10} evApplication.log ^{#10} wevApplication.evt ^{x#4} wevApplication.txt ^{#4}	Event log for applications
	evSecurity.evt ^{#10} evSecurity.log ^{#10} wevSecurity.evt ^{x#4} wevSecurity.txt ^{#4}	Event log for security
	evSystem.evt ^{#10} evSystem.log ^{#10} wevSystem.evt ^{x#4} wevSystem.txt ^{#4}	Event log for the system
	wevSetup.evt ^{x#4} wevSetup.txt ^{#4}	Event log for setup programs
	getrasn.log	Trace log for the DLMgetras utility

Folder that stores collected files ^{#1}	Files	Explanation
	HBA-reg.txt	Registry setting information for HBAs
	hdlmdsm-status.txt	HDLM driver information
	hntrlib-reg.txt	Contents of the HNTRLib registry
	hyper-v.txt	WMI class instance related to Hyper-V
	hyperv-haadm.txt	Windows event log related to Hyper-V
	hyperv-itegadm.txt	Windows event log related to Hyper-V
	hyperv-synfcadm.txt	Windows event log related to Hyper-V
	hyperv-synnicadm.txt	Windows event log related to Hyper-V
	hyperv-synstoradm.txt	Windows event log related to Hyper-V
	hyperv-synstorope.txt	Windows event log related to Hyper-V
	hyperv-vmmsadm.txt	Windows event log related to Hyper-V
	hyperv-vmmsnet.txt	Windows event log related to Hyper-V
	hyperv-vmmsope.txt	Windows event log related to Hyper-V
	hyperv-vmmsstor.txt	Windows event log related to Hyper-V
	hyperv-wkadm.txt	Windows event log related to Hyper-V
	iscsi-reg.txt	iSCSI registry information
	Localhost_Cluster.log #4	MSCS log
	mpio-list.txt	MPIO information
	mpio-reg.txt	MPIO registry information
	path_environ.log	Environment variable Path information
	sysdllexe.txt	Version information, timestamps for PE format files, last modification dates, and file size information for executable files installed in the HDLM directory, HNTRLib2

Folder that stores collected files ^{#1}	Files	Explanation
		directory, Hitachi common directory, and system directory.
	wevFCDiag.txt	Contents of Windows event log
	wevFCOper.txt	Contents of Windows event log
	wevFCMgrA.txt	Contents of Windows event log
	win_dep.log	DEP setting information
	winmsd.txt	Windows system information
<i>folder-to-which-collected-information-is-output\hbsainfo</i>	All files under <i>hbsainfo</i> ^{#11}	Error information of a Hitachi Command Suite product other than HDLM
<i>folder-to-which-collected-information-is-output\%SystemDrive%</i>	hdlminst.log	HDLM installation log

#1

The target error information collection folder is created in the folder to which collected information is output. The user specifies the folder to which collected information is output when executing the DLMgetras utility. If you execute the DLMgetras utility from the command prompt without specifying the folder to which collected information is output, or if the DLMgetras utility is executed from the Windows **Start** menu, the default for the folder to which collected information is output is *Windows-installation-destination-drive\hdlmtemp\hdlmgetras_nn*, where *nn* is a number from 00 to 99.

#2

The underlined part indicates the folder specified during installation

#3

In Windows Server 2008 or Windows Server 2012, files residing in *%SystemRoot%\inf* are also acquired.

#4

You can obtain these files only in Windows Server 2008 or Windows Server 2012.

#5

The value *N* depends on the setting in the *dlmwebagent.properties* file. The default value is 2.

#6

M.N indicates the version of VxVM, or of Veritas Storage Foundation for Windows including the VxVM. For example, 5.0 indicates Veritas Storage Foundation for Windows 5.0.

#7

For Windows Server 2003 (excluding the x86 edition), Windows Server 2008 (excluding the x86 edition), or Windows Server 2012, Program Files is Program Files (x86).

#8

File names are created by using the value in the Hitachi Network Objectplaza Trace Library utility's Output (directory and prefix), adding 2 onto the end, and then adding a file number onto the end of that. The default file names range from hntr21.log to hntr216.log. Note that 2 is part of the integrated trace file name and does not represent part of the file number.

#9

You can obtain `dlm_iscsims.txt` only when the iSCSI software is installed.

#10

You can obtain these files only in Windows Server 2003.

#11

You can obtain all files under `hbsainfo` only when a Hitachi Command Suite product other than HDLM from which error information is to be collected is being used.

The `dlmpr` Utility for Clearing HDLM Persistent Reservations

The `dlmpr` utility clears the persistent reservation that is left in an LU after HDLM is removed. However, a persistent reservation is not left in an LU when you remove HDLM as instructed by the procedure in this manual. This utility is located in the following location:

`drive-where-the-installation-DVD-has-been-inserted:\HDLM_Windows\DLMTools`

Note:

This utility can be executed when the following conditions are satisfied:

- HDLM has been removed.
- Services and drivers in a cluster system have not started yet.

Format

```
dlmpr {-c| -d| -h}
```

Parameters

-c

Displays a list of the paths for LUs managed by HDLM and persistent reservation information. When you specify the path ID, the persistent reservation for the path is cleared.

-d

Displays a list of the paths for LUs managed by HDLM and persistent reservation information.

-h

Displays the format of the `dlmpr` utility.

No parameters

Displays an overview of this utility.

Procedure for Executing the `dlmpr` Utility in MSCS Environments:

1. Start a host from among the hosts that make up the MSCS system.
2. Choose **Start, Settings, Control Panel**, double-click **Administrative Tool, and then double click Computer Management**.
3. Choose **Services and Applications**, and then double-click **Services**. A list of services is displayed. From the list, right-click **Cluster Service**, and choose **Properties**. In the **General** tab, select **Disabled** from the **Startup type** combo box, and then click the **OK** button.
4. In the Computer Management window, choose **Device Manager**. From the **View** menu, select **Show hidden devices**. Right-click **Cluster Disk Driver** from **Non-Plug and Play Drivers** in the right window, and then choose **Disabled**. The message **Disabling this device will cause it to stop functioning. Do you really want to disable it?** is displayed. Choose **Yes**. A message prompting you to restart the system is displayed. Choose **Yes**. The system will restart and the **Cluster Disk Driver** will be disabled.
5. Execute `dlmpr -d`.
The following shows what happens when this utility is executed. The persistent reservation remains whenever KeyCount is not 0.

```
PROMPT>dlmpr -d
PathID PathName                               KeyCount
ReservedKey      Type
000000 0001.0000.0000000000000000.0000      1      200000E08B1059EC
ExclusiveAccessRegistrantOnly
000001 0001.0000.0000000000000000.0001      1      200000E08B1059EC
ExclusiveAccessRegistrantOnly
KAPL10640-I The dlmpr utility completed normally.
PROMPT>
```

6. Execute `dlmpr -c`.

From the displayed list, enter the path ID where KeyCount is not 0. A confirmation message is displayed twice. Check the message and enter **y**. The persistent reservation is cleared. Repeat the procedure until

KeyCount for all the paths is changed to 0. The following shows what happens when executing this utility.

```
PROMPT>dlmpr -c
PathID PathName                               KeyCount
ReservedKey          Type
000000 0001.0000.0000000000000000.0000      1      200000E08B1059EC
ExclusiveAccessRegistrantOnly
000001 0001.0000.0000000000000000.0001      1      200000E08B1059EC
ExclusiveAccessRegistrantOnly
KAPL10655-I Specify the PathID of the LU for which you want to
clear persistent reservation information. (To cancel, press the
x key):0
KAPL10656-I The persistent reservation information of PathID = 0
will be cleared. Is this OK? [y/n]:y
KAPL10657-I If you continue this process, the reservation of the
LU you specified will be cleared. Please confirm that no other
servers are accessing this LU.
[y/n]:y
KAPL10658-I The persistent reservation information of PathID = 0
was cleared.
KAPL10640-I The dlmpr utility completed normally.
PROMPT>
```

7. Choose **Start, Settings, Control Panel**, double-click **Administrative Tool**, and then double-click **Computer Management**.
8. Choose **Services and Applications**, and then double-click **Services**. A list of services is displayed. From the list, right-click **Cluster Service**, and then choose Properties. Select **Automatic** from the **Startup type** combo box in the **General** tab, and then click the **OK** button.
9. In the Computer Management window, choose **Device Manager**. From the **View** menu, select **Show hidden devices**. Right-click **Cluster Disk Driver** from **Non-Plug and Play Drivers** on the right window, and choose **Enabled**.
A message prompting you to restart the system is displayed. Choose **Yes**. The system will restart and the **Cluster Disk Driver** will be enabled.
10. Make sure that MSCS starts correctly.
11. Restart all the other hosts from among the hosts that make up the MSCS system.

Procedure for Executing the dlmpr Utility in VCS Environments:

1. Start one host from among the hosts that make up the VCS system.
2. Stop the VCS.
3. Execute `dlmpr -d`.
4. Execute `dlmpr -c`.
5. From the displayed list, enter the path ID where KeyCount is not 0. A confirmation message is displayed twice. Check the message and enter **y**. The persistent reservation is cleared. Repeat the procedure until KeyCount for all the paths is changed to 0.
6. Restart the VCS.

7. Restart all the other hosts from among the hosts that make up the VCS system.

The **dlmprsvkey** Utility for Registering an HDLM Persistent Reservation Key

This utility registers and displays a PRSV key on an HDLM host. A PRSV key is required to operate HDLM functions. This utility is executed automatically during an installation of HDLM. A registered PRSV key becomes valid after the host is rebooted. This utility is located in the following location:

HDLM-installation-folder\bin

Format

`dlmprsvkey {-r [PRSV-key-to-be-specified-by-user] [-s] | -v | -h}`

Parameter

-r [PRSV-key-to-be-specified-by-user] [-s]

Specify this parameter when you register a PRSV key.

PRSV-key-to-be-specified-by-user

A maximum of 16 hexadecimal digits can be specified.

- If this parameter is omitted, or the `dlmprsvkey` utility is automatically executed during HDLM installation:
The `dlmprsvkey` utility for registering an HDLM persistent reservation key creates a PRSV key by using the MAC address of the NIC and the execution time of the utility. If the MAC address of the NIC cannot be obtained, the `dlmprsvkey` utility creates a PRSV key by using the execution time of the utility only.
- If this parameter is specified:
If less than 16 digits are specified, zeros will be added to the left of the entered value to make it 16 digits. The specified value must satisfy both of the following conditions:
 - Must be a unique value among all the hosts in the SAN.
 - Specifiable values are single-byte characters from 0 to 9, a to f, and A to F. Values cannot be specified using zeroes only.

Example

In the following example, the utility registers the PRSV key without specifying it on the host:

```
PROMPT>dlmprsvkey -r
KAPL12104-I  The operation for PRSV key registration will now
start. Is this OK? [y/n]: y
KAPL12106-I  An attempt to register the PRSV key was
successful. (PRSV key = 0123456789abcdef)
PROMPT>
```

In the following example, the utility registers the PRSV key by specifying it on the host:

```
PROMPT>dlmprsvkey -r 0123456789ABCDEF
KAPL12104-I The operation for PRSV key registration will now
start. Is this OK? [y/n]: y
KAPL12106-I An attempt to register the PRSV key was
successful. (PRSV key = 0123456789abcdef)
PROMPT>
```

-s

Specify this parameter to avoid displaying a confirmation message upon execution of the `dlmprsvkey` utility.

-v

Specify this parameter to display the registered PRSV key.

Example

```
PROMPT>dlmprsvkey -v
KAPL12116-I The registered PRSV key will now be displayed.
(PRSV key = 0123456789abcdef)
PROMPT>
```

-h

Displays the format of the `dlmprsvkey` utility.

If you do not specify any parameters, a warning message will appear.

The `dlmchkpath` Utility for Checking HDLM Paths

If you install or remove HDLM in a multi-path configuration, the disk might become corrupted. Use the `dlmchkpath` utility to check HDLM paths and to make sure that the system is in a single-path configuration. During an upgrade installation, a re-installation, or removal of HDLM, the `dlmchkpath` utility is executed automatically. If the system is in a single-path configuration, the `dlmchkpath` utility displays nothing during an upgrade installation, a re-installation, or removal of HDLM. A warning dialog box will appear if the system is in a multi-path configuration.

However, when you use one of the following methods of installing HDLM and the system is determined to be a multi-path configuration, the installation will terminate without displaying any warning dialog boxes:

- Upgrade installation using the unattended installation
- Re-installation using the unattended installation

When the `dlmchkpath` utility is executed manually, a message will appear as shown in the execution example in [Parameters on page 7-15](#). This utility is located in the following location:

HDLM-installation-folder\bin

Format

```
dlmchkpath {-singleconnect | -h}
```

Parameters

-singleconnect

Checks whether a single path configuration is being used to connect the HDLM management-target LU to the host.

Examples

In the following example, the utility determines that the system is in a single-path configuration:

```
PROMPT>dlmchkpath -singleconnect
KAPL12401-I All LUs managed by HDLM are in a single path
configuration.
PROMPT>
```

In the following example, the utility determines that the system is in a multi-path configuration:

```
PROMPT>dlmchkpath -singleconnect
KAPL12402-W iLU(0100) is in a multi-path configuration.
PathID = 0,3
KAPL12402-W iLU(0101) is in a multi-path configuration.
PathID = 1,4
KAPL12402-W iLU(0102) is in a multi-path configuration.
PathID = 5,2
PROMPT>
```

In the following example, the `view` operation is performed when the utility determines that the system is in a multi-path configuration. For details about the `view` operation, see [view \(Displays Information\) on page 6-33](#).

```
PROMPT>dlnkmgr view -path -c
Paths:000006 OnlinePaths:000006
PathStatus IO-Count IO-Errors
Online 152579 30

PathID DskName
Status Type
000000 HITACHI .DF600F .5455 0100 0C
Online Own
000001 HITACHI .DF600F .5455 0101 0C
Online Own
000002 HITACHI .DF600F .5455 0102 0C
Online Non
000003 HITACHI .DF600F .5455 0100 1C
Online Non
000004 HITACHI .DF600F .5455 0101 1C
Online Non
000005 HITACHI .DF600F .5455 0102 1C
Online Own
KAPL01001-I The HDLM command completed normally. Operation
```

```
name = view, completion time = yyyy/mm/dd hh:mm:ss
PROMPT>

-h
    Displays the format of the dlmchkpath utility.

If you do not specify any parameters, a warning message will appear.
```

The dlmhostinfo Utility for Checking HDLM Installation Information

This utility either displays HDLM installation information from the command prompt or outputs the information to a file. Installation information refers to the installation directory and the version. If HDLM has not been installed, no installation information is output.

This utility is in the following locations:

HDLM-installation-folder\bin

and

drive-where-the-installation-DVD-has-been-inserted:\HDLM_Windows
\DLMTools#

#

Use this utility only in an environment where the version of the installed HDLM and the version on the DVD are the same.

Format

```
dlmhostinfo [-output installation-information-file | -h]
```

Parameters

-output *installation-information-file*

Outputs the installation information to the specified file. If the specified file already exists, the installation information will not be output.

Example:

Specifying the **-output** parameter:

```
PROMPT>dlmhostinfo -output installation-information-file
KAPL13801-I The dlmhostinfo utility for confirming HDLM
installation information completed normally.
PROMPT>
```

```
[Contents of installation-information-file]
"installDirectory","C:\Program Files\Hitachi
\DynamicLinkManager"
"version","x.x.x-xx"
```

-h

Displays the format for running the `dlmhostinfo` utility.

No parameters

Displays installation information.

Example:

Without specifying the `-output` parameter:

```
PROMPT>dlmhostinfo
"installDirectory", "C:\Program Files\Hitachi
\DynamicLinkManager"
"version", "x.x.x-xx"
KAPL13801-I The dlmhostinfo utility for confirming HDLM
installation information completed normally.
PROMPT>
```

The following table refers to the items that make up the output installation information.

Table 7-2 Installation Information

Item name	Value
installDirectory	HDLM installation folder
version	Version of the installed HDLM#

#

The version that is output is the same as what is output for HDLM Version when the HDLM command is executed with `-sys` specified for the `view` operation. Note that when a service pack has been installed, the version in Service Pack Version is output instead.

Each item and value is enclosed in double quotation marks ("") and is output in CSV format.

The `installhdlm` Utility for Installing HDLM

The `installhdlm` utility can perform a new installation, upgrade installation, or re-installation of HDLM in the unattended installation mode. How the utility should respond during an installation, and the HDLM function settings must be predefined in an installation-information settings file.

You can also use this utility later to check the information that was set during installation.

To perform an unattended installation, store the utility in the following location:

`drive-where-the-installation-DVD-has-been-inserted:\HDLM_Windows\DLMTools`

The utility to display the information set during installation is stored in the following location:

HDLM-installation-folder\bin

For details about the procedure for performing an unattended installation, see [Performing a New Installation of HDLM on Windows Server 2003 on page 3-31](#) or [Performing a New Installation of HDLM on Windows Server 2008 and Windows Server 2012 on page 3-54](#).

Format

```
installhdml {-f installation-information-settings-file-name [-c] | -v | -h}
```

Parameters

-f *installation-information-settings-file-name*

Sets the information required to perform an installation.

For details about the installation-information settings file, see [Contents of an Installation-Information Settings File on page 7-18](#).

-c

Checks the contents of the installation-information settings file, the license, and other necessary information, but does not perform an installation.

-v

Displays the information that was set during installation.

If the installation was performed without using the unattended installation functionality, the information specified in a dialog box is displayed.

Example:

```
PROMPT>installhdml -v
installdir=C:\Program Files\HITACHI\DynamicLinkManager
storage_emc=n
storage_eva=n
HDLM_core=n
PROMPT>
```

For an explanation of each display item, see [Table 7-3 Keys That Can Be Defined in the \[INSTALLATION SETTINGS\] Section on page 7-19](#).

-h

Displays the format of the `installhdml` utility.

Contents of an Installation-Information Settings File

For information about setting the installation-information settings file, see [Preparations for Installing HDLM by Performing an Unattended Installation on page 3-29](#).

[INSTALLATION_SETTINGS] section

This section defines operation information for the `installhdml` utility. Do not modify any definitions of items that are not listed in [Table 7-3 Keys That Can Be Defined in the \[INSTALLATION_SETTINGS\] Section on page 7-19](#).

The following table lists and explains the keys that can be defined in the [INSTALLATION_SETTINGS] section.

Table 7-3 Keys That Can Be Defined in the [INSTALLATION_SETTINGS] Section

Key name	Description	Necessity of definition		Maximum character length ^{#1}
		New installation	Upgrade installation or Re-installation	
installfile_location	Specify the absolute path name of the drive in which the installation DVD is inserted. If this key is omitted, the installer uses the following folder: <i>drive-in-which-the-installation-DVD-is-inserted:\HDLM_Windows\</i>	Optional	Optional	100
workdir	Specify an absolute path to an output folder. Installation logs and processing files are output to this folder. ^{#2, #3} If this key is omitted, the installer uses the folder path that has been defined in the <code>TMP</code> or <code>TEMP</code> environment variable.	Optional	Optional	100
licensekeyfile	Specify an absolute path to a license key file stored on the host. ^{#2, #3} If this key is omitted, the installer uses the following license key file: <i>Windows-installation-drive:\hdml_license</i>	Optional ^{#4}	Optional ^{#4}	100
installdir	Specify an absolute path to an installation destination folder for HDLM. ^{#2, #3} If this key is omitted, the installer uses the following folder: <i>Windows-installation-drive:\Program Files\HITACHI\DynamicLinkManager^{#5}</i>	Optional	Not required	100

Key name	Description	Necessity of definition		Maximum character length ^{#1}
		New installation	Upgrade installation or Re-installation	
storage_emc	<p>Specify either of the following values to indicate whether to include the EMC DMX series and EMC CX series as management targets of HDLM:^{#2}</p> <p>y: Include them as management targets.</p> <p>n: Do not include them as management targets.</p> <p>If this key is omitted</p> <ul style="list-style-type: none"> ◦ In Windows Server 2003, the two series are not included as management targets. ◦ In Windows Server 2008, the two series are included as management targets. 	Optional	Not required	1
storage_eva	<p>Specify whether to include the HP EVA series as possible management targets of HDLM. Specify either of the following values:^{#2}</p> <p>y: Include them as management targets.</p> <p>n: Do not include them as management targets.</p> <p>If this key is omitted</p> <ul style="list-style-type: none"> ◦ In Windows Server 2003, the two series are not included as management targets. ◦ In Windows Server 2008, the two series are included as management targets. 	Optional	Optional	1
HDLM_core ^{#6}	<p>Specify the HDLM components to be installed. Specify either of the following values:</p> <p>y: Install only the HDLM Core components. The HDLM GUI and Hitachi Command Suite Common</p>	Optional	Optional	1

Key name	Description	Necessity of definition		Maximum character length ^{#1}
		New installation	Upgrade installation or Re-installation	
	Agent Component will not be installed. n: Install all HDLM components (default).			
restart	Specify whether to restart the host after installation. Specify either of the following values: ^{#2} y: Restart. n: Do not restart (default). In a cluster environment, do not specify y.	Optional	Optional	1

Legend:

Optional: If no key or setting value is specified, the installer uses the default value.

Not required: The specification of any key or setting value is unnecessary. If a key or setting value is specified for the key, the installer ignores the specified value.

#1

If a value exceeds the maximum length, an error will occur.

#2

If a value is not of an allowable type, an error will occur.

#3

The value to be specified does not have to be enclosed within double quotation marks ("), even if the value includes space characters.

#4

When you perform a new installation of HDLM, or when you perform an upgrade installation and the license is expired, you must prepare the license key file.

#5

In Windows Server 2003 (excluding the x86 edition), Windows Server 2008 (excluding the x86 edition), or Windows Server 2012, the installer uses the following folder:

Windows-installation-drive:\Program Files (x86)\HITACHI\DynamicLinkManager

- You cannot specify `y` for the `HDLM_core` key to perform an upgrade installation or re-installation of HDLM on a host on which all the HDLM components have already been installed. If you want to do this, first remove HDLM, and then perform a new installation.
- If you want to install all the HDLM components on a host on which only the HDLM Core components have been installed, specify `n` for the `HDLM_core` key.

[ENVIRONMENT_SETTINGS] section

This section defines HDLM operational and function information. HDLM operational and function information is optional, however, if omitted, the installer will use the following values:

- For a new installation, the installer uses the default values of the keys that are listed in the following [Table 7-4 Keys That Can Be Defined in the \[ENVIRONMENT_SETTINGS\] Section on page 7-22](#).
- For an upgrade installation or re-installation, the installer uses the old HDLM setting values.

Note that do no modify any definitions of items that are not listed in [Table 7-4 Keys That Can Be Defined in the \[ENVIRONMENT_SETTINGS\] Section on page 7-22](#).

The following table lists and explains the keys that can be defined in the [ENVIRONMENT_SETTINGS] section.

Table 7-4 Keys That Can Be Defined in the [ENVIRONMENT_SETTINGS] Section

Key name ^{#1}	Description ^{#2}	Necessity of definition		Maximum character length ^{#3}
		New installation	Upgrade installation or Re-installation	
<code>load_balance</code>	Specify whether to enable load balancing by specifying either of the following values: <code>on</code> : Enable load balancing (default). <code>off</code> : Do not enable load balancing.	Optional	Optional	3
<code>load_balance_type</code>	Specify the load balancing algorithm by specifying either of the following values: <code>rr</code> : The Round Robin algorithm	Optional	Optional	5

Key name ^{#1}	Description ^{#2}	Necessity of definition		Maximum character length ^{#3}
		New installation	Upgrade installation or Re-installation	
	<p>exrr: The Extended Round Robin algorithm</p> <p>lio: The Least I/Os algorithm</p> <p>exlio: The Extended Least I/Os algorithm (default)</p> <p>1bk: The Least Blocks algorithm</p> <p>ex1bk: The Extended Least Blocks algorithm</p>			
load_balance_same_path_use_times	<p>Specify the number of times the same path can be used for I/O operations when the Round Robin (rr), Least I/Os (lio), or Least Blocks (1bk) algorithm is used for load balancing.</p> <p>You can specify a value from 0 to 999999. The default is 1.</p> <p>Specify 0 to disable load balancing.</p>	Optional	Optional	6
lbex_usetimes_limit	<p>Specify the number of times the same path can be used for sequential I/O operations when the extended Round Robin (exrr), Least I/Os (exlio), or Least Blocks (ex1bk) algorithm is used for extended load balancing.</p> <p>You can specify a value from 0 to 999999. The default is 100.</p> <p>Specify 0 to not set a limit (that is, to not switch paths).</p>	Optional	Optional	6
lbex_random_io_usetimes_limit	<p>Specify the number of times the same path can be used for random I/O operations when the extended Round Robin (exrr), Least I/Os (exlio), or Least Blocks (ex1bk) algorithm is used for extended load balancing.</p> <p>You can specify a value from 0 to 999999. The default is 1.</p> <p>Specify 0 to not set a limit (that is, to not switch paths).</p>	Optional	Optional	6

Key name^{#1}	Description^{#2}	Necessity of definition		Maximum character length^{#3}
		New installation	Upgrade installation or Re-installation	
error_log_level	<p>Specify the level of the error information to be collected as error log data.</p> <p>You can specify a value from 0 to 4. The default is 3.</p>	Optional	Optional	1
error_log_size	<p>Specify the maximum size of error log files (dlmmgr[1-16].log) in kilobytes.</p> <p>You can specify a value from 100 to 2000000. The default is 0.</p>	Optional	Optional	7
error_log_number	<p>Specify the maximum number of error log files (dlmmgr[1-16].log).</p> <p>You can specify a value from 2 to 16. The default is 2.</p>	Optional	Optional	2
trace_level	<p>Specify the output level for traces.</p> <p>You can specify a value from 0 to 4. The default is 0.</p>	Optional	Optional	1
trace_file_size	<p>Specify the size of trace files (hdlmtr[1-64].log) in kilobytes.</p> <p>You can specify a value from 100 to 16000. The default is 1000.</p>	Optional	Optional	5
trace_file_number	<p>Specify the maximum number of trace files (hdlmtr[1-64].log).</p> <p>You can specify a value from 2 to 64. The default is 4.</p>	Optional	Optional	2
path_health_check	<p>Specify whether to enable path health checking by specifying either of the following values:</p> <p>on: Enable path health checking (default).</p> <p>off: Disable path health checking.</p>	Optional	Optional	3
path_health_check_interval	<p>Specify, in minutes, the interval at which the path health check will be performed.</p> <p>You can specify a value from 1 to 1440. The default is 30.</p>	Optional	Optional	4
autoFallback	Specify whether to enable automatic failbacks for failed paths	Optional	Optional	3

Key name ^{#1}	Description ^{#2}	Necessity of definition		Maximum character length ^{#3}
		New installation	Upgrade installation or Re-installation	
	by specifying either of the following values: on: Enable automatic failback (default). off: Disable automatic failback.			
auto_failback_interval	Specify, in minutes, the path status check interval, which is the interval between the end of the previous check and the start of the next check. You can specify a value from 1 to 1440. The default is 1.	Optional	Optional	4
intermittent_error_monitor ^{#4 #5}	Specify whether to enable intermittent error monitoring by specifying either of the following values: on: Enable intermittent error monitoring. off: Disable intermittent error monitoring (default).	Optional	Optional	3
intermittent_error_monitor_interval ^{#5}	Specify, in minutes, the intermittent error monitoring interval. You can specify a value from 1 to 1440. The default is 30.	Optional	Optional	4
intermittent_error_monitor_number ^{#5}	Specify how many times an error needs to occur to cause HDLM to assume an intermittent error. You can specify a value from 1 to 99. The default is 3.	Optional	Optional	2
dynamic_io_path_control	Specify whether to enable or disable the dynamic I/O path control function by using the values below. Note that, if this function is set, the setting for each storage system or LU is cleared. on: Enabled off: Disabled (default)	Optional	Optional	3

Key name^{#1}	Description^{#2}	Necessity of definition		Maximum character length^{#3}
		New installation	Upgrade installation or Re-installation	
dynamic_io_path_control_interval ^{#6}	For the dynamic I/O path control function, specify the checking interval (in minutes) for reviewing the information about the switching of controllers performed by the storage system. You can set the checking interval from 1 to 1440. The default is 10.	Optional	Optional	4
remove_lu	Specify whether to enable the LU dynamic removal function by setting either of the following values: on: Enable the LU dynamic removal function. off: Disable the LU dynamic removal function (default).	Optional	Optional	3
remove_lu_force	Using either of the following values, specify whether to remove an LU from the HDLM management target list when all paths to the LU are disconnected, even when there are Offline(C) paths: ^{#2} on: Remove the LU. off: Do not remove the LU (default).	Optional	Optional	3

Legend:

Optional:

- For a new installation:
If no key or setting value is specified, the installer uses the default values.
- For an upgrade installation or re-installation:
If no key or setting value is specified, the installer uses the old HDLM setting values.

#1

Keys that are not specified for an upgrade installation or re-installation inherit the current key settings.

#2

Specifying an invalid value results in an error.

For details about the function settings, see [set \(Sets Up the Operating Environment\) on page 6-16](#).

#3

If the value exceeds the maximum value, an error occurs.

#4

You can specify this key only in the following cases:

- For a new installation:

When `on` is specified for the `auto_failback` key in the installation-information settings file

- For an upgrade installation or re-installation:

When `on` is specified for the `auto_failback` key in the installation-information settings file, or when automatic failbacks are enabled in the installation pre-settings.

#5

If you want to enable intermittent error monitoring, specify this key after specifying the `auto_failback` and `auto_failback_interval` keys.

#6

The checking interval can be set regardless of whether the dynamic I/O path control function is enabled or disabled.

The following shows an example of an installation-information settings file.

```
[INSTALLATION_SETTINGS]
installfile_location=
workdir=
licensekeyfile=C:\temp\hdlm_license
installdir=D:\Program Files\HITACHI\DynamicLinkManager
storage_emc=n
storage_eva=n
HDLM_core=n
restart=n
[ENVIRONMENT_SETTINGS]
load_balance=on
load_balance_type=exlio
load_balance_same_path_use_times=1
lbex_usetimes_limit=100
lbex_random_io_usetimes_limit=1
error_log_level=3
error_log_size=9900
error_log_number=2
trace_level=0
trace_file_size=1000
trace_file_number=4
path_health_check=on
path_health_check_interval=30
auto_failback=on
auto_failback_interval=1
intermittent_error_monitor=off
#intermittent_error_monitor_interval=30
#intermittent_error_monitor_number=3
```

```
dynamic_io_path_control=off
dynamic_io_path_control_interval=10
remove_lu=off
remove_lu_force=off
```

Note:

- If a hash mark (#) is placed at the beginning of a line in the installation-information settings file, that line is assumed to be a comment.
- If you do not want to specify a key or setting value, enter a hash mark (#) at the beginning of that particular line.

About the Log File

During an unattended installation, information about the installation progress is output to the log file named `installhdml.log`.

The following explains the `installhdml.log` file:

- The `installhdml.log` file is created in the folder specified by the `workdir` key in the installation-information settings file.
- If the `installhdml.log` file already exists, log data will be appended to the file. For details about the capacity of the log output folder, see [*Preparations for Installing HDLM by Performing an Unattended Installation on page 3-29*](#).

Notes:

- The `installhdml.log` file is not deleted when HDLM is removed. If the file is no longer necessary, delete it manually.
- Creation of the `installhdml.log` file might fail if, for example, the disk does not have sufficient unused capacity. If this happens, a message will be output immediately before the `installhdml` utility terminates.

The `removehdml` Utility for Removing HDLM

The `removehdml` utility removes HDLM. If you execute the `removehdml` utility with the `-s` parameter specified, no dialog boxes will be displayed during an unattended removal.

Format

```
removehdml [-s [-r] [-w work-folder] | -h]
```

Parameters

```
-s [-r] [-w work-folder]
    Executes an unattended removal.
```

-r

Restarts the host after a removal.

-w *work-folder*

Specifies the folder to which `removehd1m.log` and work files are output. If the folder name to be specified includes space characters, enclose the entire value within double quotation marks ("").

If you do not specify this parameter, the folder defined in the `TMP` or `TEMP` environment variable will be used.

-h

Displays the format of the `removehd1m` utility.

If you execute the `removehd1m` utility without any parameters specified, the dialog boxes providing notes on removal and indicating the completion of the removal will appear, as is the case when Dynamic Link Manager is removed from the Add/Remove Programs dialog box.

Note:

- After the `removehd1m` utility has been executed and the host restarted, the utility is automatically deleted.
- After executing the `removehd1m` utility, check the messages output to the command prompt and the `removehd1m.log` file to make sure that HDLM has been removed. The `removehd1m.log` file is output to the folder defined in the `TMP` or `TEMP` environment variable or the folder specified in the `-w` parameter.
- If you specify the `-r` parameter to restart the host, you cannot check the result of HDLM removal from the command prompt. After restarting the host, check the results of the HDLM removal recorded in the `removehd1m.log` file.

Messages

This chapter describes the format and meaning of the message IDs, and also the terms used in the messages and message explanations. For details on the meaning of the return codes output by HDLM when it receives a request from Global Link Manager and measures to take for them, see [Return Codes for Hitachi Command Suite Common Agent Component on page 8-115](#).

- [Before Viewing the List of Messages](#)
- [KAPL01001 to KAPL02000](#)
- [KAPL02001 to KAPL03000](#)
- [KAPL03001 to KAPL04000](#)
- [KAPL04001 to KAPL05000](#)
- [KAPL05001 to KAPL06000](#)
- [KAPL07001 to KAPL08000](#)
- [KAPL08001 to KAPL09000](#)
- [KAPL09001 to KAPL10000](#)
- [KAPL10001 to KAPL11000](#)
- [KAPL11001 to KAPL12000](#)
- [KAPL12001 to KAPL13000](#)
- [KAPL13001 to KAPL14000](#)

- [KAPL15001 to KAPL16000](#)
- [Return Codes for Hitachi Command Suite Common Agent Component](#)
- [Events Output to Windows Event Logs by HDLM](#)

Before Viewing the List of Messages

This section explains the following information that is needed to locate messages and understand the explanations in the sections from [KAPL01001 to KAPL2000 on page 8-4](#).

- Format and meaning of the message IDs
- Terms used in the messages and message explanations

This information is explained below.

Format and Meaning of Message IDs

Each message has a message ID. The following table shows the format and meaning of message IDs.

Table 8-1 Format and Meaning of the Message ID KAPLnnnnn-1

Format	Meaning
KAPL	Indicates that the message is an HDLM message.
nnnnn	Message serial number for the module
/	Message level C: Critical E: Error W: Warning I: Information

Terms Used in Messages and Message Explanations

The following table shows the terms that appear in messages and the terms that are used for explanation (meaning, description, and handling) of the messages.

Table 8-2 Terms Used in the Messages and Message Explanations

Terms	Meaning
aa...aa	Variable (If a message contains two or more variables, they are displayed as bb...bb, cc...cc, and so on.)
FO	Failover
Operation name	The operation name that is input after <code>dlnkmgr</code> in the command.
Service status	Running status of the service
Mounted drive	A drive that the file system recognizes

KAPL01001 to KAPL02000

Message ID	Message Text	Explanation
KAPL01001-I	The HDLM command completed normally. Operation name = <i>aa...aa</i> , completion time = <i>bb...bb</i>	<p>Details</p> <p>The HDLM command completed successfully.</p> <p>When the <code>view -path</code>, <code>or view -lu</code> operation is executed, <code>view(-pstv)</code> is displayed if the Physical Storage View is disabled, and <code>view(-vstv)</code> is displayed if the Physical Storage View is disabled.</p> <p><i>aa...aa</i>: Specified operation name <i>bb...bb</i>: Year/month/day hour:minute:second</p> <p>Action</p> <p>None.</p>
KAPL01002-I	The HDLM command started. Operation name = <i>aa...aa</i>	<p>Details</p> <p>The HDLM command was executed.</p> <p><i>aa...aa</i>: Specified operation name</p> <p>Action</p> <p>None.</p>
KAPL01003-W	No operation name is specified.	<p>Details</p> <p>An operation name is missing.</p> <p>Action</p> <p>Specify the operation name, and then retry.</p>
KAPL01004-W	The operation name is invalid. Operation name = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Specified operation name</p> <p>Action</p> <p>Execute the <code>help</code> operation of the HDLM command (<code>dlnkmgr</code>) to check the operation name, and then retry. For details on the <code>help</code> operation, see help (Displays the Operation Format) on page 6-4.</p>
KAPL01005-W	A parameter is invalid. Operation name = <i>aa...aa</i> , parameter = <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: Specified operation name <i>bb...bb</i>: Specified parameter</p> <p>Action</p> <p>Execute <code>help operation-name</code> of the HDLM command (<code>dlnkmgr</code>) to check the parameter, and then retry. For details on the <code>help</code> operation, see help (Displays the Operation Format) on page 6-4.</p>

Message ID	Message Text	Explanation
KAPL01006-W	A necessary parameter is not specified. Operation name = <i>aa...aa</i>	<p>Details</p> <p>The specified operation does not contain the necessary parameter.</p> <p><i>aa...aa</i>: Specified operation name</p> <p>Action</p> <p>Execute <code>help operation-name</code> of the HDLM command (<code>dlnkmgr</code>) to check the parameter. Specify the correct parameter, and then retry. For details on the <code>help</code> operation, see help (Displays the Operation Format) on page 6-4.</p>
KAPL01007-W	A duplicate parameter is specified. Operation name = <i>aa...aa</i> , parameter = <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: Specified operation name</p> <p><i>bb...bb</i>: Duplicate parameter</p> <p>Action</p> <p>Delete the duplicate parameter, and then retry.</p>
KAPL01008-W	A necessary parameter value is not specified. Operation name = <i>aa...aa</i> , parameter = <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: Specified operation name</p> <p><i>bb...bb</i>: Parameter name</p> <p>Action</p> <p>Specify the parameter value, and then retry.</p>
KAPL01009-W	A parameter value is invalid. Operation name = <i>aa...aa</i> , parameter = <i>bb...bb</i> , parameter value = <i>cc...cc</i> , Valid value = <i>dd...dd</i>	<p>Details</p> <p><i>aa...aa</i>: Specified operation name</p> <p><i>bb...bb</i>: Parameter name</p> <p><i>cc...cc</i>: Specified parameter value</p> <p><i>dd...dd</i>: Specifiable parameter value range</p> <p>Action</p> <p>Specify a correct value for the parameter, and then retry.</p>
KAPL01012-E	Could not connect the HDLM manager. Operation name = <i>aa...aa</i>	<p>Details</p> <p>In the <code>view -sys -sfunc</code> operation, information must be collected from the HDLM manager but the manager cannot be accessed.</p> <p><i>aa...aa</i>: <code>view</code></p> <p>Action</p> <p>Execute the <code>view</code> operation of the HDLM command (<code>dlnkmgr</code>) to check whether the HDLM manager has started. Start the HDLM manager if it has not started, and</p>

Message ID	Message Text	Explanation
		then retry the HDLM command. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33 .
KAPL01013-E	An error occurred in internal processing of the HDLM command. Operation name = <i>aa...aa</i> details = <i>bb...bb</i>	<p>Details</p> <p>An error unrelated to a user operation occurred during command processing.</p> <p><i>aa...aa</i>: Specified operation name <i>bb...bb</i>: The name of the function and processing on which the error occurred</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL01014-W	No authority to execute the HDLM command. Operation name = <i>aa...aa</i>	<p>Details</p> <p>You do not have the administrator permissions necessary to execute the HDLM command.</p> <p><i>aa...aa</i>: Specified operation name</p> <p>Action</p> <p>Execute the command as a user with Administrators group permissions.</p>
KAPL01015-W	The target HBA was not found. Operation name = <i>aa...aa</i>	<p>Details</p> <p>The path having the port number and path number specified in the <code>-hba</code> parameter could not be found.</p> <p><i>aa...aa</i>: offline or online</p> <p>Action</p> <p>Execute the <code>view</code> operation of the HDLM command (<code>dlnkmgr view -path</code>) and check the value displayed in <code>PathName</code>. Use the two leftmost digits of <code>PathName</code> for the relevant HBA port, and then retry. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>

Message ID	Message Text	Explanation
KAPL01016-W	The target CHA port was not found. Operation name = <i>aa...aa</i>	<p>Details</p> <p>The path ID indicated by <code>-pathid</code> and required by the <code>-cha</code> parameter is not an object of HDLM management.</p> <p><i>aa...aa</i>: offline or online</p> <p>Action</p> <p>Execute the <code>view</code> operation of the HDLM command (<code>dlnkmgr view -path</code>), and then check the value displayed in <code>ChaPort</code>. Specify an <code>AutoPath_ID</code> that passes through the relevant CHA port, and then retry. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL01018-W	The target device was not found. Operation name = <i>aa...aa</i>	<p>Details</p> <p>The specified host device name could not be found.</p> <p><i>aa...aa</i>: <code>view</code></p> <p>Action</p> <p>Execute the <code>view</code> operation of the HDLM command (<code>dlnkmgr view -path</code>) to check the value displayed in <code>HDevName</code>. Specify a host device for the value of <code>HDevName</code>, and then retry. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL01019-W	The target path was not found. Operation name = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: offline, online, or <code>view</code></p> <ul style="list-style-type: none"> ○ <code>offline/online</code> operation The specified path does not exist. ○ <code>view</code> operation The paths have not been configured because creation of the HDLM environment or configuration changes to the HDLM operating environment have not finished. <p>Action</p> <ul style="list-style-type: none"> ○ <code>offline/online</code> operation Use the <code>view</code> operation of the HDLM command (<code>dlnkmgr</code>) to check the settings, and then retry. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.

Message ID	Message Text	Explanation
		<ul style="list-style-type: none"> o view operation <p>Refer to Chapter 3, Creating an HDLM Environment on page 3-1, Creating an HDLM Environment or Reconfiguring the HDLM Operating Environment on page 4-17, and then configure any paths that exist. If the same message appears again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, acquire the error information, and then contact your HDLM vendor or the company for which you have a service contract. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL01021-E	Cannot execute the HDLM command due to insufficient memory.	<p>Details</p> <p>Memory required for HDLM command processing could not be allocated.</p> <p>Action</p> <p>Terminate unnecessary applications to increase the amount of free memory, and then try again.</p>
KAPL01023-W	The last Online path for the device cannot be placed Offline(C).	<p>Details</p> <p>The path specified for the <code>offline</code> operation cannot be set to Offline(C) because it is the last, available path to the LU from the host.</p> <p>Action</p> <p>Use the <code>view</code> operation of the HDLM command (<code>dlnkmgr</code>) to check the status of the paths. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL01024-W	The specified parameters cannot be specified at the same time. Operation name = <i>aa...aa</i> , parameters = <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: Specified operation name <i>bb...bb</i>: Parameters that cannot be specified at the same time</p> <p>Action</p> <p>Execute <code>help</code> <i>operation</i> of the HDLM command (<code>dlnkmgr</code>) to check which parameters can be</p>

Message ID	Message Text	Explanation
		specified at the same time, and then retry. For details on the <code>help</code> operation, see help (Displays the Operation Format) on page 6-4 .
KAPL01035-W	The cluster support function is active, so the load balancing function is not supported.	<p>Details</p> <p>The load balancing function cannot be enabled because MSCS is installed.</p> <p>Action</p> <p>The load balancing function is not supported in an environment where MSCS is installed. If you want to use the load balancing function, remove MSCS.</p>
KAPL01036-E	The Offline path cannot be placed online. PathID = aa...aa	<p>Details</p> <p>The path could not be recovered.</p> <p>aa...aa: Path ID (decimal (base-10) number)</p> <p>Action</p> <p>Remove the error in the path, and then retry.</p>
KAPL01039-W	During the online operation processing of the HDLM command, a path that cannot be placed in the Online status was detected. PathID = aa...aa Would you like to continue the processing of the online operation? [y/n]:	<p>Details</p> <p>A path that cannot be placed Online was detected during multi-path online processing.</p> <p>To ignore this path and perform online processing for the next path, enter <code>y</code>.</p> <p>To cancel processing, enter <code>n</code>.</p> <p>aa...aa: Path ID (decimal (base-10) number)</p> <p>Action</p> <p>If you want to continue processing of the online operation of the HDLM command for other paths, enter <code>y</code>. If you want to terminate processing, enter <code>n</code>. For details on the online operation, see online (Places Paths Online) on page 6-11.</p>
KAPL01040-W	The entered value is invalid. Re-enter [y/n]:	<p>Details</p> <p>A value other than <code>y</code> and <code>n</code> was entered. Enter <code>y</code> or <code>n</code>.</p> <p>Action</p> <p>Enter <code>y</code> or <code>n</code>.</p>

Message ID	Message Text	Explanation
KAPL01041-E	The entered value is invalid. The operation stops. Operation name = <i>aa...aa</i>	<p>Details</p> <p>Command processing will be aborted because an incorrect value was entered three times in a row for a request.</p> <p><i>aa...aa</i>: clear, offline, online, or set</p> <p>Action</p> <p>Check the correct value, and then re-execute the HDLM command.</p>
KAPL01044-W	A duplicate parameter value is specified. Operation name = <i>aa...aa</i> , parameter = <i>bb...bb</i> , parameter value = <i>cc...cc</i>	<p>Details</p> <p>The same parameter value is specified two or more times.</p> <p><i>aa...aa</i>: view</p> <p><i>bb...bb</i>: Parameter name</p> <p><i>cc...cc</i>: Duplicate parameter value</p> <p>Action</p> <p>Delete the duplicate parameter value, and then retry.</p>
KAPL01045-W	Too many parameter values are specified. Operation name = <i>aa...aa</i> , parameters = <i>bb...bb</i> , parameter value = <i>cc...cc</i>	<p>Details</p> <p><i>aa...aa</i>: offline, online, set, or view</p> <p><i>bb...bb</i>: Parameter name</p> <p><i>cc...cc</i>: Parameter value</p> <p>Action</p> <p>Execute <code>help operation-name</code> of the HDLM command (dlnkmgr) to check the parameter value, and then retry. For details on the <code>help</code> operation, see help (Displays the Operation Format) on page 6-4.</p>
KAPL01046-I	An offline request was registered in a batch job. PathID = <i>aa...aa</i>	<p>Details</p> <p>The <code>offline</code> command was executed but the path is currently processing. If the <code>view -path</code> operation is executed in this status, <code>Offline(P)</code> will be displayed. Wait a little while, and then re-execute the <code>view -path</code> operation to make sure that the status is <code>Offline(C)</code>.</p> <p><i>aa...aa</i>: Path ID (decimal (base-10) number)</p> <p>Action</p> <p>None.</p>

Message ID	Message Text	Explanation
KAPL01047-W	Only one offline request can be registered in a batch job.	<p>Details</p> <p>The offline command cannot be executed because offline processing is already being performed.</p> <p>Action</p> <p>Wait until the offline request registered in the batch job finishes, and then retry.</p>
KAPL01048-W	Help information cannot be found. Operation name = <i>aa...aa</i> .	<p>Details</p> <p>The specified operation is not an operation of the HDLM command.</p> <p><i>aa...aa</i>: Specified operation name</p> <p>Action</p> <p>Use the <code>help</code> operation of the HDLM command (<code>dlnkmgr</code>) to check the operation name. And then retry. For details on the <code>help</code> operation, see help (Displays the Operation Format) on page 6-4.</p>
KAPL01049-I	Would you like to execute the operation? Operation name = <i>aa...aa</i> [y/n]:	<p>Details</p> <p>The <code>clear/set</code> operation will be started. To continue the operation, enter <code>y</code>. To cancel the operation, enter <code>n</code>.</p> <p><i>aa...aa</i>: <code>clear</code> or <code>set</code></p> <p>Action</p> <p>If you want to execute the operation, enter <code>y</code>. If you want to terminate processing, enter <code>n</code>. For details on the <code>clear</code> operation, see clear (Returns the Path Statistics to the Initial Value) on page 6-3. For details on the <code>set</code> operation, see set (Sets Up the Operating Environment) on page 6-16.</p>
KAPL01050-I	The currently selected paths will be changed to the Online status. Is this OK? [y/n]:	<p>Details</p> <p>The <code>online</code> operation will be started. To continue the <code>online</code> operation, enter <code>y</code>. To cancel the operation, enter <code>n</code>.</p> <p>Action</p> <p>If you want to execute <code>online</code> processing, enter <code>y</code>. If you want to terminate processing, enter <code>n</code>. For details on the <code>online</code> operation,</p>

Message ID	Message Text	Explanation
		see online (Places Paths Online) on page 6-11 .
KAPL01051-I	Because no path has been selected among the currently displayed paths, the paths in the Offline(C), Offline(E), and Online(E) statuses will be changed to the Online status. Is this OK? [y/n]:	<p>Details</p> <p>All the paths will be placed Online because the path selection parameter is not specified for the online operation. To place all the paths Online, enter y. To cancel the operation, enter n.</p> <p>Action</p> <p>If you want to execute online processing, enter y. If you want to terminate processing, enter n. Before you execute the processing, be sure to execute the view operation of the HDLM command (dlnkmgr) to check the path status. For details on the view operation, see view (Displays Information) on page 6-33. For details on the online operation, see online (Places Paths Online) on page 6-11.</p>
KAPL01052-I	The currently selected paths will be changed to the Offline(C) status. Is this OK? [y/n]:	<p>Details</p> <p>The offline operation will be started. To continue the offline operation, enter y. To cancel the operation, enter n.</p> <p>Action</p> <p>If you want to execute the offline processing, enter y. If you want to terminate processing, enter n. For details on the offline operation, see offline (Places Paths Offline) on page 6-6.</p>
KAPL01053-I	If you are sure that there would be no problem when the path is placed in the Offline(C) status, enter y. Otherwise, enter n. [y/n]:	<p>Details</p> <p>The offline operation will be started. To continue the offline operation, enter y. To cancel the operation, enter n.</p> <p>Action</p> <p>If you want to execute offline processing, enter y. If you want to terminate processing, enter n. For details on the offline operation, see offline (Places Paths Offline) on page 6-6.</p>
KAPL01054-W	During the offline operation processing of the HDLM	Details

Message ID	Message Text	Explanation
	command, a path that cannot be placed in the Offline(C) status was detected. PathID = aa...aa Would you like to continue the processing of the offline operation? [y/n]:	<p>A path that cannot be set to Offline(C) was detected during multi-path offline processing. To ignore this path and perform offline processing for the next path, enter y. To cancel offline processing, enter n.</p> <p>aa...aa: Path ID (decimal (base-10) number)</p> <p>Action</p> <p>If you want to continue processing the <code>offline</code> operation of the HDLM command for other paths, enter y. If you want to terminate processing, enter n. For details on the <code>offline</code> operation, see offline (Places Paths Offline) on page 6-6.</p>
KAPL01055-I	All the paths which pass the specified aa...aa will be changed to the Offline(C) status. Is this OK? [y/n]:	<p>Details</p> <p>Multiple paths will be collectively set to Offline(C) because the <code>-hba</code> or <code>-cha</code> parameter was specified. To collectively set multiple paths to Offline(C), enter y. To cancel the operation, enter n.</p> <p>aa...aa: CHA port or HBA</p> <p>Action</p> <p>If you want to execute <code>offline</code> processing for the paths that meet the specified requirements, enter y. If you want to terminate processing, enter n.</p>
KAPL01056-I	If you are sure that there would be no problem when all the paths which pass the specified aa...aa are placed in the Offline(C) status, enter y . Otherwise, enter n . [y/n]:	<p>Details</p> <p>This message re-asks the user whether they want to set all the paths to Offline(C). To set all the paths to Offline(C), enter y. To cancel the operation, enter n.</p> <p>aa...aa: CHA port or HBA</p> <p>Action</p> <p>If you want to execute <code>offline</code> processing for the paths that meet the specified requirements, enter y. If you want to terminate processing, enter n.</p>
KAPL01057-I	All the paths which pass the specified aa...aa will be changed to the Online status. Is this OK? [y/n]:	<p>Details</p> <p>Multiple paths will be collectively placed <code>Online</code> because the <code>-hba</code> or <code>-cha</code> parameter has been specified. To continue processing,</p>

Message ID	Message Text	Explanation
		<p>enter y. To cancel processing, enter n.</p> <p>aa...aa: CHA port or HBA</p> <p>Action</p> <p>If you want to execute online processing for the paths that meet the specified requirements, enter y. If you want to terminate processing, enter n.</p>
KAPL01058-W	<p>The specified parameter value is not needed. Operation name = aa...aa, parameter = bb...bb, parameter value = cc...cc</p>	<p>Details</p> <p>A parameter value was specified in a parameter that does not need a parameter value.</p> <p>aa...aa: Specified operation name</p> <p>bb...bb: Parameter name</p> <p>cc...cc: Parameter value</p> <p>Action</p> <p>Execute help operation-name of the HDLM command (dlnkmgr) to check the parameter and parameter value, and then retry. For details on the help operation, see help (Displays the Operation Format) on page 6-4.</p>
KAPL01059-W	<p>Cannot specify the parameter aa...aa at the same time if you specify parameter bb...bb and parameter value cc...cc. Operation name = dd...dd</p>	<p>Details</p> <p>A parameter value is conflicting with the value of another parameter.</p> <p>bb...bb: Parameter name</p> <p>cc...cc: Parameter value</p> <p>aa...aa: Parameter name</p> <p>dd...dd: view or set</p> <p>Action</p> <p>Execute help operation-name of the HDLM command (dlnkmgr) to check the parameter and parameter value, and then retry. For details on the help operation, see help (Displays the Operation Format) on page 6-4.</p>
KAPL01060-I	<p>The user terminated the operation. Operation name = aa...aa</p>	<p>Details</p> <p>Command processing will be aborted because n was entered for a required confirmation.</p> <p>aa...aa: online, offline, set, or clear</p> <p>Action</p>

Message ID	Message Text	Explanation
		None.
KAPL01061-I	<i>aa...aa</i> path(s) were successfully placed <i>bb...bb</i> ; <i>cc...cc</i> path(s) were not. Operation name = <i>dd...dd</i>	<p>Details</p> <p>This message indicates the number of the paths processed in an online/offline operation.</p> <p><i>aa...aa</i>: Number of paths where the online/offline operation was successful (decimal (base-10) number)</p> <p><i>bb...bb</i>: Online, Online(S), Online(D) or Offline(C)</p> <p><i>cc...cc</i>: Number of paths where the online/offline operation was unsuccessful (decimal (base-10) number)</p> <p><i>dd...dd</i>: online or offline</p> <p>Action</p> <p>None. For details on the online operation, see online (Places Paths Online) on page 6-11. For details on the offline operation, see offline (Places Paths Offline) on page 6-6.</p>
KAPL01062-I	<i>aa...aa</i> path(s) were successfully placed Offline(C). The offline request of <i>bb...bb</i> path(s) were registered; <i>cc...cc</i> path(s) were not. Operation name = <i>dd...dd</i>	<p>Details</p> <p>This message indicates the number of paths to be processed when an offline request was registered during reserve processing.</p> <p><i>aa...aa</i>: The number of paths that were successfully taken offline (decimal (base-10) number)</p> <p><i>bb...bb</i>: The number of paths for which offline processing was reserved (decimal (base-10) number)</p> <p><i>cc...cc</i>: The number of paths that were not successfully taken offline (decimal (base-10) number)</p> <p><i>dd...dd</i>: offline</p> <p>Action</p> <p>For batch processing of registering paths, execute the <code>view</code> operation to check the registered paths.</p> <p>For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL01063-I	The target path(s) are already <i>aa...aa</i> .	Details

Message ID	Message Text	Explanation
		<p>As a result of a previous online/offline operation, the specified path has already been set to Online/Online(S)/Online(D)/Offline(C).</p> <p><i>aa...aa</i>: Online, Online(S), Online(D) or Offline(C)</p> <p>Action</p> <p>Use the <code>view</code> operation of the HDLM command (<code>dlnkmgr</code>) to check the status of the path. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33. For details on the online operation, see online (Places Paths Online) on page 6-11. For details on the offline operation, see offline (Places Paths Offline) on page 6-6.</p> <p>For Online(S) or Online(D) paths:</p> <p>To change the status of a path from Online(S) or Online(D) to Online, re-execute the HDLM command using the <code>-hpath</code> parameter.</p>
KAPL01064-W	<p>The information for the specified host device could not be acquired. Operation name = <i>aa...aa</i></p>	<p>Details</p> <p>The host device specified in <code>view -path -hdev</code> cannot currently be accessed.</p> <p><i>aa...aa</i>: <code>view</code></p> <p>Action</p> <ul style="list-style-type: none"> ○ If the specified host device is being formatted, retry after the formatting finishes. ○ If all the paths to the specified host device contain an error, recover them from the path errors, and then retry. ○ In a cluster configuration, if the LU existing for the specified host device is exclusively used by another host, or if the specified host device is allocated to a dynamic disk volume, you cannot view the path information by specifying the host device name. Re-execute the <code>dlnkmgr</code> command's <code>view</code>

Message ID	Message Text	Explanation
		operation without specifying the host device name.
KAPL01065-E	The configuration does not support the simultaneous use of the load balancing and cluster support functions.	<p>Details</p> <p>If a storage system for which persistent reservations are not supported exists among the HDLM-managed storage systems, the load balancing function cannot be used in the cluster environment.</p> <p>Action</p> <p>Make sure that all HDLM-managed storage systems support persistent reservations. Contact your storage system vendor or maintenance company to check whether the storage systems you are using support persistent reservations.</p>
KAPL01068-I	Enter a license key:	<p>Details</p> <p>The license key will now be renewed. Enter a license key.</p> <p>Action</p> <p>None.</p>
KAPL01069-W	The entered license key is invalid.	<p>Details</p> <p>The entered license key is invalid.</p> <p>Action</p> <p>Enter a valid license key.</p>
KAPL01070-E	The entered license key is invalid. Renewal of the license key will now stop.	<p>Details</p> <p>The license key renewal processing will be aborted because an invalid license key was entered three times in a row.</p> <p>Action</p> <p>Obtain a valid license key, and then retry.</p>
KAPL01071-I	The permanent license was installed.	<p>Details</p> <p>The license was renewed and is registered as a permanent license.</p> <p>Action</p> <p>None.</p>
KAPL01072-I	The emergency license was installed. The license expires on <i>aa...aa</i> .	<p>Details</p> <p>A license was renewed and is registered as an emergency license.</p> <p><i>aa...aa</i>: Year (4 digits)/month (01-12)/day (01-31)</p>

Message ID	Message Text	Explanation
		<p>Action</p> <p>Install a permanent license by the expiration day.</p>
KAPL01073-E	The temporary license expired.	<p>Details</p> <p>The temporary license has expired. Register a permanent license.</p> <p>Action</p> <p>Register a permanent license.</p>
KAPL01074-E	The emergency license expired.	<p>Details</p> <p>The emergency license has expired. Register a permanent license.</p> <p>Action</p> <p>Register a permanent license.</p>
KAPL01075-E	A fatal error occurred in HDLM. The system environment is invalid.	<p>Details</p> <p>The license information file is missing.</p> <p>Action</p> <p>Re-install HDLM.</p>
KAPL01076-I	The permanent license has been installed.	<p>Details</p> <p>You do not need to install a license because a permanent license has already been installed.</p> <p>Action</p> <p>None.</p>
KAPL01079-W	The intermittent error monitoring function cannot be set up because automatic failback is disabled.	<p>Details</p> <p>The intermittent error monitoring function cannot be set up because automatic failbacks are disabled.</p> <p>Action</p> <p>Enable automatic failbacks, and then re-execute.</p>
KAPL01080-W	The error monitoring interval and the number of times that the error is to occur conflict with the automatic failback checking interval.	<p>Details</p> <p>An intermittent error cannot be detected by using the values specified for the following: the checking interval for automatic failbacks, the error-monitoring interval, and the number of times the error needs to occur.</p> <p>Action</p> <p>Set the intermittent error-monitoring interval to a value that is equal to or greater than</p>

Message ID	Message Text	Explanation
		<i>(automatic-failback-checking-interval x number-of-times-error-is-to-occur-for-intermittent-error-monitoring).</i>
KAPL01081-E	The license key file is invalid. File name = <i>aa...aa</i>	<p>Details</p> <p>The format of the license key file is invalid.</p> <p><i>aa...aa</i>: Windows-installation-destination-drive-name: \hdml_license</p> <p>Action</p> <p>Store the license key file directly under the Windows installation-destination drive.</p>
KAPL01082-E	There is no installable license key in the license key file. File name = <i>aa...aa</i>	<p>Details</p> <p>There is no useable license key for HDLM in the license key file.</p> <p><i>aa...aa</i>: Windows-installation-destination-drive-name \hdml_license</p> <p>Action</p> <p>Make sure that the license key file is correct, and then re-execute.</p>
KAPL01083-I	There is no license key file. File name = <i>aa...aa</i>	<p>Details</p> <p>There is no license key file in the designated folder:</p> <p><i>aa...aa</i>: Windows-installation-destination-drive-name \hdml_license</p> <p>Action</p> <p>When the message that prompts you to enter the license key is displayed, enter the license key.</p> <p>Alternatively, cancel the HDLM command, store the license key file directly under the Windows installation-destination drive, and then re-execute HDLM command.</p>
KAPL01084-W	An attempt to delete the license key file has failed. File name = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Windows-installation-destination-drive-name \hdml_license</p> <p>Action</p> <p>If a license key file exists, delete it.</p>
KAPL01088-W	The specified parameter values cannot be specified at the same time. Operation name = <i>aa...aa</i> ,	<p>Details</p> <p><i>aa...aa</i>: view</p>

Message ID	Message Text	Explanation
	parameter = <i>bb...bb</i> , parameter values = <i>cc...cc</i>	<p><i>bb...bb</i>: Parameter name <i>cc...cc</i>: Parameter values that cannot be specified at the same time</p> <p>Action</p> <p>Execute <code>help operation-name</code> of the HDLM command (<code>dlinkmgr</code>) to check which parameter can be specified, and then retry. For details on the <code>help</code> operation, see help (Displays the Operation Format) on page 6-4.</p>
KAPL01089-E	One of the following was executed at the same time as an HDLM command set -lic operation: another set -lic operation, or an update of the license for an update installation.	<p>Action</p> <p>Check the license by using the HDLM command's <code>view -sys -lic</code> operation. If necessary, re-execute the HDLM command's <code>set -lic</code> operation. If the same error message is output again, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>Do not perform the following operations:</p> <ul style="list-style-type: none"> ◦ Simultaneously execute the HDLM command's <code>set -lic</code> operation with the <code>view -sys -lic</code> operation. ◦ Execute the HDLM command's <code>set -lic</code> operation while the license for an upgrade or re-installation is being updated.
KAPL01095-E	An attempt to acquire the HDLM version information has failed. details = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Code showing the reason for the error</p> <p>Action</p> <p>Re-execute the command. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, acquire the error information, and then contact your HDLM vendor or the company for which you have a service contract.</p>
KAPL01096-E	An attempt to acquire the Service Pack version information has failed. details = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Code showing the reason for the error</p> <p>Action</p> <p>Re-execute the command. If the same error occurs again, execute</p>

Message ID	Message Text	Explanation
		the DLMgetras utility for collecting HDLM error information, acquire the error information, and then contact your HDLM vendor or the company for which you have a service contract.
KAPL01097-W	All the current trace files will be deleted. Is this OK? [y/n]	<p>Details</p> <p>If you set a value that is less than the current value of the trace file size or number of trace files, all the current trace files will be deleted. To continue the operation, enter <i>y</i>. To cancel the operation, enter <i>n</i>.</p> <p>Action</p> <p>If you want to execute the operation of the HDLM command, enter <i>y</i>. If you want to terminate processing, enter <i>n</i>.</p>
KAPL01098-W	The storage system (<i>aa...aa</i> , <i>bb...bb</i>) cannot perform the <i>cc...cc</i> operation in units of CHA ports.	<p>Details</p> <p>Multiple paths cannot be set to Offline or Online at the same time, via a specific CHA port on the EMC DMX series, EMC CX series, or HP EVA series.</p> <p><i>aa...aa</i>: Vendor ID <i>bb...bb</i>: Product ID <i>cc...cc</i>: offline or online</p> <p>Action</p> <p>Execute the Offline or Online command for each, individual path.</p>
KAPL01100-I	<i>aa...aa</i>	<p>Details</p> <p>This message indicates the executed command line.</p> <p><i>aa...aa</i>: Executed command</p> <p>Action</p> <p>None.</p>
KAPL01101-W	The target HBA port was not found. Operation name = <i>aa...aa</i>	<p>Details</p> <p>The HBA having the HBA port WWN specified in the –hbaportwwn parameter could not be found.</p> <p><i>aa...aa</i>: offline or online</p> <p>Action</p> <p>Use the view operation of the HDLM command (dlnkmgr view –path –hbaportwwn) to check the</p>

Message ID	Message Text	Explanation
		target HBA port WWN. After that, specify the appropriate HBA port WWN, and then retry.
KAPL01102-I	All the paths which pass the specified <i>aa...aa</i> port will be changed to the Offline(C) status. Is this OK? [y/n]:	<p>Details</p> <p>Multiple paths will be collectively placed Offline(C) because the -hbaportwwn parameter was specified. To collectively place multiple paths Offline(C), enter <i>y</i>. To not collectively place them Offline(C), enter <i>n</i>.</p> <p><i>aa...aa</i>: HBA</p> <p>Action</p> <p>If you want to execute the offline processing for the paths which pass the specified target, enter <i>y</i>. If you want to terminate the processing, enter <i>n</i>.</p>
KAPL01103-I	If you are sure that there would be no problem when all the paths which pass the specified <i>aa...aa</i> port are placed in the Offline(C) status, enter <i>y</i> . Otherwise, enter <i>n</i> . [y/n]:	<p>Details</p> <p>This message re-asks the user whether to place all the paths Offline(C). To place all the paths Offline(C), enter <i>y</i>. To not place them Offline(C), enter <i>n</i>.</p> <p><i>aa...aa</i>: HBA</p> <p>Action</p> <p>If you want to execute the offline processing for the paths which pass the specified target, enter <i>y</i>. If you want to terminate the processing, enter <i>n</i>.</p>
KAPL01104-I	All the paths which pass the specified <i>aa...aa</i> port will be changed to the Online status. Is this OK? [y/n]:	<p>Details</p> <p>Multiple paths will be collectively placed Online because the -hbaportwwn parameter was specified. To collectively place multiple paths Online, enter <i>y</i>. To not collectively place them Online, enter <i>n</i>.</p> <p><i>aa...aa</i>: HBA</p> <p>Action</p> <p>If you want to execute the online processing for the paths which pass the specified target, enter <i>y</i>. If you want to terminate the processing, enter <i>n</i>.</p>
KAPL01106-W	One or more connected storage system cannot use the load balancing function.	Action None.

Message ID	Message Text	Explanation
KAPL01107-I	The load balancing type specified for individual LUs will become invalid when this operation is executed. Do you want to execute the operation anyway? Operation name = set [y/n]:	<p>Action</p> <p>If you want to change the load balancing algorithm for the system, enter <i>y</i>. If you want to terminate processing, enter <i>n</i>.</p>
KAPL01112-E	An attempt to connect to the HDLM driver has failed. Operation name = <i>aa...aa</i>	<p>Details</p> <p>HDLM driver information must be collected to execute the given HDLM command, but the HDLM driver cannot be accessed.</p> <p><i>aa...aa</i>: Specified operation name</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL01114-W	The audit log configuration file does not exist. Execute the "dlnkmgr view -sys -audlog" command and check the setting.	<p>Details</p> <p>The audit log configuration file does not exist.</p> <p>Action</p> <p>Execute the <code>dlnkmgr view -sys -audlog</code> command, and then specify the desired setting by using the <code>dlnkmgr set -audlog</code> command.</p>
KAPL01115-W	The audit log configuration file cannot be opened. Execute the "dlnkmgr view -sys -audlog" command and check whether a normal result is displayed.	<p>Details</p> <p>The audit log configuration file cannot be opened.</p> <p>Action</p> <p>If the <code>dlnkmgr view -sys -audlog</code> command does not display a normal result, contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>
KAPL01116-W	The audit log configuration file is invalid. Execute the "dlnkmgr view -sys -audlog" command and check the setting.	<p>Details</p> <p>The audit log configuration file is invalid.</p> <p>Action</p> <p>Execute the <code>dlnkmgr view -sys -audlog</code> command, and then</p>

Message ID	Message Text	Explanation
		specify the desired setting by using the <code>dlnkmgr set -audlog</code> command.
KAPL01117-W	An error occurred during processing to read the audit log configuration file.	<p>Details An internal error occurred while reading the audit log configuration file.</p> <p>Action Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL01118-W	An error occurred during processing to output the audit log configuration file.	<p>Details An internal parameter error when the audit-log data was output.</p> <p>Action Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL01119-W	An error occurred during processing to output the audit log configuration file.	<p>Details An internal parameter error when the audit-log data was output.</p> <p>Action Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL01120-W	A storage system model ID could not be displayed. Details = <i>aa...aa, bb...bb</i>	<p>Details A storage system model ID could not be displayed.</p> <p><i>aa...aa</i>: Storage recognition information</p> <p><i>bb...bb</i>: Error code</p> <p>Action Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL01133-I	<i>aa...aa</i> path(s) were successfully placed <i>bb...bb</i> ; <i>cc...cc</i> path(s) were successfully placed <i>dd...dd</i> ; <i>ee...ee</i> path(s) were not. Operation name = <i>ff...ff</i>	<p>Details The number of paths processed by an online operation is shown.</p> <p><i>aa...aa</i>: The number of paths which changed to the Online status</p>

Message ID	Message Text	Explanation
		<p><i>bb...bb</i>: Online or Online(S) <i>cc...cc</i>: The number of paths which changed to the Online(S) or Online(D) status <i>dd...dd</i>: Online(S), Online(D) or Online(S)/Online(D) <i>ee...ee</i>: The number of paths which failed to change to either the Online, Online(S) or Online(D) status <i>ff...ff</i>: online</p> <p>Action None.</p>
KAPL01134-I	The target paths are already Online or Online(S).	<p>Details The specified paths are already in the Online or Online(S) status as a result of an online operation.</p> <p>Action Check path status by using the <code>view</code> operation.. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p> <p>For Online(S) paths: To change the status of a path from Online(S) to Online, re-execute the HDLM command using the <code>-hpath</code> parameter.</p>
KAPL01154-W	The dynamic I/O path control function is already set to <i>aa...aa</i> for the system.	<p>Details <i>aa...aa</i>: "on" or "off"</p> <p>Action Use the <code>view</code> operation of the HDLM command (<code>dlkmgr</code>) to check the setting for the host, storage, and LUs. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL01155-W	The dynamic I/O path control function is already set to <i>aa...aa</i> for storage.	<p>Details <i>aa...aa</i>: "on" or "off"</p> <p>Action Use the <code>view</code> operation of the HDLM command (<code>dlkmgr</code>) to check the setting for storage. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>

Message ID	Message Text	Explanation
KAPL01156-I	The dynamic I/O path control function was set to <i>aa...aa</i> for storage.	<p>Details <i>aa...aa</i>: "on" or "off"</p> <p>Action</p> <p>Use the view operation of the HDLM command (dlnkmgr) to check the setting for storage and LUs. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL01157-I	The dynamic I/O path control function was set to <i>aa...aa</i> for the system.	<p>Details <i>aa...aa</i>: "on" or "off"</p> <p>Action</p> <p>Use the view operation of the HDLM command (dlnkmgr) to check the setting for the host, storage, and LUs. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL01158-E	Dynamic I/O path control cannot be applied to the specified storage.	<p>Action</p> <p>Use the view operation of the HDLM command (dlnkmgr) to check the path ID. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL01160-W	The path configuration was not changed.	<p>Details</p> <p>This message indicates that no paths were deleted.</p> <p>Action</p> <ul style="list-style-type: none"> ○ Check whether the paths to be deleted have been disconnected from the system. ○ Check whether the paths to be deleted are in the Offline(C) status. ○ Use the <code>view</code> operation of the HDLM command (dlnkmgr) to check whether the paths have already been deleted from HDLM.
KAPL01161-I	This operation will change the path configuration. Do you want to continue? [y/n]:	<p>Details</p> <p>This message confirms whether to perform a path configuration change by using a <code>delete</code> operation.</p> <p>Action</p>

Message ID	Message Text	Explanation
		Enter y to change the path configuration, or enter n to cancel the operation.
KAPL01163-E	The path configuration change failed. (details = <i>aa...aa</i>)	<p>Details This message indicates that a delete operation failed. <i>aa...aa</i>: code indicating the content of the error</p> <p>Action Execute the DLMgetras utility for collecting HDLM error information, and then contact your HDLM vendor or, if you have a maintenance contract for HDLM, the maintenance company.</p>
KAPL01164-I	Paths were deleted. (number of paths deleted = <i>aa...aa</i> , completion time = <i>bb...bb</i>)	<p>Details This message indicates that a delete operation succeeded. <i>aa...aa</i>: number of paths deleted <i>bb...bb</i>: year (4 digits)/month/date hour:minute:second</p> <p>Action Use the <code>view</code> operation of the HDLM command (dlnkmgr) to verify that the paths were deleted.</p>
KAPL01165-I	A path was deleted. (path ID = <i>aa...aa</i> , storage = <i>bb...bb</i> , iLU = <i>cc...cc</i>)	<p>Details This message displays information about a path deleted as the result of a delete operation. <i>aa...aa</i>: path ID of the deleted path <i>bb...bb</i>: storage (vendor ID.product ID.serial number) to which the deleted path was connected <i>cc...cc</i>: LU number to which the deleted path was connected</p> <p>Action Use the <code>view</code> operation of the HDLM command (dlnkmgr) to verify that the paths were deleted.</p>
KAPL01166-I	If you execute this operation, the specified number of times that the same path can be used for individual LUs will become invalid. Do you want to execute the operation anyway? Operation name = set [y/n]:	The specified number of times that the same path can be used for individual LUs will become invalid. To continue the operation, enter y . To cancel the operation, enter n .

Message ID	Message Text	Explanation
		<p>Action</p> <p>If you want to change the number of times that the same path can be used for the system, enter y. To cancel the operation, enter n.</p>
KAPL01167-I	All paths will be set to Online or Online(D) . Is this OK? [y/n]:	<p>Details</p> <p>All paths will be set to Online or Online(D) because no path is specified. To continue, enter y. To cancel the operation, enter n.</p> <p>Action</p> <p>To set all paths to Online or Online(D), enter y. To cancel the operation, enter n. Before you execute the processing, you must check the path status by executing the view operation of the HDLM command <code>dlnkmgr</code>.</p>
KAPL01168-I	All P-VOL paths that are connected to the LU that has the specified path ID will be set to Online(D) . Is this OK? [y/n]:	<p>Details</p> <p>All paths for each specified LU will be set to Online or Online(D). To continue, enter y. To cancel the operation, enter n.</p> <p>Note: All paths of the LU, including non-P-VOL paths, will be set to Online or Online(D).</p> <p>Action</p> <p>To set to Online or Online(D) all paths that are connected to the LU that has the specified path ID, enter y. To cancel the process, enter n.</p>
KAPL01169-I	All Online(S) or Online(D) paths will be set to Online . Is this OK? [y/n]:	<p>Details</p> <p>All paths in the Online(S) or Online(D) status will be set to Online because no path is specified. To continue, enter y. To cancel the operation, enter n.</p> <p>Action</p> <p>To execute online processing, enter y. To cancel the operation, enter n. Before you execute the processing, you must check the path status by executing the view operation of the HDLM command <code>dlnkmgr</code>.</p>
KAPL01170-I	All Online(S) or Online(D) paths that are connected to the	<p>Details</p> <p>All paths in the Online(S) or Online(D) status for each</p>

Message ID	Message Text	Explanation
	LU that has the specified path ID will be set to Online. Is this OK? [y/n]:	<p>specified LU will be set to Online. To continue, enter y. To cancel the operation, enter n.</p> <p>Action</p> <p>To set to online the all Online(S) or Online(D) paths that are connected to the specified LU with path ID, enter y. To cancel the operation, enter n.</p>
KAPL01171-I	The target paths are already <i>aa...aa</i> or <i>bb...bb</i> .	<p>Details</p> <p>The specified paths are already in the Online, Online(S), or Online(D) status as a result of an online operation.</p> <p><i>aa...aa</i>: Online or Online(S) <i>bb...bb</i>: Online(D) or Online(S)/Online(D)</p> <p>Action</p> <p>Check path status by using the view operation. For Online(S) or Online(D) paths: To change the status of a path from Online(S) or Online(D) to Online, re-execute the HDLM command with the -hapath parameter specified.</p>
KAPL01172-I	There are no Online(S)/Online(D) paths among the target paths.	<p>Details</p> <p>An online operation was executed using the -hapath parameter, but there are no paths with the Online(S)/Online(D) status among the specified paths.</p> <p>Action</p> <p>Use the view operation of the HDLM command (dlnkmgr) to check the status of the path.</p>
KAPL01173-W	The target CHA port was constructed from multiple physical CHA ports. Operation name = <i>aa...aa</i> . Specify a physical CHA port by using the "-cha -pathid" parameter.	<p>Details</p> <p>In an environment where storage systems are virtualized, when you specify a CHA port by using the -chaid parameter of the offline or online operation, the CHA port might be constructed from multiple CHA ports of the physical storage system. In such a case, you cannot execute the offline or online operation with the -chaid parameter specified.</p> <p><i>aa...aa</i>: offline or Online</p> <p>Action</p>

Message ID	Message Text	Explanation
		Specify a physical CHA port by using the <code>-cha -pathid</code> parameter, and then re-execute the <code>offline</code> or <code>online</code> operation.
KAPL01174-W	If the Physical Storage View is disabled, the parameter value <code>aa...aa</code> cannot be specified for the <code>-item</code> parameter.	<p>Details</p> <p>If the Physical Storage View is disabled, the parameter value shown cannot be specified.</p> <p><code>aa...aa</code>: <code>virt</code></p> <p>Action</p> <p>When specifying virtual storage information as a display item, enable the Physical Storage View.</p>
KAPL01175-W	If the Physical Storage View is enabled, the parameter value <code>aa...aa</code> cannot be specified for the <code>-item</code> parameter.	<p>Details</p> <p>If the Physical Storage View is enabled, the parameter value shown cannot be specified.</p> <p><code>aa...aa</code>: <code>phys, vid, ha, or hastat</code></p> <p>Action</p> <p>When specifying physical storage information as a display item, disable the Physical Storage View.</p>
KAPL01176-I	Some of the target paths are in the offline status. Storage system settings are not refreshed for offline paths.	<p>Details</p> <p>HDLM cannot refresh storage system settings for offline paths, because HDLM cannot acquire the settings.</p> <p>Action</p> <p>Place online the paths for which HDLM will refresh storage system settings, and execute the refresh operation.</p>
KAPL01177-W	HDLM failed to acquire storage system settings for some paths.	<p>Details</p> <p>HDLM failed to acquire storage system settings for some paths.</p> <p>Action</p> <p>If this message is output when path errors occur during a refresh operation, recover from the path errors, place the paths online, and then re-execute the refresh operation. If this message is output when there are no offline paths, execute the <code>DLMgetras</code> utility to collect error information, and then contact your vendor or maintenance company.</p>

Message ID	Message Text	Explanation
KAPL01178-E	HDLM failed to refresh the storage system settings. Details = aa...aa, bb...bb	<p>Details <i>aa...aa</i>: Detailed information 1 <i>bb...bb</i>: Detailed information 2</p> <p>Action Execute the DLMgetras utility to collect error information, and then contact your vendor or maintenance company.</p>

KAPL02001 to KAPL03000

Message ID	Message Text	Explanation
KAPL02001-I	HDLM GUI has started normally. java.version = aa...aa	<p>Details <i>aa...aa</i>: Version</p> <p>Action None.</p>
KAPL02002-I	HDLM GUI has terminated.	<p>Action None.</p>
KAPL02003-E	You lack permission to start HDLM GUI.	<p>Action Execute the command as a user with Administrators group permissions or as an Administrator.</p>
KAPL02004-E	An error occurred during internal processing of HDLM GUI. HDLM GUI cannot start. Details = aa...aa	<p>Details During the GUI startup, an error occurred that might not be a result of a user operation.</p> <p><i>aa...aa</i>: Failed API name:</p> <ul style="list-style-type: none"> ○ JHSPGetPathBy ○ JHSPGetManagerStatus ○ JHSPGetDriverStatus ○ JHSPGetADriverStatus ○ JHSPVerifyAuthorization <p>Action Execute the DLMgetras utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the DLMgetras utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>

Message ID	Message Text	Explanation
KAPL02005-E	An attempt to start HDLM GUI has failed due to insufficient memory.	<p>Details</p> <p>There is not enough memory to use the HDLM GUI.</p> <p>Action</p> <p>Terminate unnecessary applications to increase the amount of free memory, or restart the host.</p>
KAPL02006-W	No path was detected.	<p>Details</p> <p>The target path could not be found.</p> <p>Action</p> <p>Set up a path between the host and storage system, and then restart the host.</p>
KAPL02007-E	The HDLM manager could not be connected. The <i>aa...aa</i> operation has been stopped.	<p>Details</p> <p>The system could not access the HDLM manager when the Option window was started up or the Set Option Information operation was executed.</p> <p><i>aa...aa</i>: Get Option Information or Set Option Information</p> <p>Action</p> <p>Execute the <code>view</code> operation of the HDLM command (<code>dlnkmgr</code>) to check whether the HDLM manager has started. If the HDLM manager has not started, start the HDLM manager, and then restart the HDLM GUI. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL02011-I	Would you like to execute the <i>aa...aa</i> operation? [OK/Cancel]	<p>Details</p> <p>This is a confirmation for execution. If you want to execute the operation, click OK. To cancel the operation, click Cancel.</p> <p><i>aa...aa</i>: Clear Data</p> <p>Action</p> <p>If you want to execute the operation, click OK. To cancel the operation, click Cancel.</p>
KAPL02012-I	<i>aa...aa</i> has started.	<p>Details</p> <p><i>aa...aa</i>: Operation (character string)</p> <ul style="list-style-type: none"> ◦ Export CSV ◦ Set Option Information

Message ID	Message Text	Explanation
		<ul style="list-style-type: none"> ○ Refresh ○ Online ○ Offline ○ Clear Data ○ Refresh of the GAD non-preferred path option settings <p>Action None.</p>
KAPL02013-I	<i>aa...aa</i> has completed successfully.	<p>Details</p> <p><i>aa...aa</i>: Operation (character string)</p> <ul style="list-style-type: none"> ○ Export CSV ○ Define Option Information ○ Refresh ○ Clear Data ○ Refresh of the GAD non-preferred path option settings <p>Action None.</p>
KAPL02014-W	No data has been input in <i>aa...aa</i> .	<p>Details</p> <p>Nothing has been entered into the input field of the Option window.</p> <p><i>aa...aa</i>: Input item (character string)</p> <ul style="list-style-type: none"> ○ Path Health Checking Interval ○ Auto Failback Checking Interval ○ Error Log File Size ○ Monitoring Interval ○ Number of times ○ Error Log Number of Files ○ Trace File Size ○ Trace Number of Files <p>Action Data has not been input for the specified item. See the HDLM GUI Help to specify a number within the valid range.</p>
KAPL02015-W	A value which is not a number has been input in <i>aa...aa</i> .	<p>Details</p> <p>A character other than a numeric character has been entered in the input field of the Option window.</p>

Message ID	Message Text	Explanation
		<p><i>aa...aa</i>: Input item (character string)</p> <ul style="list-style-type: none"> ○ Path Health Checking Interval ○ Auto Failback Checking Interval ○ Error Log File Size ○ Monitoring Interval ○ Number of times ○ Error Log Number of Files ○ Trace File Size ○ Trace Number of Files <p>Action</p> <p>Specify a number for the item.</p>
KAPL02016-W	A value which is outside of the valid range has been input in <i>aa...aa</i> .	<p>Details</p> <p>The entered value for the input field of the Option window is not within the valid range.</p> <p><i>aa...aa</i>: Input item (character string)</p> <ul style="list-style-type: none"> ○ Path Health Checking Interval ○ Auto Failback Checking Interval ○ Error Log File Size ○ Monitoring Interval ○ Number of times ○ Error Log Number of Files ○ Trace File Size ○ Trace Number of Files <p>Action</p> <p>See the HDLM GUI Help to specify a number within the valid range.</p>
KAPL02017-I	The currently selected paths will be changed to the Online status. Is this OK? [OK/Cancel]	<p>Details</p> <p>The currently selected paths will be changed to the Online status. If you want to continue, click OK. If you do not want to proceed, click Cancel.</p> <p>Action</p> <p>If you want to execute online processing, click OK. To cancel online processing, click Cancel.</p>
KAPL02018-I	Because no path has been selected among the currently	<p>Details</p> <p>Among the currently displayed paths, the paths that are not</p>

Message ID	Message Text	Explanation
	displayed paths, the paths in the Offline(C), Offline(E), and Online(E) statuses will be changed to the Online status. Is this OK? [OK/Cancel]	<p>online will be changed to the Online status. If you want to continue, click OK. If you do not want to proceed, click Cancel.</p> <p>Action</p> <p>If you want to execute online processing, click OK. To cancel online processing, click Cancel.</p>
KAPL02019-I	The currently selected paths will be changed to the Offline(C) status. Is this OK? [OK/Cancel]	<p>Details</p> <p>The currently selected paths will be changed to the Offline (C) status. If you want to continue, click OK. If you do not want to proceed, click Cancel.</p> <p>Action</p> <p>If you want to execute offline processing, click OK. To cancel offline processing, click Cancel.</p>
KAPL02020-I	If you are sure that there would be no problem when the path is placed in the Offline(C) status, click OK. Otherwise, click Cancel. [OK/Cancel]	<p>Details</p> <p>This is a confirmation to check whether you really want to change the selected path(s) to the Offline (C) status. If you want to continue, click OK. If you do not want to proceed, click Cancel.</p> <p>Action</p> <p>If you want to execute offline processing, click OK. To cancel offline processing, click Cancel.</p>
KAPL02021-I	<i>aa...aa</i> path(s) were successfully placed <i>bb...bb</i> . <i>cc...cc</i> path(s) could not be placed <i>bb...bb</i> .	<p>Details</p> <p>The online/offline processing has completed.</p> <p><i>aa...aa</i>: Number of paths successfully processed (decimal (base-10) number)</p> <p><i>bb...bb</i>: Online or Offline</p> <p><i>cc...cc</i>: Number of failed paths (decimal (base-10) number)</p> <p>Action</p> <p>For the path ID of a path for which online/offline processing failed, see the operation log.</p>
KAPL02022-W	A path that cannot be placed in the Online status has been detected. PathID = <i>aa...aa</i> Would you like to continue the Online processing? [OK/Cancel]:	<p>Details</p> <p>While online processing was being performed for multiple paths, at least one path that could not be changed to Online was detected. If you want to ignore the path and</p>

Message ID	Message Text	Explanation
		<p>continue, click OK. To cancel the operation, click Cancel. <i>aa...aa</i>: Path ID (decimal (base-10) number)</p> <p>Action</p> <p>If you want to continue online processing, click OK. To cancel online processing, click Cancel. For the paths in which online processing failed, correct the problem, and then re-execute online processing.</p>
KAPL02023-W	<p>A path that cannot be placed in the Offline(C) status has been detected. PathID = <i>aa...aa</i> Would you like to continue the Offline processing? [OK/Cancel]:</p>	<p>Details</p> <p>While offline processing was being performed for multiple paths, at least one path that could not be changed to Offline(C) was detected. If you want to ignore the path and continue, click OK. To cancel the operation, click Cancel.</p> <p><i>aa...aa</i>: Path ID (decimal (base-10) number)</p> <p>Action</p> <p>If you want to continue offline processing, click OK. To cancel offline processing, click Cancel. For paths that cannot be processed, do the following:</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL02026-W	<p>The target path of the <i>aa...aa</i> operation could not be found.</p>	<p>Details</p> <p>The target path of the operation could not be found.</p> <p><i>aa...aa</i>: Operation (character string)</p> <ul style="list-style-type: none"> ○ Online ○ Clear Data ○ Export CSV ○ Get Path Information ○ Refresh

Message ID	Message Text	Explanation
		<ul style="list-style-type: none"> Refresh of the GAD non-preferred path option settings <p>Action</p> <p>Click Refresh to update the contents of the view operation, check the path status, and then retry.</p>
KAPL02027-E	The last Online path or Online(E) path to the LU cannot be placed in the Offline(C) status. PathID = aa...aa	<p>Details</p> <p>The path specified for offline processing cannot be placed Offline(C) because it is the last, remaining path connected to the LU.</p> <p>aa...aa: Path ID (decimal (base-10) number)</p> <p>Action</p> <p>Click Refresh to update the contents of the view operation, check the path status, and then retry.</p>
KAPL02028-W	You lack write permission for the aa...aa.	<p>Details</p> <p>You do not have write permission for the specified CSV file.</p> <p>aa...aa: Output CSV file name</p> <p>Action</p> <p>Check whether you have access permission for the specified file and whether the specified file name is correct.</p>
KAPL02029-E	An error occurred during internal processing of the HDLM GUI. The aa...aa operation has been stopped. Details = bb...bb	<p>Details</p> <p>During GUI processing, an error occurred that was probably not a result of a user operation.</p> <p>aa...aa: Internal processing name (character string)</p> <ul style="list-style-type: none"> Get Option Information Set Option Information Online Offline Get Path Information Refresh Clear Data Get HDLM Manager Status Get HDLM Driver Status Get HDLM Alert Driver Status

Message ID	Message Text	Explanation
		<ul style="list-style-type: none"> ○ Refresh of the GAD non-preferred path option settings <p><i>bb...bb:</i> Issuing API name (character string)</p> <ul style="list-style-type: none"> ○ JHSPGetOption ○ JHSPSetOption ○ JHSPOnlinePath ○ JHSPOfflinePath ○ JHSPGetPathBy ○ JHSPClearStatistics ○ JHSPGetManagerStatus ○ JHSPGetDriverStatus ○ JHSPGetADriverStatus ○ JHSPGetClusterService ○ JHSPRefreshGADInfo <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <i>DLMgetras Utility for Collecting HDLM Error Information</i> on page 7-2.</p>
KAPL02032-E	The <i>aa...aa</i> operation cannot be executed because the amount of memory is insufficient.	<p>Details</p> <p>There was not enough memory to use the HDLM GUI.</p> <p><i>aa...aa:</i> Internal processing names (character string)</p> <ul style="list-style-type: none"> ○ Export CSV ○ Online ○ Offline ○ Get Path Information ○ Refresh ○ Clear Data ○ Get Option Information ○ Set Option Information ○ Get HDLM Manager Status ○ Get HDLM Driver Status ○ Get HDLM Alert Driver Status

Message ID	Message Text	Explanation
		<ul style="list-style-type: none"> ○ Refresh of the GAD non-preferred path option settings <p>Action</p> <p>Terminate unnecessary applications to increase the amount of free memory, or restart the host.</p>
KAPL02033-E	An unexpected error occurred, and the <i>aa...aa</i> operation has been stopped.	<p>Details</p> <p>An exception occurred during HDLM GUI processing.</p> <p><i>aa...aa</i>: Internal processing names (character string)</p> <ul style="list-style-type: none"> ○ Export CSV ○ Get Path Information ○ Refresh ○ Online ○ Offline ○ Clear Data ○ Get Option Information ○ Set Option Information ○ Get HDLM Manager Status ○ Get HDLM Driver Status ○ Get HDLM Alert Driver Status ○ Refresh of the GAD non-preferred path option settings <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL02040-E	The Offline(C) path cannot be placed Online. PathID = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Path ID (decimal (base-10) number)</p> <p>Action</p> <p>Remove the error in the path, and then retry.</p>

Message ID	Message Text	Explanation
KAPL02041-W	The cluster support function is active, so the load balancing function is not supported.	<p>Details</p> <p>The load balancing function cannot be enabled because MSCS is installed.</p> <p>Action</p> <p>The load balancing function is not supported in an environment where MSCS is installed. If you want to use the load balancing function, remove MSCS.</p>
KAPL02042-E	An unexpected error occurred. The HDLM GUI cannot start.	<p>Details</p> <p>An exception occurred when starting up the HDLM GUI.</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL02043-E	The target path of the <i>aa...aa</i> operation could not be found. PathID = <i>bb...bb</i>	<p>Details</p> <p>The target path of the operation could not be found.</p> <p><i>aa...aa</i>: Online or Offline <i>bb...bb</i>: The Path ID to which the operation was attempted (decimal (base-10) number)</p> <p>Action</p> <p>Click Refresh to update the contents of the <code>view</code> operation, check the path status, and then retry.</p>
KAPL02044-W	<i>aa...aa</i> exists already. Do you want to overwrite it? [OK/Cancel]	<p>Details</p> <p>The existing file will be overwritten. To continue, click OK. Otherwise, click Cancel.</p> <p><i>aa...aa</i>: File name</p> <p>Action</p> <p>To overwrite the existing file, click OK. Otherwise, click Cancel.</p>
KAPL02052-W	The HDLM manager could not be connected.	<p>Details</p> <p>The HDLM manager could not be accessed when the HDLM GUI was started.</p>

Message ID	Message Text	Explanation
		<p>Action</p> <p>Execute the <code>view</code> operation of the HDLM command (<code>dlnkmgr</code>) to check whether the HDLM manager has started. If the HDLM manager has not started, start the HDLM manager and then restart the HDLM GUI. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33.</p>
KAPL02053-I	Would you like to terminate the HDLM GUI? [OK/Cancel]	<p>Action</p> <p>If you want to terminate the HDLM GUI, click OK. If you do not want to terminate the HDLM GUI, click Cancel.</p>
KAPL02054-I	<p><i>aa...aa</i> path(s) were successfully placed Offline(C). The Offline request of <i>bb...bb</i> path(s) were registered. <i>cc...cc</i> path(s) could not be placed Offline(C).</p>	<p>Details</p> <p>This message indicates the number of paths to be processed when an offline request was registered during reserve processing.</p> <p><i>aa...aa</i>: The number of paths that were successfully taken offline (decimal (base-10) number)</p> <p><i>bb...bb</i>: The number of paths registered in the offline request (decimal (base-10) number)</p> <p><i>cc...cc</i>: The number of paths that were not successfully taken offline (decimal (base-10) number)</p> <p>Action</p> <p>For the Path IDs of any failed paths, see the operation log. Click Refresh to view any paths that were registered together as a batch job.</p>
KAPL02055-I	The target path(s) are already <i>aa...aa</i> .	<p>Details</p> <p>The specified paths are already Online/Offline (C), as a result of the online/offline operation that was just executed.</p> <p><i>aa...aa</i>: Online or Offline (C)</p> <p>Action</p> <p>Click Refresh to check the status of the path.</p>
KAPL02058-E	The configuration does not support the simultaneous use of the load balancing and cluster support functions.	<p>Details</p> <p>If a storage system for which persistent reservations are not supported exists among the HDLM-managed storage systems,</p>

Message ID	Message Text	Explanation
		<p>the load balancing function cannot be used in the cluster environment.</p> <p>Action</p> <p>Make sure that all HDLM-managed storage systems support persistent reservations. Contact your storage system vendor or maintenance company to check whether the storage systems you are using support persistent reservations.</p>
KAPL02061-W	The getting PathInformation has been stopped because the path configuration was changed during HDLM GUI startup processing.	<p>Details</p> <p>The path information could not be acquired because the path configuration was changed when the HDLM GUI was started.</p> <p>Action</p> <p>After confirming that the paths are not currently being reconfigured, click the Refresh button.</p>
KAPL02062-E	The Refresh operation has been stopped because the configuration of paths was changed during the processing of the Refresh operation.	<p>Details</p> <p>The path information could not be acquired because the path configuration was changed when the system was refreshed.</p> <p>Action</p> <p>After confirming that the paths are not currently being reconfigured, click the Refresh button.</p>
KAPL02063-W	The version number cannot be displayed.	<p>Details</p> <p>The version number could not be acquired because an attempt to read a parameter file, which starts up the HDLM GUI, failed.</p> <p>Action</p> <p>The version number cannot be displayed, but HDLM GUI operations can be executed. If you want to display the version number, reinstall HDLM.</p>
KAPL02064-W	The error monitoring interval and the number of times that the error is to occur conflict with the automatic fallback checking interval.	<p>Details</p> <p>An intermittent error cannot be detected by using the values specified for the following: the checking interval for automatic fallbacks, the error-monitoring</p>

Message ID	Message Text	Explanation
		<p>interval, and the number of times the error needs to occur.</p> <p>Action</p> <p>Set the intermittent error-monitoring interval to a value that is equal to or greater than <i>(automatic-failback-checking-interval x number-of-times-error-is-to-occur-for-intermittent-error-monitoring)</i>.</p>
KAPL02065-W	The getting PathInformation has been stopped because the configuration of paths was changed during the processing of the getting PathInformation.	<p>Details</p> <p>Updated path information could not be acquired because the path configuration was changed after an Offline, Online, or Clear Data operation was performed.</p> <p>Action</p> <p>After confirming that the paths are not currently being reconfigured, click the Refresh button.</p>
KAPL02076-W	An attempt to acquire the HDLM version information failed. Details = <i>aa...aa</i>	<p>Details</p> <p>The HDLM version information could not be acquired.</p> <p><i>aa...aa</i>: Code showing the reason for the error</p> <p>Action</p> <p>Re-execute the command. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>
KAPL02077-W	An attempt to acquire the Service Pack version information failed. Details = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Code showing the reason for the error</p> <p>Action</p> <p>Re-execute the command. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>
KAPL02080-W	All the current trace files will be deleted. Is this OK? [OK/Cancel]	<p>Details</p> <p>If you choose a value that is less than the current value of the trace file size or number of trace files, all the current trace files will be</p>

Message ID	Message Text	Explanation
		<p>deleted. To continue the operation, click OK. To cancel the operation, click Cancel.</p> <p>Action</p> <p>If you want to execute the operation, click OK. To cancel the operation, click Cancel.</p>
KAPL02083-I	HDLM GUI is started by the user-specified JRE. <i>aa...aa</i> , <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: The user-specified JRE version (character string) <i>bb...bb</i>: Vendor who provided the user-specified JRE (character string)</p> <p>Action</p> <p>None.</p>
KAPL02084-E	An error occurred in HDLM GUI startup processing. HDLM GUI cannot start. Details = <i>aa...aa bb...bb cc...cc</i>	<p>Details</p> <p>During the GUI startup, an error occurred that was probably not a result of a user operation.</p> <p><i>aa...aa</i>: Executed function name (character string) <i>bb...bb</i>: Return value of function (decimal (base-10) number) <i>cc...cc</i>: Information detailing where the failure occurred (character string)</p> <p>Action</p> <p>Re-execute the command. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>
KAPL02087-I	"Configuration View" is not supported for this storage system model. Please use the "Path List View" instead. Storage = <i>aa...aa</i>	<p>Details</p> <p>"Configuration View" cannot be displayed for the selected storage system because "Configuration View" cannot be displayed in the HDLM GUI.</p> <p><i>aa...aa</i>: Name of the storage system</p> <p>Action</p> <p>Please use the "Path List View".</p>
KAPL02089-E	The HDLM GUI cannot start because a JRE is not installed in <i>aa...aa</i> . Re-install HDLM, or install a JRE by referring to the	<p>Details</p> <p>The HDLM GUI cannot start because a JRE is not installed on the system.</p>

Message ID	Message Text	Explanation
	JRE installation instructions in the user's guide.	<p><i>aa...aa</i>: jre_user folder</p> <p>Action</p> <p>Re-install HDLM, or install a JRE. For details on the JRE installation instructions, see Installing JRE on page 3-68.</p>
KAPL02094-W	<p>Specifying 0 for <i>aa...aa</i> is the same as disabling load balancing.</p> <p>Is this OK? [OK / Cancel]</p>	<p>Details</p> <p>Specifying 0 for the number of times the same path can be used for load balancing is the same as disabling load balancing.</p> <p>If you want to continue, click OK. If you do not want to proceed, click Cancel.</p> <p>Note:</p> <p>For extended load balancing, specifying 0 for the number of times the same path can be used for extended load balancing for both sequential and random I/O is the same as disabling load balancing.</p> <p><i>aa...aa</i>: Input item (character string)</p> <ul style="list-style-type: none"> ○ Number of times the same path can be used for load balancing ○ Number of times the same path can be used for extended load balancing <p>Action</p> <p>If you want to execute the operation, click OK. To cancel the operation, click Cancel.</p>
KAPL02097-I	Path type will be refreshed according to the <i>aa...aa</i> settings. This processing might take several minutes.	<p>Details</p> <p>This is a confirmation for execution. If you want to execute the operation, click OK. To cancel the operation, click Cancel.</p> <p><i>aa...aa</i>: GAD non-preferred path option</p> <p>Action</p> <p>If you want to execute the operation, click OK. To cancel the operation, click Cancel.</p>
KAPL02098-W	HDLM failed to acquire storage system settings for some paths.	<p>Details</p> <p>HDLM failed to acquire storage system settings for some paths.</p> <p>Action</p>

Message ID	Message Text	Explanation
		<p>If this message is output when path errors occur during the operation, recover from the path errors, place the paths online, and then re-execute the operation. If this message is output when there are no offline paths, execute the DLMgetras utility to collect error information, and then contact your vendor or maintenance company. For details on the DLMgetras utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL02099-I	Some of the target paths are in the offline status. <i>aa...aa</i> settings are not refreshed for offline paths.	<p>Details</p> <p>HDLM cannot refresh storage system settings for offline paths, because HDLM cannot acquire the settings.</p> <p><i>aa...aa</i>: GAD non-preferred path option</p> <p>Action</p> <p>Place online the paths for which HDLM will refresh storage system settings, and execute the operation.</p>
KAPL02200-I	GUI information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for resolving problems.</p> <p><i>aa...aa</i>: Trace information</p> <p>Action</p> <p>None.</p>

KAPL03001 to KAPL04000

Message ID	Message Text	Explanation
KAPL03001-I	HDLM API information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for resolving problems.</p> <p><i>aa...aa</i>: Trace information</p> <p>Action</p> <p>None.</p>
KAPL03002-W	HDLM API Warning - <i>aa...aa</i>	<p>Details</p> <p>This information is required for resolving problems.</p>

Message ID	Message Text	Explanation
		<p><i>aa...aa</i>: API trace information</p> <p>Action</p> <p>Refer to the contents of the warning.</p>
KAPL03003-E	HDLM API Error information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for resolving problems.</p> <p><i>aa...aa</i>: API trace error information</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL03004-C	A critical error occurred in the HDLM API. (<i>aa...aa</i>)	<p>Details</p> <p>This information is required for resolving problems.</p> <p><i>aa...aa</i>: API trace error information</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL03006-E	An access to the HDLM driver causes an error. (<i>aa...aa</i>)	<p>Details</p> <p>This information is required for resolving problems.</p> <p><i>aa...aa</i>: API trace error information</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting</p>

Message ID	Message Text	Explanation
		HDLM Error Information on page 7-2.
KAPL03007-E	An error occurred during communication with the HDLM manager. (aa...aa)	<p>Details</p> <p>This information is required for resolving problems.</p> <p>aa...aa: API trace error information</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL03008-E	An error occurred during log input to the HDLM alert driver. (aa...aa)	<p>Details</p> <p>This information is required for resolving problems.</p> <p>aa...aa: API trace error information</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL03999-E	An unexpected error occurred.	<p>Details</p> <p>Conflicting versions of HDLM modules are being used.</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>

KAPL04001 to KAPL05000

Message ID	Message Text	Explanation
KAPL04001-I	HDLM manager started.	Action None.
KAPL04002-E	Could not start the HDLM manager.	Details The HDLM manager failed to start because the current environment is unsuitable for the HDLM manager to run in. Action Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2 .
KAPL04003-E	The startup parameter is invalid.	Details The HDLM manager internal parameter is invalid. Action Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2 .
KAPL04004-I	HDLM manager will now terminate.	Action None.
KAPL04005-E	Cannot connect the service control manager.	Details HDLM manager could not start normally because it was unable to connect the service control manager. Action The HDLM manager starts as a service and as such, to start HDLM from the command line, use the <code>net start DLMManager</code> command.

Message ID	Message Text	Explanation
KAPL04006-E	Cannot register the service control handler function. Return value = <i>aa...aa</i>	<p>Details</p> <p>HDLM manager could not start normally because it was unable to register the service control handler function.</p> <p><i>aa...aa</i>: OS error code</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL04007-E	Cannot register the service status. Return value = <i>aa...aa</i>	<p>Details</p> <p>HDLM manager could not start normally because it was unable to register the service status.</p> <p><i>aa...aa</i>: OS error code</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL04008-E	Cannot open the option definition file (<i>aa...aa</i>).	<p>Details</p> <p>HDLM manager could not start normally because it was unable to open the option definition file.</p> <p><i>aa...aa</i>: Option definition file name</p> <p>Action</p> <p>Check whether another program is currently using this file (for example, the file is being opened in a text editor), or whether the file has been inadvertently deleted.</p>
KAPL04009-E	The option definition is invalid.	<p>Details</p> <p>HDLM manager could not start normally because some of the definitions in the option definition file were invalid.</p> <p>Action</p> <p>If the KAPL04033-W message is output after this message, execute the <code>dlnkmgr view -sys -sfunc</code> command, and then check the option settings.</p> <p>Use the <code>dlnkmgr set</code> operation to return options settings back to where you had them.</p> <p>If the KAPL04033-W message is not output, restart HDLM manager.</p>

Message ID	Message Text	Explanation
		If the same error occurs, re-install HDLM. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33 . For details on the <code>set</code> operation, see set (Sets Up the Operating Environment) on page 6-16 .
KAPL04010-E	Could not open the error log file.	<p>Details</p> <p>HDLM manager could not start normally because it was unable to open the error log file.</p> <p>Action</p> <p>Check whether another program is currently using the error log file (for example, the file is being opened in a text editor), or whether the error log file has been inadvertently deleted.</p>
KAPL04011-E	Could not output the error log file.	<p>Details</p> <p>The log information could not be output to the error log file.</p> <p>Action</p> <p>Make sure that the disk has enough unused capacity.</p>
KAPL04012-E	Could not create a communication pipe. RC = <i>aa...aa</i>	<p>Details</p> <p>HDLM manager could not start normally because it was unable to create a pipe file, which is used in communication with HDLM commands.</p> <p><i>aa...aa</i>: OS error code (decimal (base-10) number)</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL04013-E	Input is impossible via the communication pipe. RC = <i>aa...aa</i>	<p>Details</p> <p>Data could not be read from the pipe file while communicating with an HDLM command.</p> <p><i>aa...aa</i>: OS error code (decimal (base-10) number)</p> <p>Action</p>

Message ID	Message Text	Explanation
		Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2 .
KAPL04014-E	Output is impossible via the communication pipe. RC = <i>aa...aa</i>	<p>Details</p> <p>Data could not be written to the pipe file while communicating with an HDLM command.</p> <p><i>aa...aa</i>: OS error code (decimal (base-10) number)</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL04019-E	Could not collect the error information. RC = <i>aa...aa</i>	<p>Details</p> <p>An attempt to read the log information from the alert driver failed.</p> <p><i>aa...aa</i>: API return code (decimal (base-10) number)</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL04021-I	HDLM manager information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for resolving problems.</p> <p><i>aa...aa</i>: HDLM manager trace information</p> <p>Action</p>

Message ID	Message Text	Explanation
		None.
KAPL04022-W	HDLM manager warning information - aa...aa	<p>Details</p> <p>This information is required for resolving problems.</p> <p>aa...aa: HDLM manager trace warning information</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL04023-E	HDLM manager error information - aa...aa	<p>Details</p> <p>This information is required for resolving problems.</p> <p>aa...aa: HDLM manager trace error information</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL04024-C	A critical error occurred in the HDLM manager. (aa...aa)	<p>Details</p> <p>This information is required for resolving problems.</p> <p>aa...aa: HDLM manager trace error information</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>

Message ID	Message Text	Explanation
KAPL04025-C	A memory shortage occurred in the HDLM manager.	<p>Details</p> <p>There was not enough memory to run the HDLM manager processes.</p> <p>Action</p> <p>To increase the amount of free memory, terminate unnecessary applications or restart the host.</p>
KAPL04026-I	The temporary license is valid. The license expires in <i>aa...aa</i> days on (<i>bb...bb</i>).	<p>Details</p> <p><i>aa...aa</i>: Number of days remaining</p> <p><i>bb...bb</i>: <i>Expiration date format</i>: Year (4 digits)/month (01-12)/day (01-31)</p> <p>Action</p> <p>Install a permanent license by the expiration day.</p>
KAPL04027-I	The emergency license is valid. The license expires in <i>aa...aa</i> days on (<i>bb...bb</i>).	<p>Details</p> <p><i>aa...aa</i>: Number of days remaining</p> <p><i>bb...bb</i>: <i>Expiration date format</i>: Year (4 digits)/month (01-12)/day (01-31)</p> <p>Action</p> <p>Install a permanent license by the expiration day.</p>
KAPL04028-E	The temporary license expired.	<p>Action</p> <p>Install a permanent license.</p>
KAPL04029-E	The emergency license expired.	<p>Action</p> <p>Install a permanent license.</p>
KAPL04030-E	The temporary license has already expired.	<p>Action</p> <p>Install a permanent license.</p>
KAPL04031-E	The emergency license has already expired.	<p>Action</p> <p>Install a permanent license.</p>
KAPL04032-C	A fatal error occurred in HDLM. The system environment is invalid	<p>Details</p> <p>A part of the HDLM configuration file is missing.</p> <p>Action</p> <p>Re-install HDLM.</p>
KAPL04033-W	The option definition file was re-created.	<p>Details</p> <p>When an existing option definition file cannot be read, a new option definition file will be re-created by using the default values. If some of the options can be read, those values can be used. As for any</p>

Message ID	Message Text	Explanation
		<p>remaining values, the default values will be used.</p> <p>Action</p> <p>For any non-default options, use the <code>dlnkmgr set</code> operation to set the options again. For details on the <code>set</code> operation, see set (Sets Up the Operating Environment) on page 6-16.</p>
KAPL04034-E	An attempt to create the option definition file has failed.	<p>Details</p> <p>An attempt to re-create an option definition file using the default values has failed.</p> <p>Action</p> <p>Remove unnecessary files to secure unused capacity on the file system, or check the write permissions for the folder and file.</p>
KAPL04035-I	The path health check will now start. Total number of paths = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Total number of paths</p> <p>Action</p> <p>None.</p>
KAPL04036-I	The path health check for the path <i>aa...aa</i> was executed. Number of error paths = <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: Number of paths targeted for path health checking.</p> <p><i>bb...bb</i>: Number of paths determined to have an error by path health checking.</p> <p>Action</p> <p>None.</p>
KAPL04037-I	The path health check completed normally. Path ID = <i>aa...aa</i>	<p>Details</p> <p>All the paths that path health checking examined are fine.</p> <p><i>aa...aa</i>: Path ID for the path examined by path health checking.</p> <p>Action</p> <p>None.</p>
KAPL04042-I	HDLM SNMP TRAP information - <i>aa...aa</i>	<p>Details</p> <p>All the paths that path health checking examined are fine.</p> <p><i>aa...aa</i>: Start or stop.</p> <p>Action</p> <p>None.</p>
KAPL04045-I	HDLM SNMP TRAP was sent. Trap ID = <i>aa...aa</i> , IP Address =	<p>Details</p> <p><i>aa...aa</i>: Trap ID</p>

Message ID	Message Text	Explanation
	<i>bb...bb</i> , Port Number= <i>cc...cc</i> , Community = <i>dd...dd</i> , Trap Data = <i>ee..ee</i>	<p><i>bb...bb</i>: Destination IP address of the trap</p> <p><i>cc...cc</i>: Destination port number of the trap</p> <p><i>dd...dd</i>: Community name given to the trap</p> <p><i>ee..ee</i>: Transmission data</p> <p>Action</p> <p>None.</p>
KAPL04053-W	The option definition file was recovered from a work file.	<p>Action</p> <p>Execute the <code>dlnkmgr view -sys</code> command to check whether the settings are recovered. If the settings are not recovered, execute the <code>dlnkmgr set</code> operation to recover the settings. For details on the <code>view</code> operation, see view (Displays Information) on page 6-33. For details on the <code>set</code> operation, see set (Sets Up the Operating Environment) on page 6-16.</p>
KAPL04054-I	The owner controller will now be revised. (number of LUs = <i>aa...aa</i>)	<p>Details</p> <p><i>aa...aa</i>: number of targeted LUs</p> <p>Action</p> <p>None.</p>
KAPL04055-I	The owner controller was revised. (number of changed LUs = <i>aa...aa</i>)	<p>Details</p> <p><i>aa...aa</i>: number of changed LUs</p> <p>Action</p> <p>None.</p>
KAPL04056-W	The owner controller cannot be revised because no paths are in the Online status. (LU = <i>aa...aa</i>)	<p>Details</p> <p><i>aa...aa</i>: ID (serial number + iLUN) of the LU that was not revised</p> <p>Action</p> <p>Recover the paths from the failure, and then place them in the Online status, or exclude the LU from dynamic I/O path control.</p>

KAPL05001 to KAPL06000

Message ID	Message Text	Explanation
KAPL05001-I	DriverEntry() started. 0	<p>Details</p> <p>The initialization function was executed.</p>

Message ID	Message Text	Explanation
		Action None.
KAPL05002-I	DriverEntry() completed normally.	Details The initialization function completed successfully. Action None.
KAPL05003-I	The HDLM driver (filter component) was successfully attached to Disk (aa...aa), Partition (bb...bb).	Details aa...aa: Disk sequence number (decimal (base-10) number) bb...bb: Partition sequence number (always 0) A HDLM driver (filter component) device object was added to the disk device stack and partition. Action None.
KAPL05004-I	The filtering function (aa...aa) for the HDLM driver (filter component) was initialized successfully.	Details The HDLM driver (filter component) was successfully initialized for each device object. aa...aa: Device object address (hexadecimal number) Action None.
KAPL05005-I	The control function (aa...aa) for the HDLM driver (filter component) was initialized successfully.	Details The HDLM driver (filter component) was successfully initialized for each device object. aa...aa: Device object address (hexadecimal number) Action None.
KAPL05008-E	Could not allocate memory. (aa...aa:bb...bb) Execute the DLMgetras utility to collect error information, and then contact your vendor or maintenance company. Refer to the HDLM User's Guide for instructions how to execute the DLMgetras utility.	Details An attempt to execute the OS memory allocation function or the application memory allocation function failed. aa...aa: Information indicating the number of program lines (hexadecimal number) bb...bb: Memory capture size (hexadecimal number) Action Check whether the HDLM driver has started normally. If it has not

Message ID	Message Text	Explanation
		started or contains an error, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2 .
KAPL05010-E	<p>Could not initialize the HDLM driver (filter component). $(aa...aa:bb...bb)$ Execute the <code>DLMgetras</code> utility to collect error information, and then contact your vendor or maintenance company. Refer to the HDLM User's Guide for instructions how to execute the <code>DLMgetras</code> utility.</p>	<p>Details The HDLM driver (filter component) could not be initialized for each device object. $aa...aa$: Information indicating the number of program lines (hexadecimal number) $bb...bb$: Detailed information (hexadecimal number)</p> <p>Action Check whether the HDLM driver has started normally. If it has not started or contains an error, contact your HDLM vendor or the maintenance company, if there is a maintenance contract for HDLM, and report the error and detail code.</p>
KAPL05012-I	<p>The device $(aa...aa)$ for Disk $(bb...bb)$, Partition $(cc...cc)$ is selected for a mounted drive.</p>	<p>Details The device object corresponding to the disk $(bb...bb)$: Disk sequence number (decimal (base-10) number), partition $(cc...cc)$: Partition sequence number (decimal (base-10) number), and device object address $(aa...aa)$: Device object address (hexadecimal number)) is the first path for the LU (including the non-HDLM target device).</p> <p>Action None.</p>
KAPL05013-I	<p>The device $(aa...aa)$ for Disk $(bb...bb)$, Partition $(cc...cc)$ was removed from the mounted drive.</p>	<p>Details The device object corresponding to the disk $(bb...bb)$: Disk sequence number (decimal (base-10) number), partition $(cc...cc)$: Partition sequence number (decimal (base-10) number), and device object address $(aa...aa)$: Device object</p>

Message ID	Message Text	Explanation
		<p>address (hexadecimal number)) is the second or a subsequent path for the LU.</p> <p>Action</p> <p>This is normal. If the target drive cannot be referenced, check the disk configuration.</p>
KAPL05014-I	The device object (<i>aa...aa</i>) was registered as the path (<i>bb...bb</i>).	<p>Details</p> <p>The path (<i>bb...bb</i>: Core logic path identifier (hexadecimal number)) of the device object (<i>aa...aa</i>: Filter driver management table address (hexadecimal number)) was successfully registered into the core logic.</p> <p>Action</p> <p>None.</p>
KAPL05032-I	The path health checking for the path (<i>aa...aa</i>) completed normally. (<i>bb...bb,cc...cc</i>)	<p>Details</p> <p><i>aa...aa</i>: Path ID (hexadecimal number)</p> <p><i>bb...bb</i>: Disk sequence number (decimal (base-10) number)</p> <p><i>cc...cc</i>: Degree of progress in health checking (hexadecimal number)</p> <p>Action</p> <p>None.</p>
KAPL05033-W	The path health checking for the path (<i>aa...aa</i>) failed. (<i>bb...bb,cc...cc,dd...dd</i>)	<p>Details</p> <p><i>aa...aa</i>: Path ID (hexadecimal number)</p> <p><i>bb...bb</i>: Disk sequence number (decimal (base-10) number)</p> <p><i>cc...cc</i>: Degree of progress in disk recognition processing (hexadecimal number)</p> <p><i>dd...dd</i>: Execution result of health checking (hexadecimal number)</p> <p>Action</p> <p>Check the path for which path health checking failed. If this message is displayed for an unexpected path, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL05034-I	Disk(<i>aa...aa</i>) is a target disk system for HDLM. (<i>bb...bb,cc...cc</i>)	<p>Details</p> <p>The disk is a CoreLogic management-target disk.</p>

Message ID	Message Text	Explanation
		<p><i>aa...aa</i>: Disk sequence number (decimal (base-10) number) <i>bb...bb</i>: Degree of progress in disk recognition processing (hexadecimal number) <i>cc...cc</i>: Execution result of the disk confirmation command (hexadecimal number)</p> <p>Action None.</p>
KAPL05301-E	<p>A path has been removed. Make sure that the path is correctly connected to the LU, and then recover the path. If the path cannot be recovered, execute the DLMgetras utility to collect error information, and then contact your vendor or maintenance company. Refer to the HDLM User's Guide for instructions how to execute the DLMgetras utility.</p>	<p>Details When the LU deletion function is enabled, path information is output to the event log. Removed path information is displayed in the event viewer with the following format:</p> <p>PathID PathName DskName iLU ChaPort</p> <p>When a path is added to an LU, this message might appear. Note that this message is output by Windows activities, and not as a result of an error.</p> <p>Action Make sure that the path is correctly connected to the LU, and then recover the path. If the path cannot be recovered, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL05819-I	<p>Data for maintenance: <i>aa...aa bb...bb cc...cc dd...dd</i>.</p>	<p>Details The filter driver outputs this message for maintenance.</p> <p><i>aa...aa</i>: HDLM Device minor number (decimal (base-10) number)</p> <p><i>bb...bb</i>: Message output location information (decimal (base-10) number)</p> <p><i>cc...cc</i>: Detailed information 1 (decimal (base-10) number)</p> <p><i>dd...dd</i>: Detailed information 2 (decimal (base-10) number)</p> <p>Action None.</p>

KAPL07001 to KAPL08000

Message ID	Message Text	Explanation
KAPL07819-I	Data for maintenance: <i>aa...aa bb...bb cc...cc dd...dd.</i>	<p>Details</p> <p>This message is generated by the core logic for maintenance.</p> <p><i>aa...aa</i>: Detailed information 1 (decimal (base-10) number)</p> <p><i>bb...bb</i>: Internal function number of the core logic (decimal (base-10) number)</p> <p><i>cc...cc</i>: Detailed information 2 (decimal (base-10) number)</p> <p><i>dd...dd</i>: Detailed information 3 (decimal (base-10) number)</p> <p>Action</p> <p>None.</p>
KAPL07820-E	The configuration does not support the simultaneous use of the load balancing and cluster support functions.	<p>Details</p> <p>Because this storage system does not support persistent reservations, the load balancing function cannot be used in a cluster environment.</p> <p>Action</p> <p>Update all the HDLM target storage systems to a version that supports persistent reservations. Contact your HDLM vendor or, if you have a maintenance contract for HDLM, your maintenance company, to confirm whether your storage systems support persistent reservations.</p>
KAPL07821-I	An LU that cannot use the load balancing function in a cluster configuration is connected.	<p>Details</p> <p>The host is connected to an LU of a storage system that cannot use persistent reservations. In a cluster configuration, the load balancing function cannot be used for an LU of a storage system that cannot use persistent reservations. HDLM regards the EMC DMX series, EMC CX series, and HP EVA series as storage systems that do not support persistent reservations.</p> <p>Action</p> <p>None.</p>
KAPL07822-W	An LU connected to PathID (<i>aa...aa</i>) cannot use the load	<p>Details</p> <p>The LU connected to the PathID <i>aa...aa</i> is part of a storage system</p>

Message ID	Message Text	Explanation
	balancing function in a cluster configuration.	<p>that cannot use persistent reservations. In a cluster configuration, the load balancing function cannot be used for this kind of LU.</p> <p><i>aa...aa</i>: Path ID (same as PathID of <code>view -path</code>) (decimal (base-10) number)</p> <p>Action</p> <p>None.</p>
KAPL07823-W	An LU connected to PathID (<i>aa...aa</i>) can also use the load balancing function in a cluster configuration.	<p>Details</p> <p>The LU connected to the PathID <i>aa...aa</i> is part of a storage system that can use persistent reservations. In a cluster configuration, the load balancing function can also be used for this kind of LU.</p> <p><i>aa...aa</i>: Path ID (same as PathID of <code>view -path</code>) (decimal (base-10) number)</p> <p>Action</p> <p>None.</p>
KAPL07824-I	The owner controller of the LU connected to the path (<i>aa...aa</i>) was changed to (<i>bb...bb</i>).	<p>Details</p> <p>The owner controller of the LU connected to the path with the ID shown in the message was changed.</p> <p><i>aa...aa</i>: Path ID of the changed LU. (same as PathID of <code>view -path</code>) (Decimal number)</p> <p><i>bb...bb</i>: Owner controller ID after the change. (Hexadecimal number)</p> <p>Action</p> <p>None.</p>
KAPL07825-I	The owner core of the LU connected to the path (<i>aa...aa</i>) was changed to (<i>bb...bb</i>).	<p>Details</p> <p>The owner core of the LU connected to the path with the ID shown in the message was changed.</p> <p><i>aa...aa</i>: Path ID of the changed LU. (same as PathID of <code>view -path</code>) (Decimal number)</p> <p><i>bb...bb</i>: Owner core ID after the change. (Hexadecimal number)</p> <p>Action</p> <p>None.</p>

KAPL08001 to KAPL09000

Message ID	Message Text	Explanation
KAPL08019-E	The path (aa...aa) detected an error (bb...bb). (cc...cc)	<p>Details</p> <p>An error occurred in the path. The error is most likely due to a disconnected cable.</p> <p>aa...aa: Path identifier (hexadecimal number)</p> <p>bb...bb: Error code (hexadecimal number)</p> <ul style="list-style-type: none"> ○ When the Windows plug-and-play functionality deletes the SCSI device from Windows 0x00000000 is displayed. ○ When a path error is detected by path health checking or an online operation 0x000F0000 is displayed. ○ When a path error is detected through an I/O error The OS error code is displayed. <p>cc...cc: Address of the filter driver in which the error occurred(character string)</p> <p>Action</p> <p>Check the path in which the error was detected.</p>
KAPL08022-E	A path error occurred. ErrorCode = aa...aa, PathID = bb...bb, PathName = cc...cc.dd...dd.ee...ee.ff...ff, DNum = gg...gg, HDevName = hh...hh	<p>Details</p> <p>A physical or logical error occurred in the path.</p> <p>aa...aa: OS error code (hexadecimal number)</p> <ul style="list-style-type: none"> ○ When the Windows plug-and-play functionality deletes the SCSI device from Windows 0x00000000 is displayed. ○ When a path error is detected by path health checking or an online operation 0x000F0000 is displayed. ○ When a path error is detected through an I/O error The OS error code is displayed. <p>bb...bb: Path ID (same as PathID of view -path) (decimal (base-10) number)</p>

Message ID	Message Text	Explanation
		<p><i>cc...cc</i>: Host port number (same as PathName of <code>view -path</code>) (hexadecimal number)</p> <p><i>dd...dd</i>: Bus number (same as PathName of <code>view -path</code>) (hexadecimal number)</p> <p><i>ee...ee</i>: Target ID (same as PathName of <code>view -path</code>) (hexadecimal number)</p> <p><i>ff...ff</i>: HLU number (same as PathName of <code>view -path</code>) (hexadecimal number)</p> <p><i>gg...gg</i>: Dev number (same as DNum of <code>view -path</code>) (decimal (base-10) number)</p> <p><i>hh...hh</i>: Host device name (same as HDevName of <code>view -path</code>)</p> <p>Action</p> <p>The path might be damaged. For details on what to do, see What To Do for a Path Error on page 5-4, and then switch the path shown in the message to <code>Online</code>.</p>
KAPL08023-I	A path was recovered. PathID = <i>aa...aa</i> , PathName = <i>bb...bb.cc...cc.dd...dd.ee...ee</i> , DNum = <i>ff...ff</i> , HDevName = <i>gg...gg</i>	<p>Details</p> <p>The path has been recovered.</p> <p><i>aa...aa</i>: Path ID (same as PathID of <code>view -path</code>) (decimal (base-10) number)</p> <p><i>bb...bb</i>: Host port number (same as PathName of <code>view -path</code>) (hexadecimal number)</p> <p><i>cc...cc</i>: Bus number (same as PathName of <code>view -path</code>) (hexadecimal number)</p> <p><i>dd...dd</i>: Target ID (same as PathName of <code>view -path</code>) (hexadecimal number)</p> <p><i>ee...ee</i>: HLU number (same as PathName of <code>view -path</code>) (hexadecimal number)</p> <p><i>ff...ff</i>: Device number (same as DNum of <code>view -path</code>) (decimal (base-10) number)</p> <p><i>gg...gg</i>: Host Dev name (same as HDevName of <code>view -path</code>)</p> <p>Action</p> <p>None.</p>
KAPL08025-I	A path was recovered. PathID = <i>aa...aa</i> .	Details

Message ID	Message Text	Explanation
		<p>The auto recover function recovered a path.</p> <p>This message is output if an error occurs in all the paths to an LU and one of the paths is recovered.</p> <p><i>aa...aa</i>: Path ID (same as PathID of <code>view -path</code>) (decimal (base-10) number)</p> <p>Action</p> <p>None.</p>
KAPL08026-E	An error occurred on all the paths of the LU. PathID = <i>aa...aa</i>	<p>Details</p> <p>An error occurred in the last, remaining path of an LU. (This is most likely as a result of a disconnection.)</p> <p><i>aa...aa</i>: Path ID (same as PathID of <code>view -path</code>) (decimal (base-10) number)</p> <p>Action</p> <p>Find the KAPL05301-E message in the event log to identify the storage system that the error was detected on and resolve the problem.</p>
KAPL08027-E	A path was excluded from the items subject to automatic failback. PathID = <i>aa...aa</i>	<p>Details</p> <p>A path was excluded from being subject to automatic failbacks because the system judged that an intermittent error was occurring in that path.</p> <p><i>aa...aa</i>: Path ID (same as PathID of <code>view -path</code>) (decimal (base-10) number)</p> <p>Action</p> <p>An intermittent error has occurred. Check the path for any possible problems. For details on what to do, see What To Do for a Path Error on page 5-4, and switch the path shown in the message to Online.</p>
KAPL08032-I	A path was recovered. (PathID = <i>aa...aa</i>)	<p>Details</p> <p>The path has changed to an online status.</p> <p><i>aa...aa</i>: Path ID (same as PathID of <code>view -path</code>) (decimal (base-10) number)</p> <p>Action</p> <p>None</p>

Message ID	Message Text	Explanation
KAPL08033-E	No path connected to the LU that connects to Path ID (aa...aa) is in the Online(D) status.	<p>Details</p> <p>Due to path failure, path deletion, or offline operation, no path connected to the LU that connects to Path ID (aa...aa) is in the Online(D) status.</p> <p>aa...aa: Path ID (same as PathID of view -path) (decimal (base-10) number)</p> <p>Action</p> <p>To return a path to the Online(D) status, resolve the path failure, and then execute the "dlnkmgr online -dfha" command.</p>
KAPL08036-W	Failed to get Inquiry Page.E2h(00h) in path (aa...aa).	<p>Details</p> <p>Failed to obtain the Inquiry data of the path to show in a message.</p> <p>aa...aa: Path ID (same as PathID of view -path) (decimal (base-10) number)</p> <p>Action</p> <p>Confirm the state of the path. After having removed an obstacle, and then execute the "dlnkmgr refresh" command.</p>
KAPL08037-W	Failed to get Inquiry Page.E2h(01h) in path (aa...aa).	<p>Details</p> <p>Failed to obtain the Inquiry data of the path to show in a message.</p> <p>aa...aa: Path ID (same as PathID of view -path) (decimal (base-10) number)</p> <p>Action</p> <p>Confirm the state of the path. After having removed an obstacle, and then execute the "dlnkmgr refresh" command.</p>
KAPL08038-W	Failed to get Inquiry Page.E2h(02h) in path (aa...aa).	<p>Details</p> <p>Failed to obtain the Inquiry data of the path to show in a message.</p> <p>aa...aa: Path ID (same as PathID of view -path) (decimal (base-10) number)</p> <p>Action</p> <p>Confirm the state of the path. After having removed an obstacle, and then execute the "dlnkmgr refresh" command.</p>

KAPL09001 to KAPL10000

Message ID	Message Text	Explanation
KAPL09001-E	There is no system management permission. Login with administrator permission and <i>aa...aa</i> HDLM.	<p>Details</p> <p>The current user does not have the necessary administrator permission to install or remove HDLM.</p> <p><i>aa...aa</i>: re-install or re-remove</p> <p>Action</p> <p>Re-install or re-remove HDLM as a user who is a member of the Administrators group.</p>
KAPL09002-E	The disk does not have sufficient free space.	<p>Action</p> <p>Change the installation destination or delete unnecessary files to increase the amount of unused capacity, and then retry.</p>
KAPL09003-E	Cannot install in this system. Install HDLM on a supported OS.	<p>Details</p> <p>HDLM cannot be installed on this system.</p> <p>Action</p> <p>Install HDLM on a supported OS. For information on which OSs are supported, see OSs Supported by HDLM on page 3-2. For information on which OS SPs are supported, see the readme file for your particular SP.</p>
KAPL09004-I	Installation has finished. Restart the system.	<p>Details</p> <p>None.</p> <p>Action</p> <p>To immediately restart the system, select the Yes. I want to restart my computer now check box.</p> <p>If you do not want to immediately restart the system, select the No. I will restart my computer later check box.</p>
KAPL09005-E	Could not stop the HDLM manager. Stop it manually, and then try the installation program or the remove program again.	<p>Details</p> <p>An attempt to stop the HDLM manager service has failed.</p> <p>Action</p> <p>Stop the HDLM manager manually, and then try the installation program or the remove program again.</p>

Message ID	Message Text	Explanation
KAPL09006-E	Could not install HDLM.	<p>Action</p> <p>If the installation was interrupted, incomplete files and folders might remain. Manually delete all these files and folders.</p>
KAPL09007-W	HDLM version aa...aa is installed. Do you want to overwrite it?	<p>Details</p> <p>Confirm whether you want to overwrite the existing installation.</p> <p>aa...aa: Version number (character string)</p> <p>Action</p> <p>Choose OK to overwrite the older version of HDLM with a newer version.</p>
KAPL09008-W	The license code is invalid.	<p>Action</p> <p>Double-check the license code, and then re-enter it.</p>
KAPL09009-E	The license code is invalid. The HDLM installation program will now terminate.	<p>Details</p> <p>The HDLM installation program is terminating because multiple attempts to enter the license code failed.</p> <p>Action</p> <p>Check the license code, and then re-execute the installation program.</p>
KAPL09010-E	You cannot install onto storage media that is not a built-in disk.	<p>Action</p> <p>Install HDLM onto a built-in disk.</p>
KAPL09014-E	The OS must be restarted before you install HDLM.	<p>Action</p> <p>Restart the OS before HDLM is installed.</p>
KAPL09015-E	HDLM cannot be installed. A newer version of HDLM is already installed.	<p>Action</p> <p>Remove HDLM, and then restart the installation program.</p>
KAPL09016-E	Because HDLM has been installed in another system, HDLM cannot be installed in this system.	<p>Details</p> <p>HDLM cannot be installed on this system because it has already been installed on another system.</p> <p>Action</p> <p>Remove the HDLM that has been installed on another OS on the same drive, and then restart the installation program.</p>
KAPL09019-E	An attempt to cancel the registration of the bundle PP name of Hitachi Network	<p>Details</p>

Message ID	Message Text	Explanation
	Objectplaza Trace Library 2 failed. Remove Hitachi Network Objectplaza Trace Library 2 by referring to HDLM User's Guide section "Removing Hitachi Network Objectplaza Trace Library (HNTRLib2)".	<p>An attempt to cancel the registration of the PP name of HNTRLib2 has failed.</p> <p>Action</p> <p>Manually cancel the PP name registration, and then remove Hitachi Network Objectplaza Trace Library 2. If the attempt to cancel the registration of the PP name and remove Hitachi Network Objectplaza Trace Library 2 fails again, contact your HDLM vendor or the maintenance company if there is a maintenance contact of HDLM.</p>
KAPL09020-E	An attempt to remove Hitachi Network Objectplaza Trace Library 2 failed.	<p>Details</p> <p>An attempt to remove HNTRLib2 has failed.</p> <p>Action</p> <p>Manually remove Hitachi Network Objectplaza Trace Library 2. If the attempt to remove Hitachi Network Objectplaza Trace Library 2 fails again, contact your HDLM vendor or the maintenance company if there is a maintenance contact of HDLM.</p>
KAPL09021-E	An attempt to register the bundle PP name of Hitachi Network Objectplaza Trace Library 2 failed.	<p>Details</p> <p>An attempt to register the PP name of HNTRLib 2 has failed.</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contact of HDLM.</p>
KAPL09026-I	Hitachi Network Objectplaza Trace Library 2 wasn't removed because it was being used for other products.	<p>Details</p> <p>HNTRLib2 was not removed because it was still being used for another PP.</p> <p>Action</p> <p>None.</p>
KAPL09034-E	<p>An Internal error occurred in the HDLM Installer. Code = aa...aa bb...bb</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract of HDLM.</p>	<p>Details</p> <p>During installation of HDLM, an error occurred that was probably not a result of a user operation.</p> <p>aa...aa: Error number (decimal (base-10) number)</p> <p>bb...bb: Detailed information (decimal (base-10) number)</p> <p>Action</p>

Message ID	Message Text	Explanation
		<p>When Code = 13 1633: At least one SCSI disk managed by Windows does not have a hardware ID. Contact your OS support group because your system environment might be invalid.</p> <p>In other cases, contact your HDLM vendor or the maintenance company if there is a maintenance contact of HDLM.</p>
KAPL09071-E	The specified installation folder is read-only. Specify a different folder.	<p>Details Since the install folder you specified is read-only, you cannot install.</p> <p>Action Specify an installation folder that is not read-only.</p>
KAPL09076-I	The permanent license was installed.	<p>Action None.</p>
KAPL09077-I	The temporary license was installed. The license expires on <i>aa...aa</i> .	<p>Details A temporary license was installed. <i>aa...aa</i>: Year (4 digits)/month (01-12)/day (01-31)</p> <p>Action Install a permanent license by the expiration day.</p>
KAPL09078-I	The emergency license was installed. The license expires on <i>aa...aa</i> .	<p>Details An emergency license was installed. <i>aa...aa</i>: Year (4 digits)/month (01-12)/day (01-31)</p> <p>Action Install a permanent license by the expiration day.</p>
KAPL09079-I	The permanent license has been installed.	<p>Action None.</p>
KAPL09080-I	The temporary license has been installed. The license expires on <i>aa...aa</i> .	<p>Details <i>aa...aa</i>: Year (4 digits)/month (01-12)/day (01-31)</p> <p>Action Install a permanent license by the expiration day.</p>
KAPL09081-I	The emergency license has been installed. The license expires on <i>aa...aa</i> .	<p>Details <i>aa...aa</i>: Year (4 digits)/month (01-12)/day (01-31)</p>

Message ID	Message Text	Explanation
		Action Install a permanent license by the expiration day.
KAPL09082-W	The temporary license expired.	Action Enter a permanent license key.
KAPL09083-W	The emergency license expired.	Action Install a permanent license.
KAPL09084-W	The temporary license cannot be installed.	Details The temporary license cannot be reused. Action Install a permanent license.
KAPL09085-W	The emergency license cannot be installed.	Details An emergency license cannot be updated with another emergency license. Action Install a permanent license.
KAPL09086-W	The entered license key is invalid.	Action Enter a valid license key.
KAPL09087-E	The entered license key is invalid. Renewal of the license key will now stop. Obtain a valid license key, and then re-install HDLM.	Details The renewal of the license key will be aborted because an invalid license key was entered three times in a row. Action Obtain a valid license key, and then re-install HDLM.
KAPL09088-E	The entered license key is invalid. The HDLM installation will now terminate. Obtain a valid license key, and then re-install HDLM.	Action Obtain a valid license key, and then re-install HDLM.
KAPL09089-W	License information cannot be acquired.	Details Because the license information cannot be acquired, a license needs to be installed. Action Enter a license key when prompted by a message to do so.
KAPL09090-W	This operation will now be continued without updating the license.	Details This operation will continue without updating the license. Action

Message ID	Message Text	Explanation
		Install a permanent license at a later time.
KAPL09091-E	A fatal error occurred in HDLM. The system environment is invalid. Contact your HDLM vendor or the maintenance company if there is a maintenance contract of HDLM.	<p>Details</p> <p>A part of the HDLM configuration file is missing.</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract of HDLM.</p>
KAPL09093-I	<i>aa...aa</i> will be installed. Is this OK?	<p>Details</p> <p><i>aa...aa</i>: SP version that will be installed.</p> <p>Action</p> <p>To execute the installation, select OK. To cancel the installation, select Cancel.</p>
KAPL09114-I	There is no license key file. File name = <i>aa...aa</i>	<p>Details</p> <p>There is no license key file in the designated directory.</p> <p><i>aa...aa</i>: Windows-installation-destination-drive-name \hdlm_license or the-file-that-the-user-specified</p> <p>Action</p> <p>Enter a license key when prompted by a message to do so. Alternatively, cancel the installation, save the correct license key file in the designated folder, and then re-execute the installation.</p>
KAPL09115-W	An attempt to delete the license key file has failed. File name = <i>aa...aa</i>	<p>Details</p> <p>An attempt to delete the license key file has failed.</p> <p><i>aa...aa</i>: Windows-installation-destination-drive-name \hdlm_license or the-file-that-the-user-specified</p> <p>Action</p> <p>If a license key file exists, delete it.</p>
KAPL09118-W	The license key file is invalid. File name = <i>aa...aa</i>	<p>Details</p> <p>The format of the license key file is invalid.</p> <p><i>aa...aa</i>: Windows-installation-destination-drive-name \hdlm_license or the-file-that-the-user-specified</p>

Message ID	Message Text	Explanation
		<p>Action</p> <p>Store a correct license key file in the designated directory, and then re-execute the installation program.</p>
KAPL09119-W	<p>There is no installable license key in the license key file. File name = <i>aa...aa</i></p>	<p>Details</p> <p>There is no HDLM-installable license key in the license key file.</p> <p><i>aa...aa</i>: <i>Windows-installation-destination-drive-name</i> \hdlm_license or <i>the-file-that-the-user-specified</i></p> <p>Action</p> <p>Make sure that the correct license key file has been specified, and then re-execute the installation program.</p>
KAPL09127-W	<p>The MPIO driver has already been installed in this system.</p> <p>Driver <i>aa...aa</i> has already been installed. The file version is <i>bb...bb</i>.</p> <p>Driver <i>aa...aa</i> has already been installed. The file version could not be acquired.</p> <p>If installation continues, <i>dd...dd</i> of file version <i>cc...cc</i> will be overwritten.</p>	<p>Details</p> <p>The displayed message differs depending on the file.</p> <p>If the file version was obtained, the following message is displayed: Driver <i>aa...aa</i> has already been installed. The file version is <i>bb...bb</i>.</p> <p>In this case, the following message is not displayed: Driver <i>aa...aa</i> has already been installed. The file version could not be acquired.</p> <p>If the file version could not be obtained, the following message is displayed: Driver <i>aa...aa</i> has already been installed. The file version could not be acquired.</p> <p>In this case, the following message is not displayed: Driver <i>aa...aa</i> has already been installed. The file version is <i>bb...bb</i> is not displayed.</p> <p><i>aa...aa</i>: File name (mpio.sys, mpspfltr.sys, or mpdev.sys)</p> <p><i>bb...bb</i>: Version of the installed file (mpio.sys, mpspfltr.sys, or mpdev.sys)</p> <p><i>cc...cc</i>: Version of the file (mpio.sys, mpspfltr.sys, or mpdev.sys) to be installed</p> <p><i>dd...dd</i>: File name (mpio.sys, mpspfltr.sys, or mpdev.sys)</p> <p>Action</p>

Message ID	Message Text	Explanation
		To continue processing, click Next . To cancel processing, click Cancel .
KAPL09128-W	The entered PRSV key is invalid.	<p>Details</p> <p>An invalid PRSV key has been entered.</p> <p>Action</p> <p>Enter a valid PRSV key.</p>
KAPL09129-E	The version upgrade from <i>aa...aa</i> to <i>bb...bb</i> cannot be executed.	<p>Details</p> <p>If a version earlier than HDLM 5.5 has already been installed, version HDLM 5.5 or later cannot be installed.</p> <p><i>aa...aa</i>: Installed version of HDLM <i>bb...bb</i>: Version of HDLM to be installed</p> <p>Action</p> <p>Refer to the manual Upgrade Installation or Re-installation of HDLM on page 3-66.</p>
KAPL09131-W	An attempt to register the PRSV key has failed.	<p>Details</p> <p>An attempt to register a PRSV key has failed.</p> <p>Action</p> <p>After the installation finishes, without rebooting, execute the <code>dlmprsvkey</code> utility for registering an HDLM persistent reservation key to register the PRSV key. For details on the <code>dlmprsvkey</code> utility, see The <code>dlmprsvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13.</p>
KAPL09134-E	<p>The HDLM path cannot be added to the Path environment variable.</p> <p>Refer to the Messages section of the HDLM User's Guide for instructions to correct this problem.</p>	<p>Details</p> <p>The HDLM path could not be added to the <code>Path</code> environment variable.</p> <p>Action</p> <p>Edit the <code>Path</code> environment variable so that it stays within the following length after adding the HDLM paths.</p> <p>In Windows Server 2003 SP1 or Windows Server 2003 R2 (no service pack), if the <code>Path</code> environment variable was rounded down to 1,024 bytes, and the Microsoft patch to solve this problem has been applied:</p>

Message ID	Message Text	Explanation
		<p>2,047 bytes</p> <p>In Windows Server 2003 SP1 or Windows Server 2003 R2 (no service pack), if the <code>Path</code> environment variable was rounded down to 1,024 bytes, but the Microsoft patch program to solve this problem has not been applied:</p> <p>1,023 bytes</p> <p>When the HDLM default path is specified, the following three file paths are added to the environment variable:</p> <p>Windows Server 2003 (x86) and Windows Server 2008 (x86) (213 bytes including the added ";")</p> <ul style="list-style-type: none"> ○ <code>C:\Program Files\HDVM\HBaseAgent\bin</code> ○ <code>C:\Program Files\HDVM\HBaseAgent\util\bin</code> ○ <code>C:\Program Files\HITACHI\DynamicLinkManager\bin</code> ○ <code>C:\Program Files\HITACHI\DynamicLinkManager\lib</code> ○ <code>C:\Program Files\Common Files\Hitachi</code> <p>For Windows Server 2003 (excluding the x86 edition), Windows Server 2008 (excluding the x86 edition), or Windows Server 2012, <code>Program Files</code> is <code>Program Files (x86)</code> (243 bytes including the added ",")</p> <ul style="list-style-type: none"> ○ <code>C:\Program Files (x86)\HDVM\HBaseAgent\bin</code> ○ <code>C:\Program Files (x86)\HDVM\HBaseAgent\util\bin</code> ○ <code>C:\Program Files (x86)\HITACHI\DynamicLinkManager\bin</code> ○ <code>C:\Program Files (x86)\HITACHI\DynamicLinkManager\lib</code> ○ <code>C:\Program Files (x86)\Common Files\Hitachi</code> <p>However, if <code>Hntrlib2</code> has already been installed, the following file paths are not added:</p>

Message ID	Message Text	Explanation
		<p>Windows Server 2003 (x86) and Windows Server 2008 (x86)</p> <p>C:\Program Files\Common Files\Hitachi</p> <p>For Windows Server 2003 (excluding the x86 edition), Windows Server 2008 (excluding the x86 edition), or Windows Server 2012, Program Files is Program Files (x86)</p> <p>C:\Program Files (x86)\Common Files\Hitachi</p> <p>Do not remove the search paths that were specified during the installation of Windows from the Path system environment variable because these paths are required to install HDLM.</p>
KAPL09135-E	<p>One of the following was executed at the same time as an HDLM command set -lic operation: another set -lic operation, or an update of the license for an update installation.</p>	<p>Action</p> <p>Check the license by using the HDLM command's view -sys -lic operation. If necessary, update the license by using the set -lic operation during or after the installation. If the same error message is output, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>Do not perform the following operation: Execute the HDLM command's set -lic operation while updating a license for an upgrade or re-installation of HDLM</p>
KAPL09142-E	<p>HDLM aa...aa cannot be performed. Wait a while, and then perform aa...aa again. Error Code = bb...bb</p>	<p>Details</p> <p>HDLM could not be installed or removed because Hitachi Command Suite Common Agent Component is being used.</p> <p>aa...aa : "installation" or "remove"</p> <p>bb...bb : Internal code (decimal (base-10) number)</p> <p>Action</p> <p>When linkage is performed with Global Link Manager, cancel remote access. If this message is still output, execute the hbsasrv stop -f command as shown in the <i>Hitachi Command Suite Global Link Manager Installation and</i></p>

Message ID	Message Text	Explanation
		<i>Configuration Guide</i> . Then, install or remove HDLM again as necessary.
KAPL09173-W	HDLM version <i>aa...aa</i> is installed. Do you want to overwrite it with version <i>bb...bb</i> ?	<p>Details</p> <p><i>aa...aa</i>: Installed version number of HDLM (character string) <i>bb...bb</i>: Version number of HDLM to be installed (character string)</p> <p>Action</p> <p>Click the OK button to upgrade or re-install HDLM.</p>
KAPL09179-I	Data for maintenance: <i>aa...aa bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: Message output location information (decimal (base-10) number) <i>bb...bb</i>: Detailed information (character string)</p> <p>Action</p> <p>None.</p>
KAPL09180-I	HDLM <i>aa...aa</i> will now start.	<p>Details</p> <p>The unattended installation or remove of HDLM has started.</p> <p><i>aa...aa</i>: installation or remove</p> <p>Action</p> <p>None.</p>
KAPL09181-I	The <i>aa...aa</i> of HDLM version <i>bb...bb</i> completed successfully.	<p>Details</p> <p>The unattended installation or remove of HDLM has completed normally.</p> <p><i>aa...aa</i>: installation or remove <i>bb...bb</i>: Version number of the installed or removed HDLM</p> <p>Action</p> <p>None.</p>
KAPL09182-W	An attempt to <i>aa...aa</i> HDLM version <i>bb...bb</i> has failed. See the previous messages to resolve the problems.	<p>Details</p> <p>The unattended installation or remove of HDLM failed.</p> <p><i>aa...aa</i>: install or remove <i>bb...bb</i>: Version number of HDLM you attempted to install or remove</p> <p>Action</p> <p>See the previous warning and error messages to resolve the problems.</p>

Message ID	Message Text	Explanation
KAPL09183-I	HDLM version <i>aa...aa</i> is installed. This version will now be overwritten with version <i>bb...bb</i> .	<p>Details</p> <p><i>aa...aa</i>: Installed version number of HDLM</p> <p><i>bb...bb</i>: Version number of HDLM you attempted to install</p> <p>Action</p> <p>None.</p>
KAPL09184-I	The PRSV key was registered. (PRSV key = <i>aa...aa</i>)	<p>Details</p> <p><i>aa...aa</i>: PRSV key (16-digits hexadecimal number)</p> <p>Action</p> <p>None.</p>
KAPL09185-I	Restart the computer.	<p>Details</p> <ul style="list-style-type: none"> ○ In <code>installhdlm</code> utility for installing HDLM: The installation of HDLM has completed normally. Restart the computer before using HDLM. ○ In <code>removehdlm</code> utility for removing HDLM: The remove of HDLM has completed normally. Restart the computer. <p>Action</p> <ul style="list-style-type: none"> ○ In <code>installhdlm</code> utility for installing HDLM: Restart the computer and make sure that HDLM is running correctly. ○ In <code>removehdlm</code> utility for removing HDLM: None.
KAPL09186-I	The computer will now restart.	<p>Details</p> <ul style="list-style-type: none"> ○ In <code>installhdlm</code> utility for installing HDLM: After HDLM is installed, the computer will automatically restart because the restart option was specified in <code>installhdlm.ini</code>. ○ In <code>removehdlm</code> utility for removing HDLM: After HDLM is removed, the computer will automatically restart because the <code>-r</code> parameter was specified.

Message ID	Message Text	Explanation
		<p>Action</p> <ul style="list-style-type: none"> ○ In <code>installhdlm</code> utility for installing HDLM: After the computer restarts, make sure that HDLM is running correctly. ○ In <code>removehdlm</code> utility for removing HDLM: None.
KAPL09187-W	No parameter is specified.	<p>Details</p> <p>No installation-information settings file has been specified in the <code>installhdlm</code> utility for installing HDLM.</p> <p>Action</p> <p>Make sure that an actual installation-information settings file for the <code>installhdlm</code> utility is appropriate, and then try again.</p>
KAPL09188-W	Too many parameters are specified.	<p>Details</p> <p>More than two parameters have been specified for the <code>installhdlm</code> utility for installing HDLM.</p> <p>More than four parameters have been specified for the <code>removehdlm</code> utility for removing HDLM.</p> <p>Action</p> <p>Make sure that the parameters for the <code>installhdlm</code> or <code>removehdlm</code> utilities are appropriate, and then try again. For details on the <code>installhdlm</code> utility, see The <code>installhdlm</code> Utility for Installing HDLM on page 7-17. For details on the <code>removehdlm</code> utility, see The <code>removehdlm</code> Utility for Removing HDLM on page 7-28.</p>
KAPL09189-W	The parameter contains an incorrect value. (Value = <i>aa...aa</i>)	<p>Details</p> <p>Either <code>-f</code> or <code>-h</code> must be specified as the first parameter for the <code>installhdlm</code> utility for installing HDLM.</p> <p><code>-s, -r, -w</code> or <code>-h</code> must be specified as parameters for the <code>removehdlm</code> utility for removing HDLM.</p> <p><i>aa...aa</i>: Invalid parameter (character string)</p> <p>Action</p>

Message ID	Message Text	Explanation
		<p>Make sure that the parameters for the <code>installhdml</code> or <code>removehdml</code> utility are appropriate, and then try again. For details on the <code>installhdml</code> utility, see The <code>installhdml</code> Utility for Installing HDLM on page 7-17. For details on the <code>removehdml</code> utility, see The <code>removehdml</code> Utility for Removing HDLM on page 7-28.</p>
KAPL09190-W	The installation information settings file is not specified.	<p>Details The installation-information settings file is not specified for the second parameter in the <code>installhdml</code> utility for installing HDLM.</p> <p>Action Make sure that the parameters in the <code>installhdml</code> utility are appropriate, and then try again.</p>
KAPL09191-W	The installation information settings file does not exist.	<p>Details The installation-information settings file specified for the second parameter in the <code>installhdml</code> utility for installing HDLM does not exist.</p> <p>Action Make sure that the path name of the installation-information settings file is appropriate, and then try again.</p>
KAPL09192-W	An installation information settings file of an unsupported product version is specified. (hdmlversion = aa...aa)	<p>Details The specified installation-information settings file is not supported by this version of HDLM.</p> <p><i>aa...aa</i>: The HDLM version in which the specified installation-information settings file was provided</p> <p>Action Specify the installation-information settings file for the current version or an earlier version of HDLM, and then try again.</p>
KAPL09193-W	A definition in the installation information settings file is invalid. (aa...aa = bb...bb)	<p>Details An invalid value has been specified for a key.</p>

Message ID	Message Text	Explanation
		<p><i>aa...aa</i>: The key where the invalid value was specified <i>bb...bb</i>: The invalid key value</p> <p>Action</p> <p>Correct the definition in the installation-information settings file, and then try again.</p>
KAPL09194-W	A folder or file specified in the installation information settings file does not exist. (<i>aa...aa</i> = <i>bb...bb</i>)	<p>Details</p> <p>The folder or file specified for a key does not exist</p> <p><i>aa...aa</i>: The key name of the entry where the path name of a file or folder is specified</p> <p><i>bb...bb</i>: The path name of the file or folder that does not exist</p> <p>Action</p> <p>Correct the definition in the installation-information settings file, and then try again.</p>
KAPL09195-W	The setup.exe file does not exist.	<p>Details</p> <p>HDLM cannot be installed, because the installation program (setup.exe) does not exist in the folder that is specified in the installfile_location key.</p> <p>Action</p> <p>Specify <i>drive-in-which-the-installation-DVD-is-inserted</i>: \HDLM_Windows\ in the installfile_location key of the installation-information settings file.</p>
KAPL09196-W	Some of the LUs managed by HDLM are not in a single path configuration.	<p>Details</p> <p>Before performing an upgrade installation or remove, reconfigure the system into a single-path configuration.</p> <p>Action</p> <p>Reconfigure the system into a single-path configuration, and then try again.</p>
KAPL09197-W	The user terminated <i>aa...aa</i> , but HDLM <i>bb...bb</i> will continue.	<p>Details</p> <p>installhdlm.exe or removehdlm.exe was forcibly stopped by an action such as pressing Ctrl + C. The installhdlm.exe or removehdlm.exe processing has</p>

Message ID	Message Text	Explanation
		<p>ended, but the HDLM installation or remove will continue.</p> <p><i>aa...aa</i>: <code>installhdlm.exe</code> or <code>removehdlm.exe</code></p> <p><i>bb...bb</i>: installation or remove</p> <p>Action</p> <p>Refer to <code>installhdlm.log</code> or <code>removehdlm.log</code> and make sure that the installation or remove completed normally.</p>
KAPL09198-E	An error occurred in I/O of the installation information settings file. Code = <i>aa...aa bb...bb</i>	<p>Details</p> <p>During I/O processing with the installation-information settings file, an error occurred that was probably not a result of a user operation.</p> <p><i>aa...aa</i>: Error number (decimal (base-10) number)</p> <p><i>bb...bb</i>: Detailed information (decimal (base-10) number)</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contact of HDLM.</p>
KAPL09210-I	<i>aa...aa</i> will now start.	<p>Details</p> <p><i>aa...aa</i> has just started.</p> <p><i>aa...aa</i>: <code>dlnkmgr</code></p> <p>Action</p> <p>None.</p>
KAPL09211-I	<i>aa...aa</i> completed successfully.	<p>Details</p> <p><i>aa...aa</i>: <code>dlnkmgr</code></p> <p>Action</p> <p>None.</p>
KAPL09212-E	<i>aa...aa</i> ended abnormally.	<p>Details</p> <p><i>aa...aa</i>: <code>dlnkmgr</code></p> <p>Action</p> <p>Check the error message that was output just before this message, and then perform the action indicated in that error message.</p>
KAPL09213-W	An error occurred during <i>aa...aa</i> processing.	<p>Details</p> <p>Although the <i>aa...aa</i> processing has ended, an error occurred during the processing.</p> <p><i>aa...aa</i>: <code>dlnkmgr</code></p> <p>Action</p>

Message ID	Message Text	Explanation
		<p>Check the error message that was output just before this message, and then perform the action indicated in that error message.</p>
KAPL09216-E	An error occurred during I/O of a file that <i>aa...aa</i> uses. Error Code = <i>bb...bb cc...cc</i>	<p>Details</p> <p>An error occurred during an I/O from a file that the <code>installhdml</code> utility for installing HDLM or the <code>removehdml</code> utility for removing HDLM uses.</p> <p><i>aa...aa</i>: <code>installhdml</code> or <code>removehdml</code></p> <p><i>bb...bb</i>: Error number that indicates the executed processing (decimal (base-10) number)</p> <p><i>cc...cc</i>: Return value of the executed processing (decimal (base-10) number)</p> <p>Action</p> <ul style="list-style-type: none"> ○ In <code>installhdml</code> utility: Make sure that there is enough unused capacity for the folder specified in the <code>workdir</code> key. If there is not, allocate the required amount of capacity, and then retry the operation. For details about how to determine the amount of capacity that is required, see Preparations for Installing HDLM by Performing an Unattended Installation on page 3-29. ○ In <code>removehdml</code> utility: Make sure that there is enough unused capacity for the folder specified by the <code>-w</code> parameter. If there is not, allocate the required amount of capacity, and then retry the operation. For details about how to determine the amount of capacity that is required, see Notes on Removing HDLM on page 3-86.
KAPL09222-E	HDLM could not be removed.	<p>Details</p> <p>HDLM could not be removed.</p> <p>Action</p>

Message ID	Message Text	Explanation
		<p>Contact your HDLM vendor or the maintenance company if there is a maintenance contact of HDLM.</p>
KAPL09223-E	A feature could not be installed. (feature = aa...aa) Contact your HDLM vendor or the maintenance company if there is a maintenance contract of HDLM.	<p>Details</p> <p>You cannot use any features that have not been installed.</p> <p>aa...aa: Feature that has not been installed</p> <ul style="list-style-type: none"> ◦ If the value of aa...aa is HDLM GUI: The HDLM GUI cannot be used. ◦ If Hitachi Command Suite Common Agent Component is used: HDLM cannot be managed from Global Link Manager. ◦ If the value of aa...aa is MPIO Setting: An MPIO setting managed by Windows Management Instrumentation (WMI) has not been changed. <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contact of HDLM.</p>
KAPL09224-E	A feature could not be removed. (feature = aa...aa)	<p>Details</p> <p>A feature for Hitachi Command Suite Common Agent Component could not be removed. HDLM cannot be managed from Global Link Manager.</p> <p>aa...aa: Feature that could not be removed</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contact of HDLM.</p>
KAPL09226-I	An update (QFE) for MPIO has been installed. Driver version = aa...aa Only the HDLM driver will be installed, without overwriting the MPIO driver.	<p>Details</p> <p>If an update (QFE) for MPIO from Microsoft has been installed, the MPIO driver bundled with HDLM will not be installed.</p> <p>aa...aa: Version number of the installed MPIO driver</p> <p>Action</p> <p>None.</p>

Message ID	Message Text	Explanation
		If you want to install the MPIO driver bundled with HDLM, remove the update (QFE) for MPIO, and then install HDLM.
KAPL09253-W	y cannot be specified in the HDLM_core key when all HDLM components are installed.	<p>Details</p> <p>In an environment where all HDLM components have been installed, HDLM cannot be reinstalled or upgraded using the HDLM Core installation option.</p> <p>Action</p> <p>To install HDLM using the HDLM Core installation option in an environment where all the HDLM components have already been installed, remove everything and then perform a new installation of HDLM.</p>
KAPL09254-W	The specified folder does not exist.	<p>Details</p> <p>The folder specified with the <code>-w</code> parameter of the <code>removehdlm</code> utility for installing HDLM does not exist.</p> <p>Action</p> <p>Check the path name of the specified folder.</p>
KAPL09255-W	HDLM has already been removed.	<p>Details</p> <p>The remove stopped because HDLM has already been removed.</p> <p>Action</p> <p>None.</p>
KAPL09256-E	<p>No search paths have been specified for the Path system environment variable.</p> <p>Add the search paths that were specified during the installation of Windows, and then re-install HDLM.</p>	<p>Details</p> <p>No search paths have been specified for the Path system environment variable.</p> <p>The search paths that were specified during the installation of Windows are required for the installation of HDLM.</p> <p>Action</p> <p>Add all of the search paths that were specified during the installation of Windows into the Path system environment variable, and then install HDLM.</p> <p>If you are not sure which search paths were specified during the installation of Windows, contact Microsoft.</p>

Message ID	Message Text	Explanation
KAPL09257-W	<p>HDLM cannot be installed on a system where MPIO <i>aa...aa</i> has already been installed.</p> <p>Delete the MPIO <i>aa...aa</i> setup information files (the INF files) from the system, and then continue the installation.</p>	<p>Details</p> <p>There is an <code>mpio.sys</code> file in the <code>%SystemRoot%\system32\drivers</code> folder whose version is newer than any of the versions that HDLM supports.</p> <p><i>aa...aa</i>: Installed MPIO version</p> <p>Action</p> <p>Before continuing the HDLM installation, delete the MPIO setup information files (the INF files) from the system. For details on how to delete them, see Notes on Related Software on page 3-22.</p> <p>Even after the setup information files are deleted, the KAPL09257-W message will be output when the HDLM installation is re-executed.</p> <p>Select "OK" to continue the installation.</p>
KAPL09258-E	HDLM cannot be installed on a system where MPIO <i>aa...aa</i> has already been installed.	<p>Details</p> <p>There is an <code>mpio.sys</code> file in the <code>%SystemRoot%\system32\drivers</code> folder whose version is newer than any of the versions that HDLM supports.</p> <p><i>aa...aa</i>: Installed MPIO version</p> <p>Action</p> <p>Delete the MPIO setup information files (the INF files) from the system, and then re-execute the HDLM installation by starting <code>Setup.exe</code>. For details on how to delete them, see Notes on Related Software on page 3-22.</p>
KAPL09259-I	The HDLM <i>aa...aa</i> installation check has completed successfully.	<p>Details</p> <p>The HDLM installation check has completed successfully.</p> <p><i>aa...aa</i>: Version of HDLM that will be installed</p> <p>Action</p> <p>None.</p>
KAPL09260-W	<p>Errors were detected during the HDLM <i>aa...aa</i> installation check.</p> <p>See the previous messages to resolve the problems.</p>	<p>Details</p> <p>Errors were detected during the HDLM installation check.</p> <p><i>aa...aa</i>: Version of HDLM that will be installed</p> <p>Action</p>

Message ID	Message Text	Explanation
		See the previous warning and error messages to resolve the problems.
KAPL09261-I	A permanent license will be installed.	Action None.
KAPL09262-I	A temporary license will be installed. The license expires on <i>aa...aa</i> .	Details A temporary license will be installed. <i>aa...aa</i> : Year (4 digits)/Month (01-12)/Day (01-31) Action None.
KAPL09263-I	A emergency license will be installed. The license expires on <i>aa...aa</i> .	Details A emergency license will be installed. <i>aa...aa</i> : Year (4 digits)/Month (01-12)/Day (01-31) Action None.
KAPL09264-I	A permanent license (excluding HDLM Light) will be installed.	Action None.
KAPL09265-I	A temporary license (excluding HDLM Light) will be installed. The license expires on <i>aa...aa</i> .	Details A temporary license (excluding HDLM Light) will be installed. <i>aa...aa</i> : Year (4 digits)/Month (01-12)/Day (01-31) Action None.
KAPL09266-I	A emergency license (excluding HDLM Light) will be installed. The license expires on <i>aa...aa</i> .	Details A emergency license (excluding HDLM Light) will be installed. <i>aa...aa</i> : Year (4 digits)/Month (01-12)/Day (01-31) Action None.
KAPL09281-I	HDLM 6.3.0 or later has been installed. Only the HDLM driver will be installed, without overwriting the MPIO driver.	Details The MPIO driver will not be installed because the version of the installed MPIO driver is the same as the one bundled with HDLM. Action None. If you want to re-install the MPIO driver bundled with HDLM, select

Message ID	Message Text	Explanation
		the [Re-install MPIO driver] check box.
KAPL09283-W	<p>A silent installation cannot be executed by using <i>aa...aa\bin\installhdml.exe</i>.</p> <p>To execute a silent installation, use the HDLM installation utility (installhdml) that is included on the installation media.</p>	<p>Details</p> <p>A silent installation cannot be executed by using <i>HDLM-installation-folder\bin\installhdml.exe</i>.</p> <p><i>aa...aa</i>: HDLM installation folder</p> <p>Action</p> <p>To execute a silent installation, use <i>drive-to-which-the-installation-DVD-is-inserted:\HDLM_Windows\DLMTools\installhdml.exe</i>.</p>
KAPL09284-W	HDLM is not installed.	<p>Details</p> <p>If HDLM is not installed, the <i>installhdml</i> utility for installing HDLM cannot be executed with the <i>-v</i> parameter.</p> <p>Action</p> <p>None.</p>
KAPL09287-W	The HDLM for VMware has already been installed in this system.	<p>Details</p> <p>HDLM for Windows and HDLM for VMware cannot be installed on the same host.</p> <p>Action</p> <p>None.</p>
KAPL09501-E	HDLM is not installed on this system.	<p>Details</p> <p>An SP cannot be applied because HDLM is not installed on the system.</p> <p>Action</p> <p>Check whether HDLM has been correctly installed.</p>
KAPL09504-E	The language environments of HDLM and the Service Pack are different.	<p>Details</p> <p>The Japanese SP was applied to the English edition of HDLM, or vice versa.</p> <p>Action</p> <p>Acquire the SP that has the same language as the installed HDLM, and then try again.</p>
KAPL09505-E	<i>aa...aa</i> cannot be applied to the installed <i>bb...bb</i> .	<p>Details</p> <p><i>aa...aa</i>: the version of HDLM or SP currently being installed</p>

Message ID	Message Text	Explanation
		<p><i>bb...bb</i>: the version of HDLM or SP that is already installed</p> <p>Action</p> <p>An upgrade installation or re-installation cannot be performed on an already installed HDLM or SP. When installing HDLM: First remove the installed HDLM or SP, and then perform a new installation. When installing a SP: Obtain, and then install an SP or corrected version that can be applied to the installed version of HDLM.</p>
KAPL09509-E	Service Pack <i>aa...aa</i> cannot be installed. The same version has already been installed.	<p>Details</p> <p>The version of the SP being installed is the same as the already installed SP. Installation of the SP has stopped.</p> <p><i>aa...aa</i>: Version of the SP being installed</p> <p>Action</p> <p>You do not have to install the SP. Keep using HDLM as is.</p>
KAPL09510-E	Service Pack <i>aa...aa</i> cannot be installed. A newer <i>bb...bb</i> version has already been installed.	<p>Details</p> <p>A newer version of the SP has already been installed. Installation of the SP has stopped.</p> <p><i>aa...aa</i>: The version of the SP to be installed</p> <p><i>bb...bb</i>: The HDLM or SP version that has already been installed</p> <p>Action</p> <p>You do not have to install the SP. Keep using HDLM as is.</p>

KAPL10001 to KAPL11000

Message ID	Message Text	Explanation
KAPL10002-W	Too many parameters have been specified.	<p>Details</p> <p>Four or more parameters have been specified.</p> <p>Action</p> <p>Check the parameters of the <code>DLMgetras</code> utility for collecting HDLM error information, and then retry. For details on the</p>

Message ID	Message Text	Explanation
		DLMgetras utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2 .
KAPL10003-W	The first parameter has not been set to a directory. Value = <i>aa...aa</i>	<p>Details</p> <p>The first parameter must be a folder to which collected information will be output.</p> <p><i>aa...aa</i>: First parameter</p> <p>Action</p> <p>Check the parameters of the DLMgetras utility for collecting HDLM error information, and then retry. For details on the DLMgetras utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL10004-W	The parameter contains an incorrect value. Value = <i>aa...aa</i>	<p>Details</p> <p>The first parameter must be a folder.</p> <p><i>aa...aa</i>: Invalid parameter</p> <p>Action</p> <p>Check the parameters of the DLMgetras utility for collecting HDLM error information, and then retry. For details on the DLMgetras utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL10009-W	The specified directory already exists. Do you want to overwrite it? [y/n]:	<p>Details</p> <p>The specified folder already exists. Enter <i>y</i> to overwrite it, or <i>n</i> to cancel.</p> <p>Action</p> <p>The specified folder already exists. Enter <i>y</i> to overwrite the existing file. Enter <i>n</i> or press any other key to terminate the DLMgetras utility for collecting HDLM error information, without executing it. For details on the DLMgetras utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL10017-W	You lack privileges for executing the utility for collecting HDLM error information.	<p>Details</p> <p>The DLMgetras utility for collecting HDLM error information must be executed by a user who</p>

Message ID	Message Text	Explanation
		<p>is a member of the Administrators group.</p> <p>Action</p> <p>Re-execute the utility as a user who is a member of the Administrators group. For details on the DLMgetras utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL10020-I	The file has been obtained successfully. File = aa...aa, Collection time = bb...bb(GMT:bb...bb)	<p>Details</p> <p>The file to be collected has been obtained.</p> <p>aa...aa: Collected file name bb...bb: Year/month/day hour:minute:second</p> <p>Action</p> <p>None.</p>
KAPL10022-I	The utility for collecting HDLM error information completed normally.	<p>Details</p> <p>Error information has been collected.</p> <p>Action</p> <p>None. For details on the DLMgetras utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL10030-I	A user terminated the utility for collecting HDLM error information.	<p>Details</p> <p>Processing of the DLMgetras utility for collecting HDLM error information has been terminated because the user replied to the confirmation with an n response.</p> <p>Action</p> <p>None. For details on the DLMgetras utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL10031-W	The entered value is invalid. Continue operation ? [y/n]:	<p>Details</p> <p>A value other than y or n has been entered for a [y/n] request. Enter y or n.</p> <p>Action</p> <p>Enter y or n.</p>
KAPL10032-W	The entered value is invalid. The utility for collecting HDLM error information stops.	Details

Message ID	Message Text	Explanation
		<p>Processing of the <code>DLMgetras</code> utility for collecting HDLM error information will terminate because an invalid response was sent three times in a row to a request.</p> <p>Action</p> <p>Re-execute the <code>DLMgetras</code> utility. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL10033-W	The file does not exist. Filename = <i>aa...aa</i>	<p>Details</p> <p>No file to collect information exists.</p> <p><i>aa...aa</i>: Information collection file</p> <p>Action</p> <p>None.</p>
KAPL10034-E	The file could not be copied. Filename = <i>aa...aa</i> , Details = <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: File name you tried to copy</p> <p><i>bb...bb</i>: Error number of the Windows API (hexadecimal number)</p> <p>Action</p> <p>An error occurred while the information collection file was being copied. The error might be a result of an unstable user environment. Check the system configuration.</p>
KAPL10041-I	Collection of <i>aa...aa</i> information will now start.	<p>Details</p> <p><i>aa...aa</i>: Log information to be collected</p> <p>Action</p> <p>None.</p>
KAPL10042-I	Collection of <i>aa...aa</i> information will now finish.	<p>Details</p> <p><i>aa...aa</i>: Collected log information</p> <p>Action</p> <p>None.</p>
KAPL10043-I	Error information is being collected. (<i>aa...aa%</i>)	<p>Details</p> <p><i>aa...aa</i>: What percentage of all the information to be collected is log information</p> <p>Action</p> <p>None.</p>
KAPL10044-W	There is insufficient disk space.	Details

Message ID	Message Text	Explanation
		<p>The <code>DLMgetras</code> utility for collecting HDLM error information execution will now stop because the available disk capacity has decreased to less than 50 MB.</p> <p>Action</p> <p>Re-execute in an environment that has at least 50 MB of free disk capacity.</p>
KAPL10045-W	A parameter is invalid.	<p>Details</p> <p>The specified parameter is invalid.</p> <p>Action</p> <p>Make sure that the parameters for the <code>DLMgetras</code> utility for collecting HDLM error information are appropriate, and then try again.</p>
KAPL10046-W	A parameter value is invalid.	<p>Details</p> <p>The specified parameter is invalid.</p> <p>Action</p> <p>Make sure that the parameters for the <code>DLMgetras</code> utility for collecting HDLM error information are appropriate, and then try again.</p>
KAPL10047-W	A necessary parameter value has not been specified. (parameter = <i>aa...aa</i>)	<p>Details</p> <p>A required parameter value has not been specified.</p> <p><i>aa...aa</i>: Parameter name</p> <p>Action</p> <p>Make sure that the parameters for the <code>DLMgetras</code> utility for collecting HDLM error information are appropriate, and then try again.</p>
KAPL10048-E	An error occurred in internal processing of the utility for collecting HDLM error information. Details = <i>aa...aa</i> , <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: Error number (character string)</p> <p><i>bb...bb</i>: Error number (character string)</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL10080-I	Data for maintenance: <i>aa...aa</i> <i>bb...bb</i> <i>cc...cc</i> <i>dd...dd</i>	<p>Details</p> <p><i>aa...aa</i>: Maintenance information</p> <p><i>bb...bb</i>: Error number of the Windows API (hexadecimal number)</p>

Message ID	Message Text	Explanation
		<p><i>cc...cc</i> and <i>dd...dd</i>: Fixed to 0 (hexadecimal number)</p> <p>Action</p> <p>None</p>
KAPL10081-I	Data for maintenance: <i>aa...aa bb...bb cc...cc dd...dd</i>	<p>Details</p> <p><i>aa...aa</i>: Maintenance information</p> <p><i>bb...bb</i>: Error number of the Windows API (hexadecimal number)</p> <p><i>cc...cc</i> and <i>dd...dd</i>: Fixed to 0 (hexadecimal number)</p> <p><i>ee...ee</i>: The command that could not be executed and the registry key that could not be obtained.</p> <p>Action</p> <p>None</p>
KAPL10640-I	The <code>dlmpr</code> utility completed normally.	<p>Details</p> <p>The <code>dlmpr</code> utility for canceling the HDLM persistent reserve finished normally.</p> <p>Action</p> <p>None. For details on the <code>dlmpr</code> utility, see The <code>dlmpr</code> Utility for Clearing HDLM Persistent Reservations on page 7-10.</p>
KAPL10644-W	The specified parameters cannot be specified at the same time. parameter = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Specified parameter (character string)</p> <p>Action</p> <p>Execute the <code>dlmpr</code> utility for clearing HDLM persistent reservation with the <code>-h</code> parameter to check the parameter, and then retry. For details on the <code>dlmpr</code> utility, see The <code>dlmpr</code> Utility for Clearing HDLM Persistent Reservations on page 7-10.</p>
KAPL10646-W	A parameter is invalid. parameter = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Specified parameter (character string)</p> <p>Action</p> <p>Execute the <code>dlmpr</code> utility for clearing HDLM persistent reservation with the <code>-h</code> parameter to check the parameters that can be specified, and then retry. For details on the <code>dlmpr</code> utility, see The <code>dlmpr</code> Utility for Clearing</p>

Message ID	Message Text	Explanation
		HDLM Persistent Reservations on page 7-10.
KAPL10648-E	An internal error occurred in the <code>dlmpr</code> utility. Error Code = <i>aa...aa</i>	<p>Details <i>aa...aa</i>: Error number (character string)</p> <p>Action Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>dlmpr</code> utility, see The <code>dlmpr</code> Utility for Clearing HDLM Persistent Reservations on page 7-10.</p>
KAPL10651-I	The user terminated the operation.	<p>Action None.</p>
KAPL10652-E	The entered value is invalid. The operation stops	<p>Details An invalid response to a request was entered three times in a row.</p> <p>Action Re-execute the <code>dlmpr</code> utility.</p>
KAPL10653-W	The entered value is invalid. Please Re-enter it [y/n]:	<p>Action Enter <i>y</i> or <i>n</i>.</p>
KAPL10654-W	The parameter (<i>aa...aa</i>) cannot be not specified alone.	<p>Action Specify the correct value for the parameter, and then retry.</p>
KAPL10655-I	Specify the PathID of the LU for which you want to clear persistent reservation information. (To cancel, press the <i>x</i> key):	<p>Action Enter the path ID of the LU for which you want to clear the persistent reservation information, and then press the Enter key or enter <i>n</i> to cancel.</p>
KAPL10656-I	The persistent reservation information of PathID = <i>aa...aa</i> will be cleared. Is this OK ? [y/n]:	<p>Details If you want to clear the persistent reservation information for an LU, we recommend that you report the path ID of that LU to the user for confirmation.</p> <p><i>aa...aa</i>: The path ID (decimal (base-10) number)</p> <p>Action Enter <i>y</i> to execute clearing, or <i>n</i> to cancel.</p>
KAPL10657-I	If you continue this process, the reservation of the LU you specified will be cleared. Please	<p>Details We recommend that you report the effects of using the utility to the user for confirmation.</p>

Message ID	Message Text	Explanation
	confirm that no other servers are accessing this LU.	Action To clear the LU reservation, enter y . Enter n to cancel.
KAPL10658-I	The persistent reservation information of PathID = <i>aa...aa</i> was cleared.	Details <i>aa...aa</i> : The path ID (decimal (base-10) number) Action None.
KAPL10659-I	There is no LU for which persistent reservation information exists.	Action None.
KAPL10660-I	There is no LU managed by HDLM.	Action None.
KAPL10661-E	The SCSI command failed. SCSI Code = <i>aa...aa</i> , Service Action = <i>bb...bb</i> , Status Code = <i>cc...cc</i> , Error Code = <i>dd...dd</i> , LU = <i>ee...ee</i>	Details <i>aa...aa</i> : SCSI Code (hexadecimal number) <i>bb...bb</i> : Service Action (hexadecimal number) <i>cc...cc</i> : Status Code (hexadecimal number) <i>dd...dd</i> : Error code for Windows <i>ee...ee</i> : LU Number (character string) Action If the following two conditions are satisfied, contact your HDLM vendor or maintenance company if you have a maintenance contract for HDLM: <ul style="list-style-type: none"> o The cluster system service and driver are running. o An LU was disconnected from the server during execution of a utility.
KAPL10662-E	Free memory is insufficient.	Action Terminate unnecessary applications, and then retry. If the problem persists, restart the host, and then retry. Alternatively, in <code>dlmpr.exe</code> , specify only the connected LUs for which you want to clear the persistent reservation information.
KAPL10663-W	The input value is invalid. Specify the PathID of the LU for you want to clear persistent reservation information. (To cancel: press the x key):	Action Enter a path ID displayed in the list to continue processing, or enter x to cancel.

Message ID	Message Text	Explanation
KAPL10664-E	An attempt to acquire Inquiry data failed. PortNo = <i>aa...aa</i> , Error Code = <i>bb...bb</i>	<p>Details</p> <p>An error occurred in the issuing of <code>IOCTL_SCSI_GET_INQUIRY_DATA</code> for a SCSI controller. PortNo is the port number of the SCSI controller to which <code>IOCTL_SCSI_GET_INQUIRY_DATA</code> is issued.</p> <p><i>aa...aa</i>: Port number (hexadecimal number) <i>bb...bb</i>: Error code (hexadecimal number)</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL10665-I	The dlmpr utility completed.	<p>Action</p> <p>None. For details on the <code>dlmpr</code> utility, see The <code>dlmpr</code> Utility for Clearing HDLM Persistent Reservations on page 7-10.</p>
KAPL10666-I	There is no persistent reservation information for the LU of PathID = <i>aa...aa</i> . The clear processing will not be executed.	<p>Details</p> <p><i>aa...aa</i>: The path ID of the LU specified by the user.</p> <p>Action</p> <p>None.</p>
KAPL10667-C	An attempt to the get physical drive number failed. LU = <i>aa...aa</i>	<p>Details</p> <p>An LU without a physical drive number existed.</p> <p><i>aa...aa</i>: LU number</p> <p>Action</p> <p>If the following condition is satisfied, contact your HDLM vendor or maintenance company if you have a maintenance contract for HDLM.</p> <ul style="list-style-type: none"> - The cluster system service and the driver are running.
KAPL10668-E	An attempt to open a device failed. DeviceName = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Device name</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL10669-W	The utility for clearing HDLM persistent reservation (dlmpr)	<p>Action</p> <p>The <code>dlmpr</code> utility can be executed only when a persistent reservation</p>

Message ID	Message Text	Explanation
	cannot be executed because HDLM is installed.	remains after HDLM is removed. To execute the <code>dlmpr</code> utility, remove HDLM, and then reboot the host.

KAPL11001 to KAPL12000

Message ID	Message Text	Explanation
KAPL11901-I	<i>aa...aa</i> has started.	<p>Details</p> <p>The operation has started on the host.</p> <p><i>aa...aa</i> : Operation (character string)</p> <ul style="list-style-type: none"> ◦ Get Path Information ◦ Get Option Information ◦ Set Option Information ◦ Clear Data ◦ Get HDLM Manager Status ◦ Get HDLM Driver Status ◦ Get HDLM Alert Driver Status ◦ Get SNMP Trap Information ◦ Set SNMP Trap Information ◦ Set LU Load Balance ◦ Get Path Status Log Information ◦ Get Local Time ◦ Add Path Information ◦ Delete Path Information ◦ Set Storage Identification Information <p>Action</p> <p>None.</p>
KAPL11902-I	<i>aa...aa</i> has started. PathID = <i>bb...bb</i>	<p>Details</p> <p>The operation has started on the host.</p> <p><i>aa...aa</i>: Operation (character string)</p> <ul style="list-style-type: none"> ◦ Online ◦ Offline <p><i>bb...bb</i>: The Path ID of the target path (decimal number)</p> <p>Action</p>

Message ID	Message Text	Explanation
		<p>None.</p>
KAPL11903-I	<i>aa...aa</i> has completed normally.	<p>Details</p> <p>The operation has completed normally on the host.</p> <p><i>aa...aa</i>: Any of the following operations (character string)</p> <ul style="list-style-type: none"> ◦ Get Path Information ◦ Get Option Information ◦ Set Option Information ◦ Clear Data ◦ Get HDLM Driver Status ◦ Get HDLM Manager Status ◦ Get HDLM Alert Driver Status ◦ Online ◦ Offline ◦ Get SNMP Trap Information ◦ Set SNMP Trap Information ◦ Set LU Load Balance ◦ Get Path Status Log Information ◦ Get Local Time ◦ Add Path Information ◦ Delete Path Information ◦ Set Storage Identification Information <p>Action</p> <p>None.</p>
KAPL11904-E	<i>aa...aa</i> has completed abnormally. Error status = <i>bb...bb</i>	<p>Details</p> <p>The operation has completed abnormally on the host.</p> <p><i>aa...aa</i>: Operation (character string)</p> <ul style="list-style-type: none"> ◦ Get Path Information ◦ Get Option Information ◦ Set Option Information ◦ Clear Data ◦ Get HDLM Driver Status ◦ Get HDLM Manager Status ◦ Get HDLM Alert Driver Status ◦ Online ◦ Offline

Message ID	Message Text	Explanation
		<ul style="list-style-type: none"> ○ Get SNMP Trap Information ○ Set SNMP Trap Information ○ Set LU Load Balance ○ Get Path Status Log Information ○ Add Path Information ○ Delete Path Information ○ Set Storage Identification Information <p><i>bb...bb:</i> Error status returned from API (character string)</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if you have a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL11905-E	An unexpected error occurred.	<p>Details</p> <p>An exception occurred during processing on the host.</p> <p>Action</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if you have a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
KAPL11906-I	GUI information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for resolving problems.</p> <p><i>aa...aa:</i> Trace information (character string)</p> <p>Action</p> <p>None.</p>
KAPL11907-I	XML reception - <i>aa...aa</i>	<p>Details</p> <p>This information is required for resolving problems.</p> <p><i>aa...aa:</i> XML information (character string)</p>

Message ID	Message Text	Explanation
		Action None.
KAPL11908-I	XML transmission - aa...aa	Details This information is required for resolving problems. aa...aa: XML information (character string) Action None.

KAPL12001 to KAPL13000

Message ID	Message Text	Explanation
KAPL12101-W	A parameter has not been specified.	Action Make sure that the parameters for the <code>dlmprvkey</code> utility for registering an HDLM persistent reservation key are appropriate, and then try again. For details on the <code>dlmprvkey</code> utility, see The <code>dlmprvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13 .
KAPL12102-W	There are too many parameters	Action Make sure that the parameters for the <code>dlmprvkey</code> utility for registering an HDLM persistent reservation key are appropriate, and then try again. For details on the <code>dlmprvkey</code> utility, see The <code>dlmprvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13 .
KAPL12103-W	The parameter value is invalid. (value = aa...aa)	Details The first parameter must be <code>-r</code> , <code>-v</code> , or <code>-h</code> . When the <code>-r</code> parameter is specified, the second parameter must be the <code>-s</code> parameter or must have 16 digits and be hexadecimal. When the <code>-h</code> parameter is specified, values other than the <code>-h</code> parameter cannot be entered for the parameter. aa...aa: Invalid parameter (character string)

Message ID	Message Text	Explanation
		<p>Action</p> <p>Make sure that the parameters for the <code>dlmprvkey</code> utility for registering an HDLM persistent reservation key are appropriate, and then try again. For details on the <code>dlmprvkey</code> utility, see The <code>dlmprvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13.</p>
KAPL12104-I	The operation for PRSV key registration will now start. Is this OK? [y/n]:	<p>Details</p> <p>PRSV key registration is ready to start. To continue, enter <code>y</code>. To cancel, enter <code>n</code>.</p> <p>Action</p> <p>To execute the operation, enter <code>y</code>. To stop the operation, enter <code>n</code>.</p>
KAPL12105-W	The user does not have permission to execute the utility for registering HDLM persistent reservation key.	<p>Details</p> <p>The <code>dlmprvkey</code> utility for registering an HDLM persistent reservation key must be executed by a user who is a member of the Administrators group.</p> <p>Action</p> <p>Try again as a user who is a member of the Administrators group. For details on the <code>dlmprvkey</code> utility, see The <code>dlmprvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13.</p>
KAPL12106-I	An attempt to register the PRSV key was successful. (PRSV key = <code>aa...aa</code>)	<p>Details</p> <p><code>aa...aa</code>: Registered PRSV key (character string)</p> <p>Action</p> <p>None.</p>
KAPL12107-W	An attempt to register the PRSV key has failed. (PRSV key = <code>aa...aa</code>)	<p>Details</p> <p><code>aa...aa</code>: Registered PRSV key (character string)</p> <p>Action</p> <p>Check whether HDLM has been installed correctly. If it has, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL12108-I	The utility for registering the HDLM persistent reservation key finished due to a user specification.	<p>Details</p>

Message ID	Message Text	Explanation
		<p>Processing of the <code>dlmprvkey</code> utility for registering an HDLM persistent reservation key has stopped, because the user input n as a response to the confirmation.</p> <p>Action</p> <p>None. For details on the <code>dlmprvkey</code> utility, see The <code>dlmprvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13.</p>
KAPL12110-W	The entered value is invalid. Processing of the utility for registering the HDLM persistent reservation key will now terminate.	<p>Details</p> <p>Processing of the <code>dlmprvkey</code> utility for registering an HDLM persistent reservation key will now stop, because an invalid response was made three times in a row for the response request.</p> <p>Action</p> <p>Re-execute the <code>dlmprvkey</code> utility. For details on the <code>dlmprvkey</code> utility, see The <code>dlmprvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13.</p>
KAPL12111-E	The registry key for the registration destination does not exist.	<p>Details</p> <p>The registry key <code>HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\HDLMdsm\Parameters\PRSVKeyString</code> does not exist.</p> <p>Action</p> <p>Check whether HDLM has been installed correctly. If it has, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL12112-E	An error occurred during internal processing of the utility for registering the HDLM persistent reservation key. Details = aa...aa, bb...bb	<p>Details</p> <p>During processing of the <code>dlmprvkey</code> utility for registering an HDLM persistent reservation key, an error occurred that was probably not a result of a user operation.</p> <p><code>aa...aa</code>: Error detail <code>bb...bb</code>: Error Code (character string)</p> <p>Action</p>

Message ID	Message Text	Explanation
		<p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>dlmprvkey</code> utility, see The <code>dlmprvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13.</p>
KAPL12113-E	An attempt to acquire the PRSV key has failed.	<p>Details</p> <p>An attempt to acquire the PRSV key from the registry key <code>HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\HDLMdsm\Parameters\PRSVKeyString</code> failed when the <code>dlmprvkey</code> utility for registering an HDLM persistent reservation key was executed with <code>-v</code> specified.</p> <p>Action</p> <p>If the PRSV key was not registered using the <code>dlmprvkey</code> utility, register the PRSV key, and then re-execute the utility with the <code>-v</code> option. If the PRSV key has been registered, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. For details on the <code>dlmprvkey</code> utility, see The <code>dlmprvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13.</p>
KAPL12114-E	An invalid PRSV key has been registered.	<p>Details</p> <p>An invalid PRSV key has been entered in the registry key <code>HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\HDLMdsm\Parameters\PRSVKeyString</code>.</p> <p>Action</p> <p>Execute the <code>dlmprvkey</code> utility for registering an HDLM persistent reservation key to register a valid PRSV key.</p>
KAPL12115-E	An attempt to generate the PRSV key has failed.	<p>Action</p> <p>Specify the <code>-r</code> parameter for the PRSV key, and then try again. For details on the <code>dlmprvkey</code> utility, see The <code>dlmprvkey</code> Utility for Registering an HDLM Persistent Reservation Key on page 7-13.</p>

Message ID	Message Text	Explanation
KAPL12116-I	The registered PRSV key will now be displayed. (PRSV key = <i>aa...aa</i>)	<p>Details</p> <p>The PRSV key registered in the registry key <code>HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\HDLMdsm\Parameters\PRSVKeyString</code> will now be displayed.</p> <p><i>aa...aa</i>: PRSV key</p> <p>Action</p> <p>None.</p>
KAPL12117-I	Trace data for maintenance: registered PRSV key = <i>aa...aa</i>	<p>Details</p> <p>Output when PRSV key registration is successful. <i>aa...aa</i> contains the PRSV key (hexadecimal number). Message for trace logs.</p> <p>Action</p> <p>None.</p>
KAPL12118-E	Trace data for maintenance: <i>aa...aa bb...bb cc...cc dd...dd</i>	<p>Details</p> <p>This is the trace message when the <code>-r</code> parameter is specified and an error occurs before the PRSV key is generated, or when the <code>-v</code> parameter is specified and an error occurs before the PRSV key can be acquired.</p> <p><i>aa...aa</i>: Maintenance information 1 (hexadecimal number)</p> <p><i>bb...bb</i>: Maintenance information 2 (hexadecimal number)</p> <p><i>cc...cc</i>: Maintenance information 3 (hexadecimal number)</p> <p><i>dd...dd</i>: Maintenance information 4 (hexadecimal number)</p> <p>Action</p> <p>None.</p>
KAPL12119-E	Trace data for maintenance: <i>aa...aa bb...bb cc...cc dd...dd ee...ee</i>	<p>Details</p> <p>This is the trace message when the <code>-r</code> parameter is specified and an error occurs before the PRSV key is generated, or when the <code>-v</code> parameter is specified and an error occurs before the PRSV key can be acquired.</p> <p><i>aa...aa</i>: Maintenance information 1 (hexadecimal number)</p> <p><i>bb...bb</i>: Maintenance information 2 (hexadecimal number)</p>

Message ID	Message Text	Explanation
		<p><i>cc...cc</i>: Maintenance information 3 (hexadecimal number)</p> <p><i>dd...dd</i>: Maintenance information 4 (hexadecimal number)</p> <p><i>ee...ee</i>: PRSV key (hexadecimal number)</p> <p>Action</p> <p>None.</p>
KAPL12150-W	An error occurred during internal processing of HDLM Performance Monitor. HDLM Performance Monitor cannot start. Details = <i>aa...aa</i>	<p>Details</p> <p>An attempt to start HDLM Performance Monitor has failed.</p> <p>There might not be enough memory or the host might be under a heavy load.</p> <p>This message might also be output when the WMI repository is corrupted.</p> <p><i>aa...aa</i>: Error details (character string)</p> <p>Action</p> <p>Check the system status.</p> <p>If this message is output repeatedly, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>If the WMI repository is corrupted, consider rebuilding the repository.</p>
KAPL12151-W	A Windows Management Instrumentation service access error occurred. Details = <i>aa...aa, bb...bb</i>	<p>Details</p> <p>A Windows Management Instrumentation service access error occurred.</p> <p>The Windows Management Instrumentation service might not be working.</p> <p>This message might also be output when the WMI repository is corrupted.</p> <p><i>aa...aa</i>: API name (character string)</p> <p><i>bb...bb</i>: Error code (decimal (base-10) number)</p> <p>Action</p> <p>Check whether the Windows Management Instrumentation service is working. If not, start it. If the service cannot be started or if the problem is not solved even after restarting the service,</p>

Message ID	Message Text	Explanation
		<p>contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>If the WMI repository is corrupted, consider rebuilding the repository.</p>
KAPL12152-W	An error occurred during internal processing of HDLM Performance Monitor. Details = <i>aa...aa, bb...bb</i>	<p>Details</p> <p>During Performance Monitor processing, an error occurred that was probably not a result of a user operation.</p> <p>There might not be enough memory or the host might be under a heavy load.</p> <p>This message might also be output when the WMI repository is corrupted.</p> <p><i>aa...aa</i>: Internal processing name (character string) <i>bb...bb</i>: Error code (decimal (base-10) number)</p> <p>Action</p> <p>Check the system status.</p> <p>If this message is output repeatedly, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>If the WMI repository is corrupted, consider rebuilding the repository.</p>
KAPL12401-I	All LUs managed by HDLM are in a single path configuration.	<p>Details</p> <p>This message is displayed when the number of LUs managed by HDLM is 0.</p> <p>Action</p> <p>None.</p>
KAPL12402-W	iLU (<i>aa...aa</i>) is in a multi-path configuration. PathID = <i>bb...bb[,cc...cc]...</i>	<p>Details</p> <p>The LU for the LU number in the message is not in a single path configuration.</p> <p><i>aa...aa</i>: LU number <i>bb...bb,cc...cc</i>: Path ID of the path connected to the LU</p> <p>Action</p> <p>Before performing remove, upgrade installation, or re-installation, change all the LUs to a single path configuration.</p>

Message ID	Message Text	Explanation
KAPL12403-W	A necessary parameter has not been specified.	<p>Action</p> <p>Execute the <code>dlmchkpath</code> utility for checking HDLM paths with the <code>-h</code> parameter to check the parameter, and then retry. For details on the <code>dlmchkpath</code> utility, see The <code>dlmchkpath</code> Utility for Checking HDLM Paths on page 7-14.</p>
KAPL12404-W	A parameter is invalid. Parameter = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Specified parameter</p> <p>Action</p> <p>Execute the <code>dlmchkpath</code> utility for checking HDLM paths with the <code>-h</code> parameter to check the parameter, and then retry. For details on the <code>dlmchkpath</code> utility, see The <code>dlmchkpath</code> Utility for Checking HDLM Paths on page 7-14.</p>
KAPL12405-E	Cannot execute the utility for checking HDLM paths due to insufficient memory.	<p>Details</p> <p>Not enough memory could be allocated for the <code>dlmchkpath</code> utility for checking HDLM paths.</p> <p>Action</p> <p>Terminate unnecessary applications to increase the amount of free memory.</p> <p>Alternatively, restart the host.</p>
KAPL12406-E	An error occurred in internal processing of the utility for checking HDLM paths. Error code = <i>aa...aa</i> , details code = <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: Error code</p> <p><i>bb...bb</i>: Details code</p> <p>Action</p> <ul style="list-style-type: none"> ○ Error code: 22 <ul style="list-style-type: none"> Check whether HDLM has been installed correctly. If it has, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM. ○ Error code: Others <ul style="list-style-type: none"> Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.

KAPL13001 to KAPL14000

Message ID	Message Text	Explanation
KAPL13601-W	The audit log configuration file does not exist. Execute the "dlnkmgr view -sys -audlog" command and check the setting.	<p>Details</p> <p>The audit log configuration file does not exist.</p> <p>Action</p> <p>Restart the HDLM manager, execute the <code>dlnkmgr view -sys -audlog</code> command, and then specify any desired settings by using the <code>dlnkmgr set -audlog</code> command.</p>
KAPL13602-W	The audit log configuration file cannot be opened. Execute the "dlnkmgr view -sys -audlog" command and check whether a normal result is displayed.	<p>Details</p> <p>The audit log configuration file cannot be opened.</p> <p>Action</p> <p>If the <code>dlnkmgr view -sys -audlog</code> command does not display a normal result, contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>
KAPL13603-W	The audit log configuration file is invalid. Execute the "dlnkmgr view -sys -audlog" command and check the setting.	<p>Details</p> <p>The audit log configuration file is invalid.</p> <p>Action</p> <p>Restart the HDLM manager, execute the <code>dlnkmgr view -sys -audlog</code> command, and then specify any desired settings by using the <code>dlnkmgr set -audlog</code>.</p>
KAPL13604-W	An error occurred during processing to read the audit log configuration file.	<p>Details</p> <p>An internal error occurred during processing to read the audit log configuration file.</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL13605-W	An error occurred during processing to output the audit log configuration file.	<p>Details</p> <p>An internal parameter error occurred during output of the audit log data.</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>

Message ID	Message Text	Explanation
KAPL13606-W	An error occurred during processing to output the audit log configuration file.	<p>Details</p> <p>An internal error occurred during output of the audit log data.</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL13801-I	The <code>dlmhostinfo</code> utility for confirming HDLM installation information completed normally.	<p>Details</p> <p>Installation information has been output.</p> <p>Action</p> <p>None.</p>
KAPL13802-W	Installation information failed to be output.	<p>Details</p> <p>Installation information was not output because an error occurred in the <code>dlmhostinfo</code> utility for confirming HDLM installation information.</p> <p>Action</p> <p>Determine the cause of the error by referring to the previous warning or error message.</p>
KAPL13803-W	The user does not have the privileges required to execute the <code>dlmhostinfo</code> utility for confirming HDLM installation information.	<p>Details</p> <p>The <code>dlmhostinfo</code> utility must be executed by a user with Administrator group privileges.</p> <p>Action</p> <p>Re-execute the <code>dlmhostinfo</code> utility as a user with Administrator group privileges.</p>
KAPL13804-W	Too many parameters have been specified.	<p>Details</p> <p>Three or more parameters have been specified.</p> <p>Action</p> <p>Check the parameters for the <code>dlmhostinfo</code> utility for confirming HDLM installation information, and then re-execute the utility.</p>
KAPL13805-W	At least one parameter is invalid.	<p>Details</p> <p>At least one of the specified parameters is invalid.</p> <p>Action</p> <p>Check the parameters for the <code>dlmhostinfo</code> utility for confirming HDLM installation information, and then re-execute the utility.</p>

Message ID	Message Text	Explanation
KAPL13806-W	The installation information file has not been specified.	<p>Details</p> <p>The installation information file has not been specified for the second parameter.</p> <p>Action</p> <p>Check the parameters for the <code>dlmhostinfo</code> utility for confirming HDLM installation information, and then re-execute the utility.</p>
KAPL13807-W	HDLM is not installed.	<p>Details</p> <p>The <code>dlmhostinfo</code> utility for confirming HDLM installation information cannot be executed if HDLM is not installed.</p> <p>Action</p> <p>None.</p>
KAPL13808-W	An attempt to create the installation information file has failed. Code = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Error code (decimal number)</p> <p>The installation information file will not be created if any of the following conditions are met:</p> <ul style="list-style-type: none"> ○ The installation information file already exists. ○ A folder with the same name as the installation information file exists. ○ The parent folder does not exist. ○ The user does not have write permission for the parent folder. <p>Action</p> <p>Make sure that the installation information file does not meet any of the above conditions.</p>
KAPL13809-E	An internal error occurred in the <code>dlmhostinfo</code> utility for confirming HDLM installation information. Code = <i>aa...aa, bb...bb</i>	<p>Details</p> <p>An error, which does not seem to be a result of a user action, occurred during processing of the <code>dlmhostinfo</code> utility.</p> <p><i>aa...aa</i>: Error code (decimal number)</p> <p><i>bb...bb</i>: Details code (decimal number)</p> <p>When the Code is "2, 403", an HDLM version earlier than 6.0.0 might be installed.</p>

Message ID	Message Text	Explanation
		<p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>

KAPL15001 to KAPL16000

Message ID	Message Text	Explanation
KAPL15010-W	The HDLM utility was executed by the user who does not have the authority. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the utility that the user executed</p>
KAPL15030-I	An HDLM persistent reservation key was successfully registered. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the utility that the user executed</p>
KAPL15031-W	An attempt to register an HDLM persistent reservation key has failed. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the utility that the user executed</p>
KAPL15032-I	An HDLM persistent reservation key was successfully displayed. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the utility that the user executed</p>
KAPL15033-W	An attempt to display an HDLM persistent reservation key has failed. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the utility that the user executed</p>
KAPL15034-I	The status that indicates whether paths are in an individual or multiple path configuration was successfully displayed. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the utility that the user executed</p>
KAPL15035-W	An attempt to display the status that indicates whether paths are in an individual or multiple path configuration has failed. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the utility that the user executed</p>
KAPL15060-I	DLMgetras was invoked. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the utility that the user executed</p>
KAPL15061-I	DLMgetras successfully executed. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the utility that the user executed</p>
KAPL15101-I	Clear operation was completed successfully. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Command that the user executed</p>

Message ID	Message Text	Explanation
KAPL15102-W	Clear operation has failed. Command Line = <i>aa...aa</i>	Details <i>aa...aa</i> : Command that the user executed
KAPL15103-I	<i>aa...aa</i> path(s) were successfully placed <i>bb...bb</i> . <i>cc...cc</i> path(s) were not. Command Line = <i>bb...bb</i>	Details <i>aa...aa</i> : Number of paths where online/offline is successful <i>bb...bb</i> : Online, Online(S), Online(D) or Offline(c) <i>cc...cc</i> : Number of paths where online/offline is unsuccessful
KAPL15104-W	<i>aa...aa</i> path(s) were failed to place <i>bb...bb</i> . Command Line = <i>cc...cc</i>	Details <i>aa...aa</i> : Number of paths that failed to be placed online or offline <i>bb...bb</i> : Online or Offline(c) <i>cc...cc</i> : Command that the user executed
KAPL15105-I	Setting up the operating environment succeeded. Command Line = <i>aa...aa</i>	Details <i>aa...aa</i> : Command that the user executed
KAPL15106-W	Setting up the operating environment failed. Command Line = <i>aa...aa</i>	Details <i>aa...aa</i> : Command that the user executed
KAPL15107-I	Program information was successfully displayed. Command Line = <i>aa...aa</i>	Details <i>aa...aa</i> : Command that the user executed
KAPL15108-W	An attempt to display program information has failed. Command Line = <i>aa...aa</i>	Details <i>aa...aa</i> : Command that the user executed
KAPL15109-I	Information about HDLM-management targets was successfully displayed. Command Line = <i>aa...aa</i>	Details <i>aa...aa</i> : Command that the user executed
KAPL15110-W	An attempt to display information about HDLM-management targets has failed. Command Line = <i>aa...aa</i>	Details <i>aa...aa</i> : Command that the user executed
KAPL15111-W	The HDLM command was started or stopped by the user who does not have the authority. Command Line = <i>aa...aa</i>	Details <i>aa...aa</i> : Command that the user executed
KAPL15116-I	<i>bb...bb</i> path(s) were successfully placed <i>aa...aa</i> . <i>dd...dd</i> path(s) were successfully placed <i>cc...cc</i> .	Details <i>aa...aa</i> : Online or Online(S)

Message ID	Message Text	Explanation
	ee...ee path(s) were not. Command Line = online	<p><i>bb...bb</i>: The number of paths which changed to the Online or Online(S) status</p> <p><i>cc...cc</i>: Online(S), Online(D) or Online(S)/Online(D)</p> <p><i>dd...dd</i>: The number of paths which changed to the Online(S) or Online(D) status</p> <p><i>ee...ee</i>: The number of paths which failed to change to either the Online, Online(S) or Online(D) status</p>
KAPL15119-I	Deletion of path(s) succeeded. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Command that the user executed</p>
KAPL15120-W	Deletion of path(s) failed. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Command that the user executed</p>
KAPL15121-I	The storage system settings were successfully refreshed. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Command that the user executed</p>
KAPL15122-W	The refresh of the storage system settings failed. Command Line = <i>aa...aa</i>	<p>Details</p> <p><i>aa...aa</i>: Command that the user executed</p>
KAPL15201-I	HDLM GUI has started successfully.	-
KAPL15202-I	HDLM GUI has terminated.	-
KAPL15203-W	HDLM GUI was executed by the user who does not have the authority.	-
KAPL15204-W	HDLM GUI has not started successfully.	-
KAPL15205-I	<i>aa...aa</i> has completed successfully.	<p>Details</p> <p><i>aa...aa</i>: Refresh, Clear Data, Export CSV, Get Option Information, Set Option Information, or Refresh of the GAD non-preferred path option settings</p>
KAPL15206-W	<i>aa...aa</i> has failed.	<p>Details</p> <p><i>aa...aa</i>: Refresh, Clear Data, Export CSV, Get Option Information, Set Option Information, or Refresh of the GAD non-preferred path option settings</p>

Message ID	Message Text	Explanation
KAPL15207-I	<i>aa...aa</i> path(s) were successfully placed <i>bb...bb</i> . <i>cc...cc</i> path(s) could not be placed <i>bb...bb</i> .	Details <i>aa...aa</i> : Number of paths that were successfully placed online or offline <i>bb...bb</i> : Online or Offline <i>cc...cc</i> : Number of paths that failed to be placed online or offline
KAPL15208-W	<i>aa...aa</i> path(s) were failed to place <i>bb...bb</i> .	Details <i>aa...aa</i> : Number of paths that failed to be placed online or offline <i>bb...bb</i> : Online or Offline
KAPL15401-I	HDLM Manager successfully started.	-
KAPL15402-W	Could not start the HDLM manager.	-
KAPL15403-I	HDLM Manager successfully stopped.	-
KAPL15404-W	The HDLM Manager was executed by the user who does not have the authority.	-

Return Codes for Hitachi Command Suite Common Agent Component

When an operation requested of HDLM from Global Link Manager terminates abnormally, or terminates normally with a warning, HDLM outputs one of the return codes described below.

Return Code	Explanation
1002	Details There is no path on which the operation can be performed. Action Refresh the host information, check the path status, and then perform the operation again.
1003	Details No path was detected. Action Check whether a path between the host and the storage system is connected. If a path is connected, check whether HDLM is configured correctly.
1004	Details Memory required for HDLM internal processing could not be allocated.

Return Code	Explanation
	<p>Action Terminate unnecessary applications to increase free memory, or restart the host.</p>
1006	<p>Details An <code>Offline</code> path cannot be placed <code>Online</code>. Action Remove the error in the path, and then retry.</p>
1007	<p>Details The target path of the offline operation is the last, remaining path connected to the device and therefore, cannot be placed in the offline status. Action Click Refresh to update the host information, check the path status, and then retry the offline operation.</p>
1015	<p>Details The <code>Offline</code> path cannot be placed <code>Online</code>. Action Remove the error in the path, and then retry.</p>
1016	<p>Details The target path(s) are already <code>Online</code>. Action Update the host information, and then check the path status.</p>
1017	<p>Details The target path(s) are already <code>Offline (C)</code>. Action Update the host information, and then check the path status.</p>
1019	<p>Details An error occurred during HDLM internal processing. Action Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if you have a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
1020	<p>Details An unexpected error occurred during HDLM internal processing. Action Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if you have a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>

Return Code	Explanation
1021	<p>Details MSCS is not installed on the host.</p> <p>Action Execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or the maintenance company if you have a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
1022	<p>Details Batch registration of <code>offline</code> processing was performed.</p> <p>Action Refresh the host information, and then check the path status.</p>
1023	<p>Details Batch registration of <code>offline</code> processing has already been performed.</p> <p>Action Refresh the host information, and then check the path status.</p>
1024	<p>Details The configuration does not allow the load balancing function to be used in a cluster.</p> <p>Action Make sure that all HDLM-managed storage systems support persistent reservations on the host. Contact your storage system vendor or maintenance company to check whether the storage systems you are using support persistent reservations.</p>
1025	<p>Details A parameter value is invalid.</p> <p>Action Refresh the host information, and then perform the operation again. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if you have a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
1026	<p>Details The acquisition of path information has been aborted, because the path configuration was changed while the system was attempting to acquire the path information.</p> <p>Action Refresh the host information, check the path status, and then perform the operation again.</p>
1027	<p>Details The error monitoring interval and the number of times that the error needs to occur are conflicting with the automatic fallback-checking interval.</p>

Return Code	Explanation
	<p>Action</p> <p>Set the intermittent error-monitoring interval to a value that is equal to or greater than (<i>automatic-fallback-checking-interval</i> x <i>number-of-times-error-is-to-occur-for-intermittent-error-monitoring</i>).</p>
1033	<p>Details</p> <p>An attempt to acquire the HDLM version information failed.</p> <p>Action</p> <p>Re-execute the command. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
1034	<p>Details</p> <p>An attempt to acquire information about the HDLM version or SP version has failed.</p> <p>Action</p> <p>Re-execute the command. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
1035	<p>Details</p> <p>An attempt to acquire information about the HDLM version or SP version has failed.</p> <p>Action</p> <p>Re-execute the command. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
1036	<p>Details</p> <p>An attempt to acquire information about the HDLM version or SP version has failed.</p> <p>Action</p> <p>Re-execute the command. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The DLMgetras Utility for Collecting HDLM Error Information on page 7-2.</p>
1037	<p>Details</p> <p>A parameter is invalid.</p> <p>Action</p>

Return Code	Explanation
	Refresh the host information, and then perform the operation again. If the same error occurs again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if you have a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2 .
1038	<p>Details A storage system that cannot use the load balancing function is connected.</p> <p>Action Check the system configuration. One or more connected storage systems cannot use the load balancing function. The load balancing function does not operate on the LUs of such storage systems.</p>
1041	<p>Details An attempt to communicate with the HDLM manager has failed.</p> <p>Action Check whether the HDLM manager is running on the host. If it is not running, start the HDLM manager.</p>
1042	<p>Details Information about the path configuration on the specified LU does not match the path configuration information held by HDLM.</p> <p>Action Refresh the host information, check the path status, and then perform the operation again.</p>
1043	<p>Details The specified LU is part of a storage system that cannot use the load balancing function.</p> <p>Action Check the storage system of the LU that is connected by the specified path.</p>
1045	<p>Details A parameter is invalid.</p> <p>Action Refresh the host information, and then perform the operation again. If the same error occurs even again, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if you have a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2.</p>
1046	<p>Details A parameter is invalid.</p> <p>Action Refresh the host information, and then perform the operation again. If the same error occurs again, execute the <code>DLMgetras</code> utility for</p>

Return Code	Explanation
	collecting HDLM error information, and then contact your HDLM vendor or maintenance company if you have a maintenance contract for HDLM. For details on the <code>DLMgetras</code> utility, see The <code>DLMgetras</code> Utility for Collecting HDLM Error Information on page 7-2 .
1063	<p>Details An attempt to update global-active device non-preferred path option failed.</p> <p>Action If a path error occurs during an update operation and this message is output, perform recovery for the path error to return the path to the online status, and then try the operation again. If this message is output when there are no offline paths, execute the <code>DLMgetras</code> utility for collecting HDLM error information, and then contact your HDLM vendor or maintenance company if you have a maintenance contract for HDLM.</p>

Events Output to Windows Event Logs by HDLM

The following table lists [Table 8-3 Events Output to the Windows Application Log on page 8-120](#) and [Table 8-4 Events Output to the Windows System Log on page 8-121](#) events output by HDLM to Windows event logs.

Table 8-3 Events Output to the Windows Application Log

Message ID	Type	Source	Category	Event ID	User
KAPL04001-I	Information	DLManager	None	16385	N/A
KAPL04002-E	Error	DLManager	None	16386	N/A
KAPL04003-E	Error	DLManager	None	16387	N/A
KAPL04004-I	Information	DLManager	None	16388	N/A
KAPL04005-E	Error	DLManager	None	16389	N/A
KAPL04006-E	Error	DLManager	None	16390	N/A
KAPL04007-E	Error	DLManager	None	16391	N/A
KAPL04008-E	Error	DLManager	None	16392	N/A
KAPL04009-E	Error	DLManager	None	16393	N/A
KAPL04010-E	Error	DLManager	None	16394	N/A
KAPL04011-E	Error	DLManager	None	16395	N/A
KAPL04012-E	Error	DLManager	None	16396	N/A
KAPL04013-E	Error	DLManager	None	16397	N/A
KAPL04014-E	Error	DLManager	None	16398	N/A
KAPL04019-E	Error	DLManager	None	16403	N/A

Message ID	Type	Source	Category	Event ID	User
KAPL04023-E	Error	DLMManager	None	16407	N/A
KAPL04024-C	Error	DLMManager	None	16408	N/A
KAPL04025-C	Error	DLMManager	None	16409	N/A
KAPL04026-I	Information	DLMManager	None	16410	N/A
KAPL04027-I	Information	DLMManager	None	16411	N/A
KAPL04028-E	Error	DLMManager	None	16412	N/A
KAPL04029-E	Error	DLMManager	None	16413	N/A
KAPL04030-E	Error	DLMManager	None	16414	N/A
KAPL04031-E	Error	DLMManager	None	16415	N/A
KAPL04032-C	Error	DLMManager	None	16416	N/A
KAPL04033-W	Warning	DLMManager	None	16417	N/A
KAPL04034-E	Error	DLMManager	None	16418	N/A
KAPL05008-E	Error	DLMManager	None	20488	N/A
KAPL05010-E	Error	DLMManager	None	20490	N/A
KAPL07820-E	Error	DLMManager	None	29492	N/A
KAPL08019-E	Error	DLMManager	None	32787	N/A
KAPL08022-E	Error	DLMManager	None	32790	N/A
KAPL08023-I	Information	DLMManager	None	32791	N/A
KAPL08025-I	Information	DLMManager	None	32793	N/A
KAPL08026-E	Error	DLMManager	None	32794	N/A
KAPL08027-E	Error	DLMManager	None	32795	N/A
KAPL12150-W	Warning	PerfHdIm	None	60033	N/A
KAPL12151-W	Warning	PerfHdIm	None	60034	N/A
KAPL12152-W	Warning	PerfHdIm	None	60035	N/A
KAPL12151-W	Warning	ProvHdIm	None	60034	N/A
KAPL12152-W	Warning	ProvHdIm	None	60035	N/A

Table 8-4 Events Output to the Windows System Log

Message ID	Type	Source	Category	Event ID	User
KAPL05301-E	Error	hdlmdsm	None	20781	N/A

Functional Differences Between Versions of HDLM

This section explains the functional differences between newer and older versions of HDLM.

- [Functional Differences Between Version 6.6 or Later and Versions Earlier Than 6.6](#)
- [Functional Differences Between Version 6.2 or Later and Versions Earlier Than 6.2](#)
- [Functional Differences Between Version 6.0.1 or Later and Versions Earlier Than 6.0.1](#)
- [Functional Differences Between Version 6.0 or Later and Versions Earlier Than 6.0](#)
- [Functional Differences Between Version 5.9.4 or Later and Versions Earlier Than 5.9.4](#)
- [Functional Differences Between Version 5.9.1 or Later and Versions Earlier Than 5.9.1](#)
- [Functional Differences Between Versions 5.9 or Later and Versions Earlier Than 5.9](#)
- [Path Status Transition and Automatic Path Switching](#)
- [Differences in the LU Dynamic Removal Function](#)
- [Differences in the Drive Letters Displayed in Windows](#)

- [Differences in Default Values](#)
- [Differences in the Load Balancing Function in an MSCS Environment](#)

Functional Differences Between Version 6.6 or Later and Versions Earlier Than 6.6

- The type of the messages listed below that are output to the event log has been changed from *Error* to *Warning* in HDLM version 6.6. Also, the level of the message IDs has been changed from *E* to *W*.
 - KAPL12150, KAPL12151, and KAPL12152
- **Drive** and **Disk Number** can be displayed in the Path List view of the HDLM GUI in HDLM version 6.6.
- The values for the `storage_emc` key and the `storage_eva` key in the sample file (`sample_installhdml.ini`) of the installation information settings file used by the HDLM installation utility (`installhdml`) have been changed from `n` to blank.
If the value of a key is blank, `n` is assumed for Windows Server 2003, and `y` is assumed for Windows Server 2008.

Functional Differences Between Version 6.2 or Later and Versions Earlier Than 6.2

In HDLM versions earlier than 6.2, the `KAPL02087-I` message was displayed and indicated that the Hitachi AMS2000 series, Hitachi SMS series storage, and Universal Storage Platform V/VM series storage was not supported in the HDLM GUI configuration view. However, in HDLM version 6.2, you can now display those items in the HDLM GUI configuration view.

Functional Differences Between Version 6.0.1 or Later and Versions Earlier Than 6.0.1

- In a new installation of HDLM, the default load balancing algorithm has been changed from the Round Robin algorithm to the Extended Least I/Os algorithm.

Functional Differences Between Version 6.0 or Later and Versions Earlier Than 6.0

- The format of the displayed HDLM version has been changed when HDLM commands or utilities are executed.
- The Java execution environment (JRE) bundled with HDLM has been changed to the 5.0_11 (32-bit) JRE. The Java execution environment no longer needs to be removed as a target of the Data Execution Prevention (DEP) functionality.
- In a new installation of HDLM, the default value for the automatic failback function has been changed from `off` to `on`.

Functional Differences Between Version 5.9.4 or Later and Versions Earlier Than 5.9.4

- The following operations have been changed to reduce the number of responses required during an installation:
 - Entry of user information has been deleted.
 - When the `dlmprsvkey` utility for registering an HDLM persistent reservation key is automatically executed and a PRSV key is successfully created, the PRSV key dialog box that prompts the user for a response is no longer displayed.
 - When the `dlmprsvkey` utility for registering HDLM persistent reservation keys is automatically executed, and a PRSV key is successfully created with time information only or the creation fails, a dialog box would appear that prompted you to register a PRSV key. This dialog box now includes an explanation of how to register a PRSV key.
- The size of the log files obtained by the `DLMgetras` utility for collecting HDLM error information has been changed.

Functional Differences Between Version 5.9.1 or Later and Versions Earlier Than 5.9.1

- In HDLM 5.9.1, the default loading screen for the HDLM GUI Path Management window has been changed from the **Configuration** view to the **Path List** view.

Functional Differences Between Versions 5.9 or Later and Versions Earlier Than 5.9

- In HDLM 5.9, the function for remotely operating HDLM from the HDLM GUI or HDLM Web GUI by linking with HiCommand Device Manager is no longer supported.
- In HDLM 5.9, the `DLMgetras` utility for collecting HDLM error information can be started from the Windows **Start** menu.

Path Status Transition and Automatic Path Switching

Status Transition of Paths in the Online Status

In HDLM 5.5 or later, if one of the below conditions is satisfied, Online paths will change to `Online(E)` or `Offline(E)`. In HDLM 5.4 or earlier, even if one of the following conditions is satisfied, the path status remains `Online`:

- A path is disconnected and is free from any I/O errors

- An LU has been removed from being an HDLM management-target

Automatic Switching of Paths That Have the Online(E), Offline(C), or Offline(E) Status

In HDLM 5.5 or later, if one of the following conditions is satisfied, the status of Online(E), Offline(C), or Offline(E) paths will automatically change to Online. In HDLM 5.4 or earlier, even if one of the following conditions is satisfied, the path status will not automatically change to Online:

- Online(E) paths

If one of the following conditions is satisfied, Online(E) paths will automatically change to Online.

- A path that was disconnected and was free from any I/O errors has been recovered
- An LU was removed from being an HDLM management-target, and then the same LU is re-added as an HDLM management-target

- Offline(C) paths

When all of the following conditions are satisfied, the connected Offline(C) paths are automatically placed Online:

- All the online paths are Online(E) and the SCSI devices connected to the Online(E) paths have been deleted.
- SCSI devices are connected and all the Offline(E) paths are subject to automatic failbacks.
- SCSI devices are connected to the Offline(C) paths.

- Offline(E) paths, where intermittent errors are thought to have occurred

When the following conditions are satisfied, the connected Offline(E) paths are automatically placed Online:

- All the online paths are Online(E) and the SCSI devices connected to the Online(E) paths have been deleted.
- The SCSI devices are connected to the Offline(E) paths.

- Offline(E) paths, where intermittent errors are not thought to have occurred

If one of the following conditions is satisfied, Online(E) paths will automatically change to Online.

- A path that was disconnected and was free from any I/O errors has been recovered
- An LU was removed from being an HDLM management-target, and then the same LU is re-added as an HDLM management-target

Differences in the LU Dynamic Removal Function

Depending on the HDLM version, the LU dynamic removal function differs as follows:

- In HDLM 05-02, and 5.4
 - When **Remove the LU even if there are Offline(C) paths** is not specified or when the HDLM command `dlnkmgr set -rmlu on` is executed
If none of the paths connected to an LU are `Online` or `Offline(C)`, the LU will be removed from being an HDLM management-target.
 - When **Remove the LU even if there are Offline(C) paths** is specified or when the HDLM command `dlnkmgr set -rmlu on -force` is executed
If none of the paths connected to an LU are `Online`, the LU will be removed from being an HDLM management-target.
- In HDLM 5.5 or later
 - When **Remove the LU even if there are Offline(C) paths** is not specified or when the HDLM command `dlnkmgr set -rmlu on` is executed
If none of the paths connected to an LU are `Online` or `Offline(C)`, the LU will be removed from being an HDLM management-target.
However, if one of the following conditions is satisfied, the LU will not be removed from being an HDLM management-target:
 - When an `Offline(E)` path connected to the LU satisfies the conditions to automatically switch to `Online`. For details about these conditions, see [Automatic Switching of Paths That Have the Online\(E\), Offline\(C\), or Offline\(E\) Status on page A-5](#) in [Path Status Transition and Automatic Path Switching on page A-4](#).
 - When `Offline(C)` paths are disconnected and changed to `Offline(E)` by an online operation, and as a result, no paths are `Online`
 - When **Remove the LU even if there are Offline(C) paths** is specified or when the HDLM command `dlnkmgr set -rmlu on -force` is executed
If none of the paths connected to an LU are `Online`, the LU will be removed from being an HDLM management-target. However, the LU will not be removed if any `Offline(E)` or `Offline(C)` path satisfies the conditions to automatically switch to `Online`. For details about these conditions, see [Automatic Switching of Paths That Have the Online\(E\), Offline\(C\), or Offline\(E\) Status on page A-5](#) in [Path Status Transition and Automatic Path Switching on page A-4](#).

Differences in the Drive Letters Displayed in Windows

Depending on the HDLM version, the Windows' drive letters that are displayed when all paths connected to the LU have an error status differ as follows:

- When the LU dynamic removal function is not used in HDLM 5.4
Drive letters are displayed for the disks that are displayed in **My Computer**.
- When the LU dynamic removal function is used in HDLM 5.4, or 5.5 or later, or when the function is not used in HDLM 5.5
Drive letters are not displayed for the disks that are displayed in **My Computer**.

Differences in Default Values

Depending on the HDLM version, default values for various HDLM functions differ as follows:

- Default value for path health checking
 - In HDLM 04-00 or earlier: off
 - In HDLM 05-00 or later: on. The checking interval is 30 minutes.
- Default value for error log file size
 - In HDLM 5.4 or earlier: 1000 KB. Note that this item name in HDLM 5.4 or earlier is **Log file size**.
 - In HDLM 5.4 or later: 9900 KB
- Default value for automatic failbacks
 - In HDLM earlier than 6.0: off
 - In HDLM 6.0 or later: on
- Default value for the load balancing algorithms
 - In HDLM 6.0 or earlier: rr (Round Robin)
 - In HDLM 6.0.1 or later: exlio (Extended Least I/Os)
 - Also, the value of the load_balance_type key for the following file has changed from rr to exlio: the sample file sample_installhdml.ini for the installation-information settings file used by the installhdml utility for installing HDLM

Differences in the Load Balancing Function in an MSCS Environment

HDLM 05-00 or earlier does not support the load balancing function in an MSCS environment. Therefore, when you use HDLM 05-00 or earlier in an

MSCS environment, even if you set the load balancing function to `on`, it will automatically change to `off`.

Acronyms and abbreviations

The following acronyms and abbreviations might be used in this guide.

A

AL

Arbitrated Loop

API

Application Programming Interface

ASM

Automatic Storage Management

B

BIOS

Basic Input / Output System

C

CHA

Channel Adapter

CLPR

Cache Logical Partition

CPU

Central Processing Unit

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

CSV

Comma Separated Value

CU

Control Unit

D**DBMS**

Database Management System

DEP

Data Execution Prevention

Dev

Device

DNS

Domain Name Server

F**FC**

Fibre Channel

FC-SP

Fibre Channel Security Protocol

FO

Failover

FQDN

Fully Qualified Domain Name

G**GMT**

Greenwich Mean Time

GPT

GUID Partition Table

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Acronyms-2

GUI

Graphical User Interface

GUID

Globally Unique Identifier

H**HBA**

Host Bus Adapter

HDev

Host Device

HLU

Host Logical Unit

HTTP

Hypertext Transfer Protocol

I**I/O**

Input/Output

IP

Internet Protocol

iSCSI

Internet Small Computer System Interface

L**LAN**

Local Area Network

LDAP

Lightweight Directory Access Protocol

LDEV

Logical Device

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

LU

Logical Unit

LUN

Logical Unit Number

M**MPIO**

Multipath I/O

MVS

Multiple Virtual Storage

N**NIC**

Network Interface Card

NTP

Network Time Protocol

O**OS**

Operating System

P**P**

Port

PRSV

Persistent Reserve

Q**QFE**

Quick Fix Engineering

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

R

RADIUS

Remote Authentication Dial in User Service

S

SAN

Storage Area Network

SCSI

Small Computer System Interface

SLPR

Storage Logical Partition

SMTP

Simple Mail Transfer Protocol

SNMP

Simple Network Management Protocol

SP

Service Pack

SSL

Secure Sockets Layer

SVP

Service Processor

W

WMI

Windows Management Instrumentation

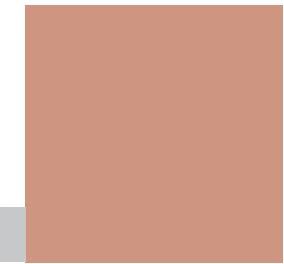
WWN

World Wide Name

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------

Acronyms-6



Glossary

This glossary explains the terms used in this manual.

A

automatic fallback

A function for checking the status of paths at regular intervals, and automatically placing the status of a path recovered from an error into the Online status.

If a path with an Offline(E) or Online(E) status recovers from an error, an automatic fallback will place the path Online.

Automatic fallbacks check the status of paths that were placed in the Offline(E) or Online(E) status because of an error, but do not check the status of paths that were placed in the Offline(C) status by executing an offline operation. For details on offline operations, see [offline \(Places Paths Offline\) on page 6-6](#).

AutoPATH_ID

An ID that HDLM assigns to a path during the system startup. Every path has a unique AutoPATH_ID.

(See also: *path*)

C

CHA (Channel Adapter)

An adapter for controlling the channels of a storage system.

CLPR(Cache Logical Partition)

A function supported by the Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000 series, Hitachi AMS2000/AMS/WMS/SMS series, HUS100 series, and HUS VM for logically splitting up a cache. This function can split up a cache into parity groups in the storage system, so that other parity groups do not affect the cache performance.

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------

cluster

A system of connecting multiple hosts with the same OS or platform (essentially, an environment in which the same application can run) and treating them as one system.

D

Dev

A logical division of an LU that HDLM controls and operates. A Dev is equivalent to a *partition* in Windows.

In Windows, each LU has only one Dev.

Each Dev has a *Dev number*.

(See also: *Dev number*)

Dev number

A Dev number (the DNum column) in the configuration list in HDLM.

0 is displayed as the number indicating the entire LU.

HDLM operates assuming that one LU has one Dev, so the Dev number is always fixed to 0.

(See also: *Dev*)

dynamic reconfiguration

Dynamic reconfiguration enables HDLM to recognize devices whose configuration has been changed without restarting the host. The plug-and-play operation of Windows enables this functionality.

E

emulation type

An LU type that is accessible from a host. Since an HDLM host is an open-system host such as a PC or a UNIX computer, the HDLM host can access only the LUs that have open-system emulation types.

For details on emulation types supported by a storage system, see the maintenance manual for that particular storage system.

F

fallback

A function for placing the status of a path recovered from an error into the *Online* status, and then switching the access path to the path that was just recovered.

failover

A function for switching to another normal path if there is an error in the current access path, thereby enabling the system to continue to operate.

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Glossary-2

FC-SAN (Fibre Channel - Storage Area Network)

A SAN using Fibre Channel.

H

HAM environment

An environment in which volume pairs that are synchronized between two storage systems are created by HAM (High Availability Manager), and hosts are configured to recognize these volumes as one volume. An HAM environment consists of the primary volume (P-VOL) in the primary site and the secondary volume (S-VOL) in the secondary site. When an error occurs on one of the volumes, the path can be switched to the other volume by using HDLM.

HBA (Host Bus Adapter)

A device that is an interface between hosts and external devices.

In this manual, the term *HBA* indicates an interface card that is mounted on a host from which the host connects to a storage system via a SCSI or FC connection.

HDLM alert driver

A program that receives information about an error detected by the HDLM driver, and then reports the error information to the HDLM manager.

HDLM driver

A program that controls all the HDLM functions, manages paths, and detects errors.

HDLM manager

A program that manages error information. The HDLM manager receives error information from the HDLM alert driver and then collects error logs.

host

A generic term for both servers and clients.

host device

A logical area in a host LU.

(See also: *host LU*, *host device name*)

host device name

A name for a host device. A drive letter is assigned to a host device name.

(See also: *host device*)

host LU

An LU that a host recognizes. The actual HDev entity is a Dev in the storage system.

Each host LU has a *host LU number*.

(See also: *LU*, *host LU number*, *host device*)

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------

host LU number

A number assigned to a host LU. The host LU number is part of a path name.
(See also: *host LU*, *path name*)

I

intermittent error

An error that occurs irregularly due to, for example, a loose cable connection.

IP-SAN (Internet Protocol - Storage Area Network)

A data transfer network that connects hosts and storage systems by using the iSCSI standard.

L

LDEV (Logical Device)

A combination of the storage system's product name, serial number, and an internal LU. HDLM uses this value to identify a particular LU.

load balancing

A function for distributing the load across all the paths that are accessing the logical areas within an LU. To distribute the load, load balancing uses multiple paths to perform I/O operations.

HDLM uses the following six algorithms for load balancing:

- The Round Robin algorithm
- The Extended Round Robin algorithm
- The Least I/Os algorithm
- The Extended Least I/Os algorithm
- The Least Blocks algorithm
- The Extended Least Blocks algorithm

LU (Logical Unit)

A logical unit that is a logical volume defined in the storage system, and with which the host can perform input or output operations.

(See also: *host LU*)

N

node

A server in a cluster.

non-owner controller

A controller other than an owner controller.

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Glossary-4

Non-owner controllers exist only in the Hitachi AMS/WMS series.
(See also: *owner controller*, *non-owner path*)

non-owner path

A path that passes through a non-owner controller.
Non-owner paths exist only in the Hitachi AMS/WMS series.
(See also: *owner path*, *non-owner controller*)

O

owner controller

A controller that has been set as an owner controller for an LU. Owner controllers are only in the Hitachi AMS/WMS series. A controller other than an owner controller is called a *non-owner controller*.

When using Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000 series, Hitachi AMS2000 series, Hitachi SMS series, HUS100 series, or HUS VM, all controllers are owner controllers.

(See also: *owner path*, *non-owner controller*)

owner path

A path that passes through an owner controller for an LU in the Hitachi AMS/WMS series. A path that passes through a controller other than an owner controller is called a *non-owner path*.

When using the Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, VSP G1000 series, Hitachi AMS2000 series#, Hitachi SMS series#, HUS100 series#, or HUS VM, all paths are owner paths.

(See also: *owner controller*, *non-owner path*)

#: This storage system applies when the dynamic I/O path control function is disabled.

P

path

An access path from a host to a storage system. Access to a logical area within an LU in a storage system is made via a cable connecting the HBA on the host and the CHA on the storage system. This cable is a path. Each path has an *AutoPATH_ID*.

(See also: *AutoPATH_ID*)

path health checking

A function for checking the status of paths at regular intervals.

When an error occurs on a path that was in the *Online* status, path health checking changes the status of the path to the *Offline (E)* status.

Path health checking checks only those paths that have the *Online* status.

path name

The path name consisting of the following four elements, separated by periods:

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- Host port number (hexadecimal number)
- Bus number (hexadecimal number)
- Target ID (hexadecimal number)
- Host LU number (hexadecimal number)

A path name is used to identify a path.
(See also: *host LU number*)

persistent reservation

Similar to *reservations*, persistent reservations enable a server to declare that it has exclusive rights to use an LU, and prevents other servers from accessing that LU. Note, however, that while reservations allows a server to have exclusive use of only one path to the LU, persistent reservations allow a server to have exclusive rights to use multiple paths.

If persistent reservations are used in HDLM, a host can have exclusive use of multiple paths to an LU, so that load balancing among these paths is possible.

(See also: *reservation*)

R

Remove LU

A function that allows the user to delete LUs from an HDLM target host. This function is performed when an LU is deleted, or when all the paths connecting the LU to the host are placed in the Offline (E) status.

reservation

The reservation function enables a host to declare that it has exclusive rights to use a particular LU, and prevents other hosts from accessing that LU. Access permission for an LU that has been reserved is given only to the host that issued the reservation, so the LU cannot be accessed from multiple paths (coming from multiple hosts) simultaneously. However, because of this, load balancing is not possible.

(See also: *persistent reservation*)

S

SAN (Storage Area Network)

A high-speed network connecting hosts to storage systems. This network is independent of a LAN and is dedicated to data transfers. A SAN provides faster access to storage systems, and prevents the transfer of high-volumes of data from deteriorating LAN performance.

SCSI device

A SCSI disk device

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Glossary-6

SLPR (Storage Logical Partition)

A function supported by Hitachi USP series, Universal Storage Platform V/VM series, Virtual Storage Platform series, and VSP G1000 series, for logically splitting up a storage system. This function splits up the resources, such as ports, CLPR, and volumes, in the storage system, so that the user can manage each resource independently.

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------	-------------------

Glossary-8

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