



Hitachi Dynamic Link Manager (HDLM) for IBM® AIX® Systems

User's Guide

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- *Hitachi Dynamic Link Manager (HDLM) for IBM® AIX® Systems User's Guide*, MK-92DLM111-06
- TI document *TI_Rev_Com MK-92DLM111-XX*
- *Hitachi Dynamic Link Manager User's Guide*, Manual number: 3000-3-926-40E

Changes in this Revision

- Added New section 2.1, Devices Managed by HDLM
- Updated Chapter 3 completely
- Added Important Notes to Chapter 4 (see section 4.1)
- Added new utilities:
 - Utility for setting the HDLM execution environment (see section 7.3)
 - Utility for checking the device configuration (d1mchkdev) (see section 7.6)
 - Utility for HDLM installation configuration support (d1msetup) (see section 7.10)
- Added new Error Messages (throughout Chapter 9)

Referenced Documents

- *Hitachi Lightning 9900™ V Series User and Reference Guide*, MK-92RD100
Hitachi Lightning 9900™ V Series IBM® AIX® Configuration Guide, MK-92RD119
- *Hitachi Lightning 9900™ User and Reference Guide*, MK-90RD008
Hitachi Lightning 9900™ IBM® AIX® Configuration Guide, MK-90RD014
- *Hitachi Thunder 9500™ V Series User and Reference Guide*, MK-92DF601
Hitachi Thunder 9500™ V Series IBM® AIX® Host Installation Guide, MK-92DF617
- *Hitachi Thunder 9200™ User and Reference Guide*, MK-90DF504
Hitachi Thunder 9200™ IBM® AIX® Host Installation Guide, MK-91DF544
- *Hitachi Freedom Storage™ 5000 Series Software Configuration User's Guide*, BO-98DF376
- HiCommand™ Device Manager user documentation:
HiCommand™ Device Manager Web Client User's Guide, MK-91HC001
HiCommand™ Device Manager Server Installation and Configuration Guide, MK-91HC002
HiCommand™ Device Manager Agent Installation Guide, MK-91HC019

Preface

The *Hitachi Dynamic Link Manager (HDLM) for AIX® User's Guide* describes and provides instructions for installing and using the HDLM for AIX® software for the Hitachi Freedom Storage™ Series disk array subsystems. This document is intended for system administrators who use HDLM to operate and manage storage.

This document assumes that the user:

- has a background in data processing and understands storage subsystems and their basic functions,
- is familiar with the Hitachi Freedom Storage™ subsystem(s): Lightning 9900™ V Series, Hitachi Lightning 9900™, Freedom Storage 7700E, Thunder 9500™ V Series, Thunder 9200™, array subsystems, Freedom Storage 5800, Freedom Storage 5700E, and
- is familiar with the AIX® operating system, file system, system commands, and utilities.

For further information on the Hitachi storage subsystems, please refer to the user's guide for the subsystem (e.g., *Hitachi Lightning 9900™ User and Reference Guide*, MK-90RD008). For further information on Hitachi Data Systems products and services, please contact your Hitachi Data Systems account team, or visit Hitachi Data Systems online at <http://www.hds.com>.

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HDLM for AIX® Software Version

This document revision applies to HDLM for AIX® version 5.6 and later.

Comments

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- E-mail: doc.comments@hds.com
- Fax: 858-695-1186
- Mail:
Technical Writing, M/S 35-10
Hitachi Data Systems
10277 Scripps Ranch Blvd.
San Diego, CA 92131

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Chapter 1 Overview of Hitachi Dynamic Link Manager (HDLM)

This chapter introduces the Hitachi Dynamic Link Manager software:

- About the Hitachi Dynamic Link Manager (HDLM) (see section 1.1)
- Major Functions (see section 1.2)
- HDLM Graphical User Interface (see section 1.3)
- HDLM Web GUI Overview (see section 1.5)

1.1 About the Hitachi Dynamic Link Manager (HDLM)

The Hitachi Dynamic Link Manager (HDLM) licensed software manages access paths to storage for the Hitachi Freedom Storage™ family of disk array subsystems. HDLM provides functions for distributing workload across paths (if multiple paths are used) and switching to an alternate path (if one is available) in the event of a failure on the current path. These functions ensure improved system reliability. HDLM enables high-speed processing of large volumes of data on a network. Networks dedicated to data transfer, such as a storage area network (SAN), can use HDLM to provide enhanced access to storage. Figure 1.1 illustrates a typical connection between hosts and storage.

HDLM supports the following Hitachi Freedom Storage™ disk array subsystems:

- Hitachi TagmaStore™ Universal Storage Platform (USP)
- Hitachi Lightning 9900™ V Series
- Hitachi Lightning 9900™
- Hitachi Freedom Storage™ 7700E
- Hitachi Thunder 9500™ V Series
- Hitachi Thunder 9200™
- Hitachi Freedom Storage™ 5800
- Hitachi Freedom Storage™ 5700E

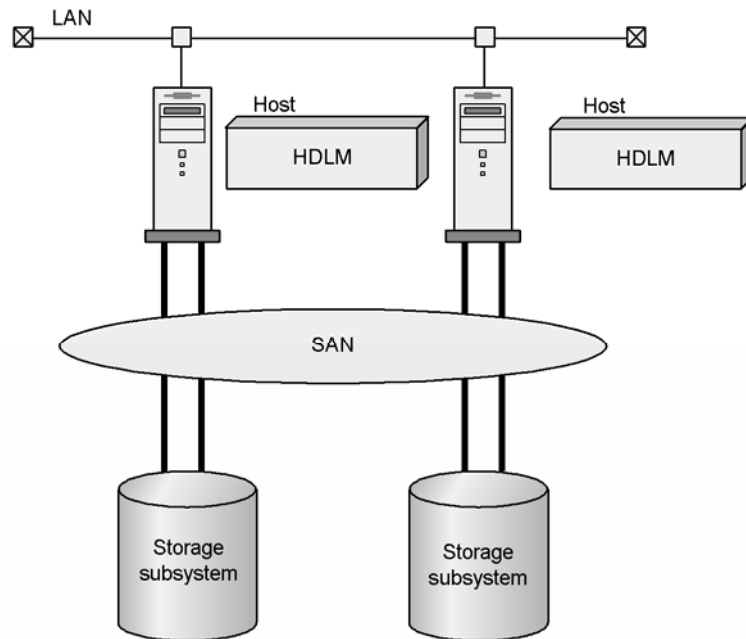


Figure 1.1 Connection between Hosts and Storage

Note: The use of HDLM and all other Hitachi Data Systems products is governed by the terms of your license agreement(s) with Hitachi Data Systems.

1.2 Major Functions

The major functions of HDLM are:

- **Load balancing:** When multiple paths connect a host and storage, HDLM distributes the load across multiple paths to prevent a heavily loaded path from affecting processing speed.
For details on load balancing, see section 2.5.1.
- **Path Failover:** When multiple paths connect a host and storage, HDLM switches to an alternate path if a failure occurs on the active path, allowing processing to continue without interruption.
For details on failover, see section 2.7.1.1.
- **Failback:** When a previously failed path becomes available, HDLM places the recovered path back online. This ensures that the maximum number of paths is always available for load balancing and failover. Both failover and failback using path switching.
For details on failback, see section 2.7.1.2.
- **Path health checking:** HDLM automatically checks the path status at regular intervals specified by the user, eliminating the need to repeatedly perform manual path status checks.
For details on path health checking, see section 5.5.2.

About the Graphical User Interface (GUI)

The HDLM for AIX® GUI displays information about the paths between hosts and storage subsystems in a configuration-diagram format or list format. You can use the GUI to change path status and set the operating environment. Two GUIs are provided:

- The *HDLM GUI*, which is the GUI displayed by the application itself. The HDLM GUI is available in the following cases:
 - When HDLM is not linked with Device Manager and the GUI is used in a host on which HDLM is installed.
 - When HDLM is linked with Device Manager (when you do not use HDLM Web GUI)
- The *HDLM Web GUI*, which is the GUI displayed by using a Web browser. The HDLM Web GUI is available when HDLM is linked with Device Manager 3.0 or later.

For details about the GUI, see Chapter 4.

Link-and-launch from HiCommand™ Device Manager

HiCommand™ Device Manager (version 2.3 or later) provides link-and-launch integration with HDLM. You can display the HDLM GUI or the HDLM Web GUI from the HiCommand™ Device Manager GUI (Web Client), enabling you to perform HDLM operations remotely from the Device Manager Web Client PC.

For details on the functionality and system configuration for remotely operating HDLM from HiCommand™ Device Manager, see section 2.12.

For details on how to display the HDLM GUI from the HiCommand™ Device Manager GUI, see Chapter 4.

1.3 HDLM Graphical User Interface

HDLM provides the following two types of GUI:

- **HDLM GUI**

The HDLM GUI is the GUI that is displayed by the HDLM application. The HDLM GUI is available when:

- HDLM is not linked with Device Manager and the GUI is used on a host on which HDLM is installed.
- HDLM is linked with Device Manager version 2.4.

- **HDLM Web GUI**

The HDLM Web GUI is the GUI that is displayed when you use a Web browser (such as Netscape). The HDLM Web GUI is available when HDLM is linked with the Device Manager version 3.0 or later.

1.4 HDLM GUI Overview

The HDLM GUI is comprised of the following windows:

- Path Management
- Options
- Help

1.4.1 About the Path Management Window

The Path Management window lets you view path information and change path status. Following is an example of the Path Management window.

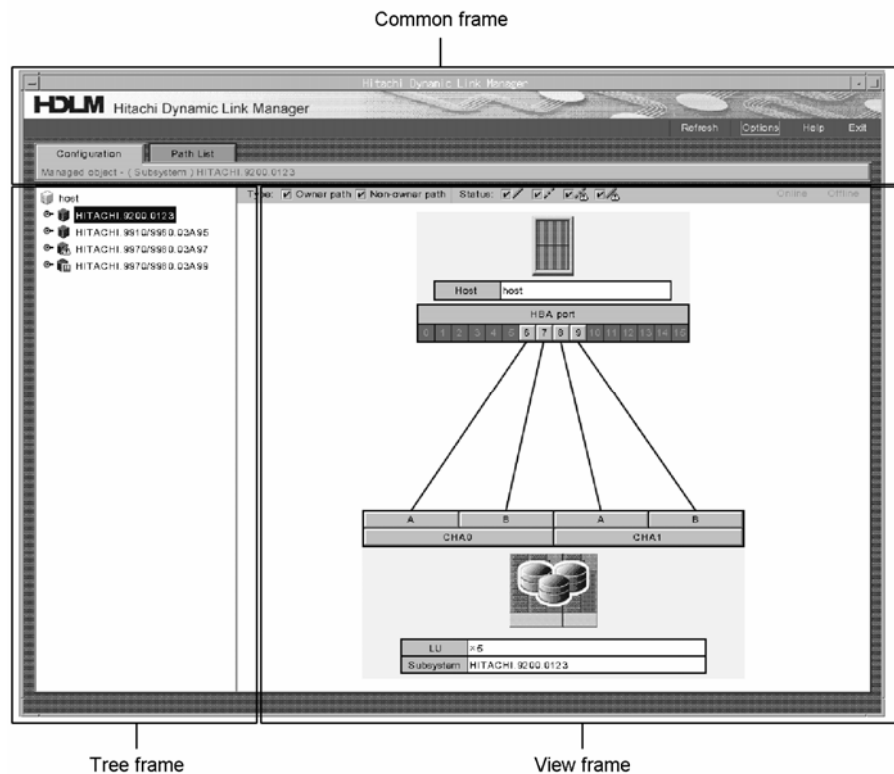


Figure 1.2 Example of the Path Management Window

The information that you can view and the operations that you can perform depend on the login authority of the Device Manager. Administrative users can view, modify, and delete data, whereas Guest users can only view data and export CSV files.

1.4.2 About the Options Window

The Options window lets you view and change an HDLM operating environment. Figure 1.3 is an example of the Options window.

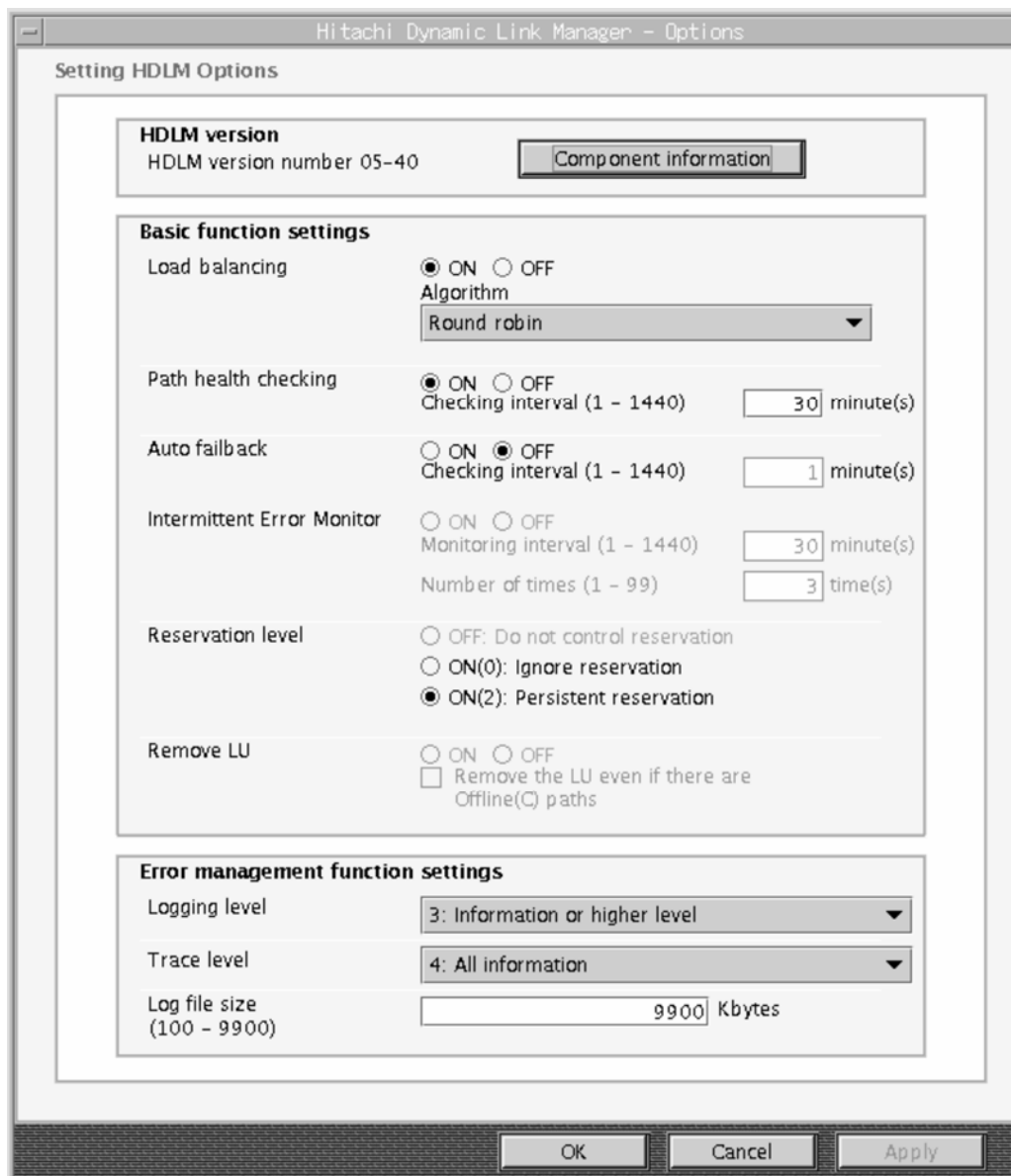


Figure 1.3 Example of the Options Window

1.4.3 About the Help Window

The Help window lets you access an electronic copy of this User's Guide. You can access the Help by clicking the Help button from the Configuration view of the Path Management window.

1.5 HDLM Web GUI Overview

The HDLM Web GUI is comprised of the following frames:

- Menu-bar
- Navigation
- Method
- Information

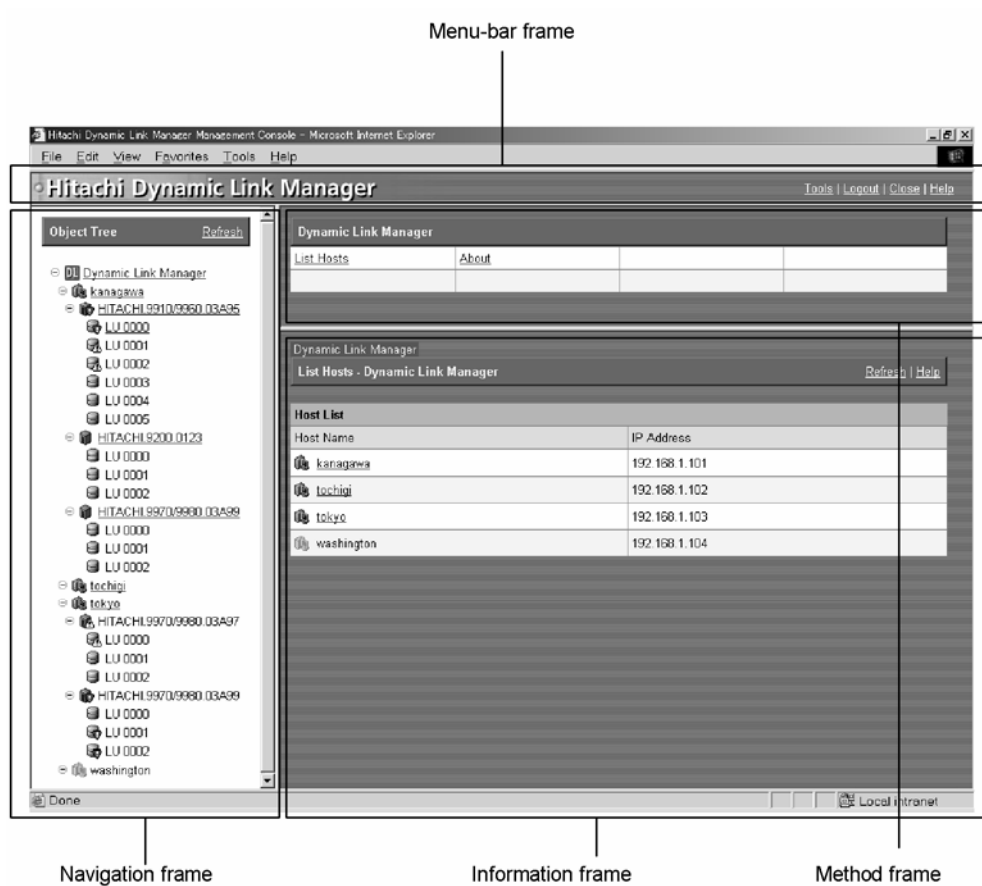


Figure 1.4 Example of the HDLM Web GUI

1.5.1 About the Frames that Comprise the HDLM Web GUI

Table 1.1 describes the function of each HDLM Web GUI frame.

Table 1.1 HDLM Web GUI Frame Descriptions

Frame	Description
Menu Bar	Displays the HDLM product names and the executable menus. You perform operations by clicking a menu option.
Navigation	Displays the management-target hosts, storage subsystems, and LUs in a tree-like hierarchy structure from the root object Dynamic Link Manager. When you click the object, the methods that can be executed for the selected object are displayed. <i>Note:</i> Among the hosts displayed in the List Objects - Hosts subwindow of the Device Manager main window, the hosts on which HDLM has not been installed are displayed in neither the navigation frame nor the Lists Hosts subwindow.
Method	Displays the methods that can be executed for the object that is selected in the Navigation frame. When you click a method, an operation is performed.
Information	Displays the execution result of the method that was selected in the Method frame, or the result of the operation that was executed in the Information frame.

Note: For information about the Method and Information frames, see Chapter 4.

Chapter 2 HDLM Configuration and Operations

This chapter describes the HDLM configuration and operations. Initially, the HDLM management targets, system configuration, and basic terms are described.

- Devices managed by HDLM (see section 2.1)
- System configuration (see section 2.2)
- LU configuration (see section 2.3)
- HDLM program configuration (see section 2.4)
- HDLM driver position (see section 2.5)
- Load distribution using load balancing (see section 2.5.1)
- Path failover and path failback using path switching (see section 2.7.2)
 - Automatic path switching (see section 2.7.1)
 - Manual path switching (see section 2.7.2)
 - Path status transition (see section 2.7.3)
- Error management (see section 2.10)
 - Log collected (see section 2.10.1)
 - Error information filtering (see section 2.10.2)
- Cluster support (see section 2.11)
- Remote operation of HDLM from the HiCommand™ Device Manager Web Client (see section 2.12)

2.1 Devices Managed by HDLM

Devices that can and cannot be managed by HDLM are shown below. The devices that can be managed by HDLM are called *HDLM management-target devices*.

- Devices that HDLM can manage
 - HDLM can manage SCSI devices in Hitachi storage subsystems.
- Devices that HDLM cannot manage
 - SCSI devices other than those for Hitachi storage subsystems
 - Hitachi storage subsystem command devices, such as Hitachi RAID Manager command devices
 - Built-in disks in a host
 - Devices other than disks (tape devices, etc.)
 - Boot disks (see *Note*)
 - Dump devices (see *Note*)
 - Swap devices (see *Note*)

Note: The settings to make these devices not a target for HDLM management must be specified. Other devices that cannot be managed by HDLM are automatically set not to be targets for HDLM management.

2.2 System Configuration

HDLM manages routes between a host and a storage subsystem by using the SCSI driver. The host and storage subsystems are connected using SAN with fiber cables or SCSI cables. The cable port on the host is a *host bus adapter* (HBA). The cable port on the storage subsystem is a *port* (P) on a *channel adapter* (CHA).

A *logical unit* (LU) contained in a storage subsystem is the target of input to, or output from, the host. An area in an LU is called a *Dev*. A route that connects a host and a Dev in an LU is called a *path*.

HDLM manages a path by assigning an ID to it. This ID is called the *AutoPATH_ID*. A path may also be called a *management target*.

Figure 2.1 shows the HDLM system configuration. Table 2.1 describes the HDLM system components.

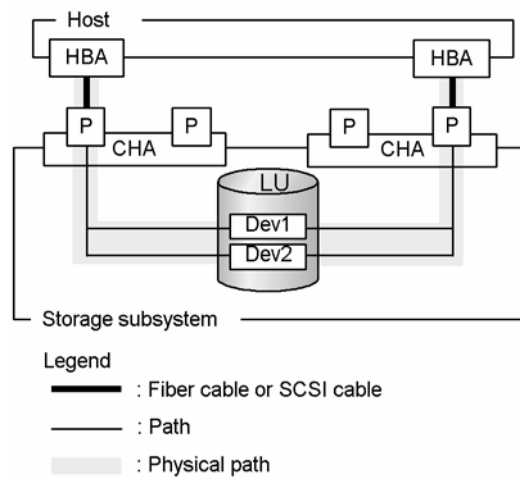


Figure 2.1 HDLM System Configuration

Table 2.1 HDLM System Components

Component	Description
HBA	A host bus adapter. This serves as a cable port on the host. All HBAs on the host must be the same type.
SAN	A dedicated network that is used for data transfer between the host machine and storage subsystems.
CHA	A channel adapter
P	A port on a channel adapter. This serves as a cable port on a storage subsystem.
LU	A logical unit (a logical volume defined on the storage subsystem). This serves as the target of input or output operations from the host.
Dev	An area in an LU.
Path	A route that connects a host and a Dev.

2.3 LU Configuration

When you install HDLM, the LU configuration recognized by the host changes as follows:

- Before installing HDLM
 - The host recognizes that a SCSI device is connected to each path.
 - Thus, a single LU in the storage subsystem is recognized as the same number of LUs as that of paths.
- After installing HDLM
 - An HDLM device corresponding one-to-one with an LU in the storage subsystem is created at a higher level than the SCSI device.
 - Thus, from the host, LUs in the storage subsystem are also recognized as one LU regardless the number of paths.

An LU recognized by a host after HDLM installation, is called a *host LU* (HLU). The areas in a host LU that correspond to the Dev in a storage subsystem LU are called *host devices* (HDev).

On a system using HDLM, the logical device file for the HDLM device is used to access the target LU instead of the logical device file for the SCSI device.

Figure 2.2 shows the LU configuration recognized by the host after HDLM installation.

Table 2.2 shows the components of the host. Table 2.3 specifies the maximum number of LUs and paths that can be managed by HDLM.

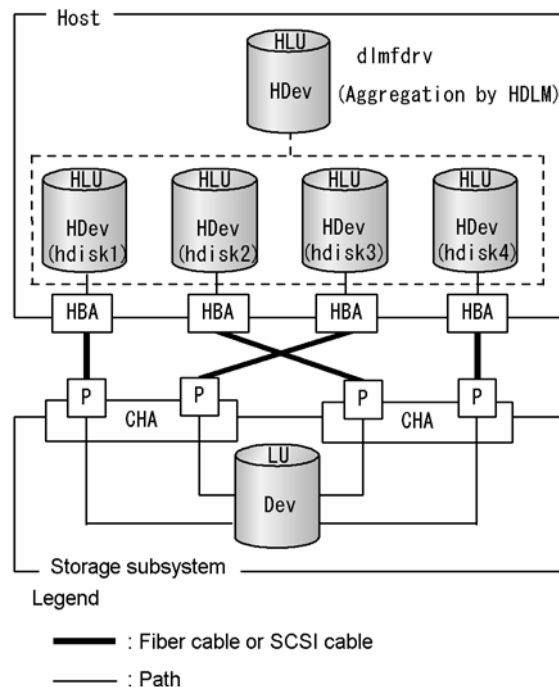


Figure 2.2 LU Configuration

Table 2.2 Host Components

Component	Description
HDev	Host device, that is, a device within a host LU. (This device is called a <i>physical volume</i> in AIX.) The actual HDev entity is a device in the storage subsystem.
HLU	Host LU, that is, an LU that the host recognizes. The actual HLU entity is an LU in the storage subsystem.

Table 2.3 Maximum Number of LUs and Paths Supported by HDLM

Management Target	Maximum Number
LUs	256
Paths for one LU	<ul style="list-style-type: none"> ▪ The reservation level is on(0):64 ▪ The reservation level is on(2), and storage is Lightning 9900 Series, Lightning 9900V Series, or USP: 64 ▪ The reservation level is on(2), and storage is Thunder 9200 Series or Thunder 9500V Series: 32
Total paths	8192

2.4 HDLM Program Configuration

HDLM runs as a combination of programs. Using HDLM requires that these programs be running normally.

Figure 2.3 shows the HDLM program configuration.

Table 2.4 lists and describes the functions of these programs.

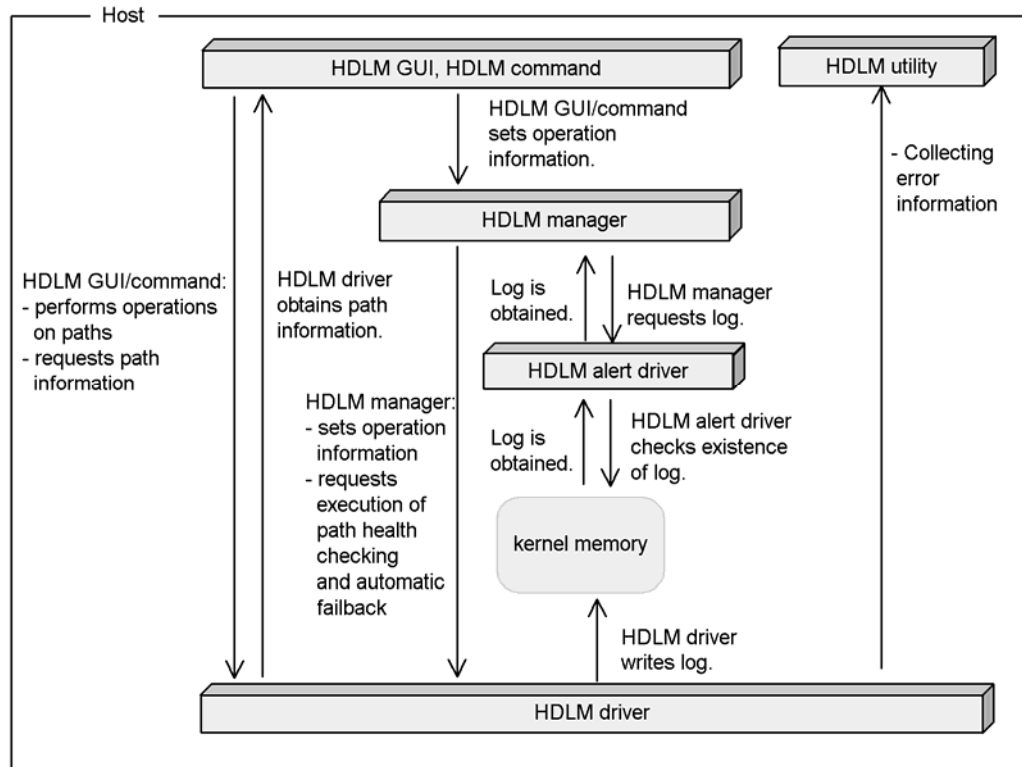


Figure 2.3 HDLM Program Configuration

Table 2.4 Functions of HDLM Programs

Program Name	Function
HDLM GUI, HDLM Web GUI	Provides a graphical user interface (GUI) to manage paths, display error information, and set up the HDLM operating environment
HDLM Utility	Provides the following functions: <ul style="list-style-type: none"> ▪ Collection of error information ▪ Operation of Volume groups ▪ Operating system support for HDLM ▪ Deletion of path information about the fscsi device instance ▪ Clear HDLM persistent reservation ▪ Definition of HDLM operations through ODM settings ▪ Register and Delete path information ▪ Check if there is an invalid path ▪ Install HDLM
HDLM command	Provides the dlmcmd command to manage paths, display error information, and set up the HDLM operating environment
HDLM manager	Configures the operating environment, requests the execution of path health checks and automatic failback, and collects error log data.
HDLM alert driver	Reports the error information detected by the HDLM driver to the HDLM manager
HDLM driver	Controls HDLM functionality, manages paths, and detects errors. The HDLM driver consists of the core logic component that controls the HDLM basic functionality and the filter component that sends and receives I/O. The driver name is dlmfdrv.

2.5 HDLM Driver and Device Position

The HDLM driver is positioned above the SCSI driver. Each application on the host uses the HDLM device (logical device file) created by HDLM, to access LUs in the storage subsystem. Figure 2.4 shows the position of the HDLM driver and device.

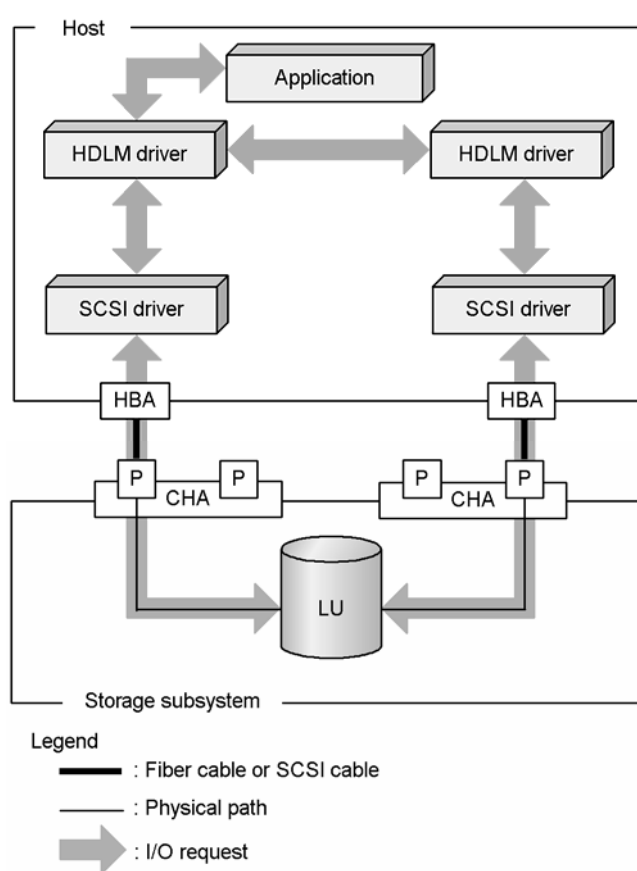


Figure 2.4 Position of the HDLM Driver And Device

The installation of HDLM creates logical device files for the HDLM drivers. When accessing the devices in a storage subsystem, each application uses the logical device files for the HDLM drivers instead of the logical device files for the SCSI drivers.

2.5.1 Logical Device Files for HDLM Devices

A logical device file is assigned to an HDLM device. The name of this logical device file is different from the name of the logical device files for physical volumes (SCSI devices). To use an HDLM management-target LU in an application, you must use the logical device file name of the HDLM device.

The following explains the names and locations of the logical device files for HDLM devices

Logical device file names of HDLM devices

The logical-device file names for HDLM devices have the `d1mfdrv n` format (where n indicates the instance number of the driver).

A logical device file for an HDLM device has a one-to-one relationship with an LU in a storage subsystem.

Thus, a logical device file (`d1mfdrv n`) for a single HDLM device may correspond to multiple physical volumes that are identified by paths (`hdisk n`); for example, `d1mfdrv0` might correspond to `hdisk1` and `hdisk4`.

A logical device file for an HDLM device created by HDLM 05-00 or earlier has a one-to-one relationship with a physical volume; for example, `d1mfdrv1` might correspond to `hdisk1`. Table 2.5 shows the relation between logical device files for HDLM devices and physical volumes, based on the HDLM version.

Table 2.5 Relation between logical device files for the HDLM devices and physical volumes based on the HDLM version

HDLM version	Relation between logical device files for HDLM devices and physical volumes
05-00 or earlier	logical device file for HDLM device (<code>d1mfdrvn</code>) : physical volume (<code>hdiskn</code>) = 1 : 1 Both instance numbers are identical.
05-01 or later	logical device file for HDLM device (<code>d1mfdrvn</code>): physical volume (<code>hdiskn</code>) = 1 : many The instance numbers are different.

You can verify the correspondence between `d1mfdrv n` and `hdisk n` by executing the `dlnkmgr` command's `view -drv` operation.

Locations of logical device files for HDLM devices

Device files for HDLM devices are created in `/dev`. Block device file names of HDLM devices have the `d1mfdrv n` format. Character device file names of HDLM devices have the `rd1mfdrv n` format.

2.6 Load Distribution Using Load Balancing

When multiple paths are connected to a device to an LU, HDLM can distribute the load across the paths by using multiple paths for I/O. This is called *load balancing* and it prevents a heavily loaded path from affecting the performance of the entire system.

Figure 2.5 shows the I/O flow when the load balancing function is not being used. Figure 2.6 shows the I/O flow when the load balancing function is being used. Both figures show an example of an I/O operation being issued for the same LU from multiple applications.

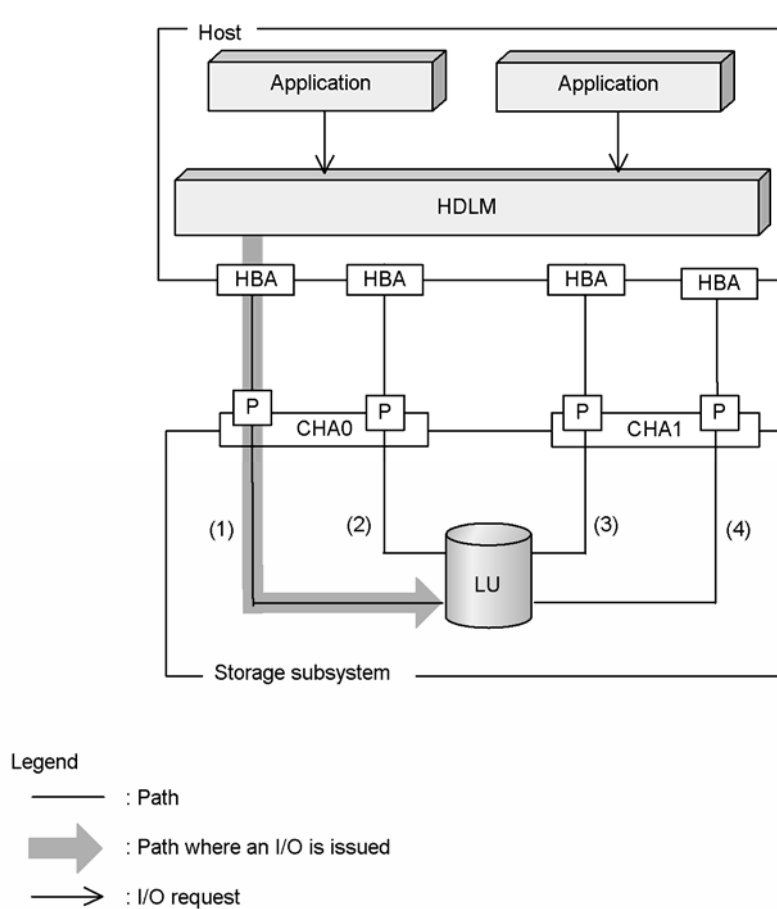
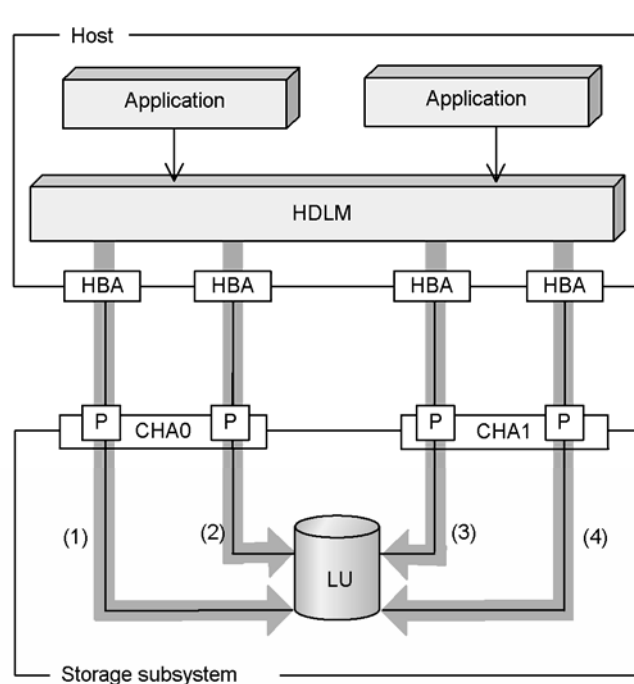


Figure 2.5 I/O Flow Without Load Balancing Function

When the load balancing function is not being used, I/O operations converge on one path (1). The load on the path (1) will cause a bottleneck, which might cause deterioration of the whole system's performance.



Legend

- : Path
- ➡ : Path where an I/O is issued
- ➞ : I/O request

Figure 2.6 I/O Flow With Load Balancing Function

When the load balancing function is being used, I/O operations are distributed via paths (1), (2), (3), and (4). This prevents deterioration of the whole system's performance from a bottleneck on one path.

2.6.1 Load Balancing Range

- When using the Thunder 9500V Series, Thunder 9200, Freedom Storage 5800, or Freedom Storage 5700E:
 - HDLM performs load balancing between owner paths or between non-owner paths. An owner path is a path that passes through the channel adapter. This path is set on the owner controller of the storage subsystem LU. A non-owner path is a path that uses a channel adapter other than the owner controller (a non-owner controller). Since the owner controller varies depending on the LU, the owner path also varies depending on the LU. A path to be used is selected in the order of owner paths and then non-owner paths. To prevent performance in the entire system from deteriorating, HDLM does not perform load balancing between owner paths and non-owner paths. When some owner paths cannot be used due to a problem such as a failure, load balancing is performed among the remaining usable owner paths. When all owner paths cannot be used, load balancing is performed among the non-owner paths.
 - In Figure 2.7, suppose that the Thunder 9500V Series, Thunder 9200, Freedom Storage 5800, or Freedom Storage 5700E is being used, and the owner controller of LU is CHA0. When a device in LU is accessed, the load is balanced among the paths that access the target device via the paths (1) and (2) (that is, between owner paths). When the path (1) cannot be used due to a problem such as a failure, a device in LU can only be accessed via the path (2). When the paths (1) and (2) cannot be used, the load is balanced among the paths that access the target device via the paths (3) and (4) (that is, between non-owner paths).
- When using the TagmaStore USP, Lightning 9900V Series, Lightning 9900 Series, or Freedom Storage 7700E:
 - All the paths are owner paths. Therefore, HDLM performs load balancing among all the paths accessing the same device. When some paths cannot be used due to a problem such as a failure, load balancing is performed among the remaining usable paths.
 - In Figure 2.7, if the TagmaStore USP, Lightning 9900V Series, Lightning 9900 Series, or Freedom Storage 7700E is being used, all the paths are owner paths. Therefore, when a device within LU is accessed, the load is balanced among the paths that access the target device via the paths (1), (2), (3), and (4). When one of the paths cannot be used due to a problem such as a failure, a device in LU can be accessed via the remaining paths.

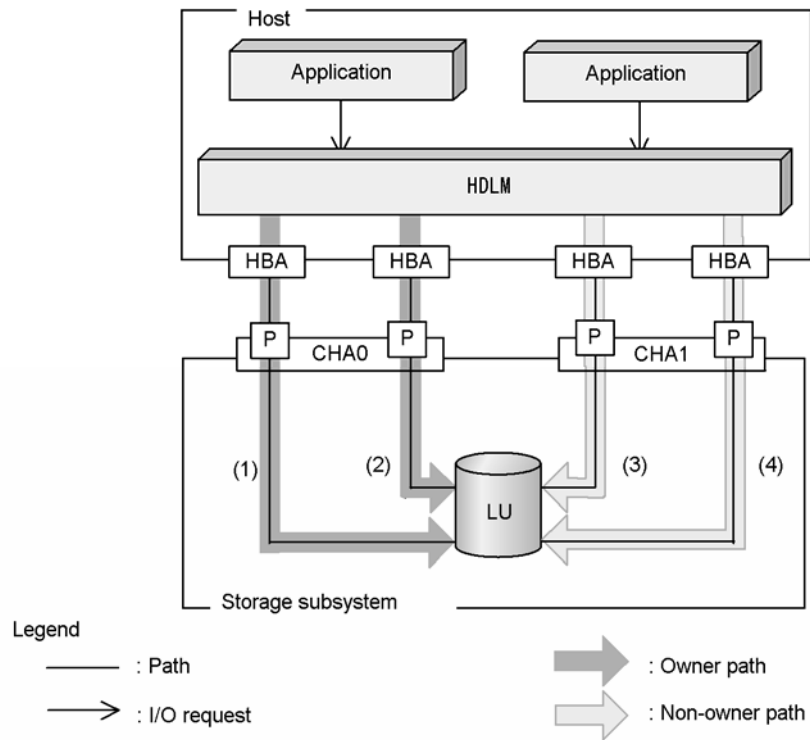


Figure 2.7 Load Balancing

2.6.2 Types of Load Balancing

HDLM has the following two types of load balancing:

- Round robin
- Extended round robin

Round robin distributes all I/Os among multiple paths.

Extended round robin distributes I/Os to paths depending on the type of the I/O, which can be either sequential access or random access. For sequential access, a single path will be used when issuing an I/O. For random access, I/Os will be distributed to multiple paths.

Table 2.6 describes the type of load balancing (round robin and extended round robin) for each I/O operation type.

Table 2.6 Types of Load Balancing

Type of Load Balancing	For Sequential Access	For Random Access
Round robin	<ul style="list-style-type: none">▪ After an I/O operation is issued to a path once or a certain number of times, the path is switched to the next path.▪ For sequential access, the storage subsystem cache might not be fully usable.	
Extended round robin	<ul style="list-style-type: none">▪ After an I/O operation is issued to a path a certain number of times in succession, the path is switched to the next path. If sequential access is switched to random access before an I/O operation is issued to a path a certain number of times, the path is switched to the next path when sequential access is switched to random access.▪ The storage subsystem cache can be used.	After an I/O operation is issued to a path once or a certain number of times, the path is switched to the next path.

When multiple applications that request sequential access are run concurrently, we recommend that you use the round robin algorithm in order to distribute I/Os across multiple paths.

When you execute only a single application that requests sequential access, such as a batch job running at night, we recommend that you use the extended round robin algorithm.

The recommended algorithm depends on the type of applications, and the operations policy.

You can specify the load balancing function from the **HDLM Environment Settings** page in the **Options** window of the HDLM GUI, the **Show HDLM Environment Settings** subwindow of the HDLM Web GUI, or by the `dlnkmgr` command's `set` operation. For details on the `set` operation, see the descriptions of `set` in section 6.6.

Note: Some I/O operations managed by HDLM can be distributed across all paths, and some cannot. Thus, you should be aware that even when you use the load balancing function, I/O operations cannot always be allocated uniformly across all paths.

2.7 Path Failover and Path Failback Using Path Switching

When the system contains multiple paths to an LU and an error occurs in the path being used, HDLM can switch to another normal path to allow the system to continue to operate. This functionality is called *failover*.

When the path in which an error occurred recovers from the error, HDLM can switch to the recovered path. This functionality is called *failback*.

Two types of failover and failback are available:

- Automatic path switching
- Manual path switching

Note: When using the 9500V, 9200, 5800, or 5700E, make sure to set the data share mode to **ON (Used)**. For details on setting the data share mode, see the User's Guide for the array.

Failover and failback change the path statuses and switch the paths. Path statuses are classified into *online* statuses and *offline* statuses. Online statuses allow the path to normally receive I/Os. Offline statuses prevent the path from receiving I/Os for the following reasons:

- An error occurred in the path.
- A user used the Path Management window to place the path offline.
- A user placed the path offline using the Show Path List subwindow of the HDLM Web GUI.
- A user executed the HDLM command's offline operation. For details on the offline operation, see section 6.4.

Note: When using the Thunder 9500V series or Thunder 9200, ensure that you set the data share mode to **ON (Used)**. For details on setting the data share mode, see the Thunder 9500V series or Thunder 9200 documentation.

2.7.1 Automatic Path Switching

This section describes the automatic failover and automatic failback functions that are used to automatically switch a path.

2.7.1.1 About Automatic Failover

If you detect a error with a path in use, you can keep operating the system by changing the state to offline, and using other online paths. This functionality is called automatic failover. Automatic failover is applicable to the following levels of errors that occur on a path:

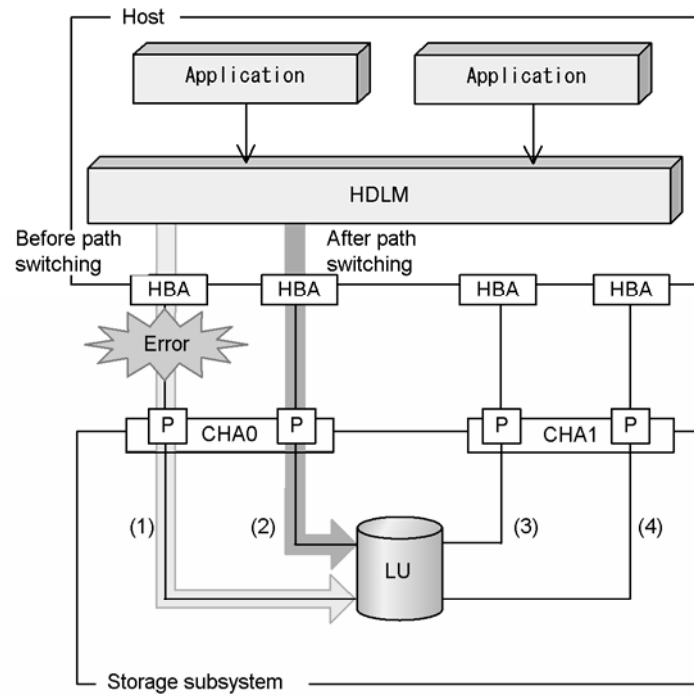
- Critical: A fatal error that may stop the system.
- Error: A high-risk error that can be avoided by using failover or other countermeasures.

For details on error levels, see Table 2.9.

When the Thunder 9500V, Thunder 9200, Freedom Storage 5800, or Freedom Storage 5700E Series is being used, HDLM selects the switching destination from the paths that access the same LU, in the order of owner paths and non-owner paths. For example, in Figure 2.8, the owner controller of LU is CHA0, and access to the LU is made only via the path (1). After the access path is placed offline, the first candidate for the switching destination is the path (2) and the second candidate is the path (3) or (4).

When the USP, 9900V, 9900, or 7700E is being used, all the paths are owner paths. This means that all the paths accessing the same device can be possible switching destinations. For example, in Figure 2.8, the LU is accessed using only path (1). After the access path is placed offline, the switching destination is one of paths (2), (3), or (4).

For all of the Hitachi Series listed above, when selecting a switching destination from owner paths or non-owner paths that access the same device, HDLM determines the appropriate destination by selecting the lowest value from the following keys, in order: the slot number, the CHA port number, and AutoPATH_ID. For more information, see section 2.7.4.



Legend

— : Path

➔ : I/O request

➡ : Path before switching

➡ : Path after switching

Figure 2.8 Path Switching

2.7.1.2 About Automatic Failback

After a path recovers from an error, HDLM automatically places the recovered path online. This functionality is called *automatic failback*.

When using this function, HDLM monitors error recovery on a regular basis.

When using the 9500V, 9200, 5800, or 5700E, HDLM selects the path to use from online owner paths, and then from online non-owner paths. Therefore, if an owner path recovers from an error and HDLM automatically places the recovered path online while any non-owner path is in use, the path to use is switched to the owner path.

When the USP, 9900V, 9900, or 7700E is being used, all the paths are owner paths. Therefore, if an owner path recovers from an error and HDLM automatically places the recovered path online, the path to use is not switched.

When intermittent errors (*Note 1*) occur in paths, the path status may frequently alternate between the online and offline status if you are using automatic failback, so the I/O performance might deteriorate. In such a case, if there is a path in which an intermittent error might be occurring, we recommend that you set up intermittent error monitoring to remove that path from those subject to automatic failback.

Note 1: An intermittent error means an error that occurs irregularly because of some reason such as a loose cable connection.

You can specify the automatic failback function or the intermittent error monitoring function in the HDLM Environment Settings page in the Options window of the HDLM GUI (see section 4.2.4.6), the Show HDLM Environment subwindow of the HDLM Web GUI, (see section 4.3.7.4) or the `dlnkmgr set` command (section 6.6).

Note: In AIX® 5.2, even if all faulty paths (offline paths) are recovered, and I/O processing is performed, the paths may not be brought online. In this case, make sure to change the paths to online after confirming that the faulty paths have been recovered.

2.7.2 Manual Path Switching

You can switch a path by manually placing a path online or offline. Manually switching a path temporarily is useful for maintenance of the system. You can manually place a path offline in the following ways:

- Place the status of a path online or offline in the Path Management window of the HDLM GUI.
- Use the Show Path List subwindow of the HDLM Web GUI.
- Execute the `dlmkmgr` command together with the `online` or `offline` operation.

Note: The status of the last path for a specific LU in offline status cannot be manually switched to offline. Also, the status of a path whose error has not been recovered cannot be switched to online.

HDLM selects the switching destination path the same way as for automatic path switching. When using the 9500V, 9200, 5800, or 5700E, HDLM selects the switching destination path from owner paths and then from non-owner paths. When the USP, 9900V, 9900, or 7700E is being used, all paths that access the same LU are candidates for the switching destination path. All other paths that run through the same physical path are switched.

Changing the path status online in the Path Management window (or Show Path List subwindow), or executing the `online` operation places the offline path back to `online`. For details on the `online` operation, see section 6.5. After the path status is changed to online, HDLM selects the path to use in the same way as for automatic path switching, which is described in section 2.7.1. When using the 9500V, 9200, 5800, or 5700E, HDLM selects the path to use from online owner paths, and then from online non-owner paths. When the USP, 9900V, 9900, or 7700E is being used, the path to use is not switched after changing the path status to online by using the Path Management window or the `online` operation.

For details on changing the path status in the Path Management window, see section 5.6.7. For information about the Show Path List subwindow, see section 4.3.7.2. For details on the `offline` and `online` operations, see sections 6.4 and 6.5.

2.7.3 Path Status Transition

There are two types of path status: *online* and *offline*. Online means the status in which I/O can normally be received. Offline means the status in which I/O cannot be issued to the path for the following reasons:

- An error occurred in the path.
- A user used the Path Management window of the HDLM GUI to place the path offline.
- A user used the Show Path List subwindow of the HDLM Web GUI to place the path offline.
- A user executed the `dlnkmgr` command together with the `offline` operation. For details on the offline operation, see section 6.4.

Furthermore, the online and offline statuses are divided depending on the attribute. The following explains the two online path statuses and the two offline statuses.

2.7.3.1 The Online Path Status

The online path statuses are as follows:

- `Online`: I/O can be issued normally.
- `Online(E)`: An error has occurred on the path and, among the paths that access the same LU, none of those are in the Online status.

If none of the paths accessing a single 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, by making sure that all paths are not offline.

The (E) indicates the error attribute, which indicates that an error occurred in the path.

2.7.3.2 The Offline Path Status

The offline path statuses are as follows:

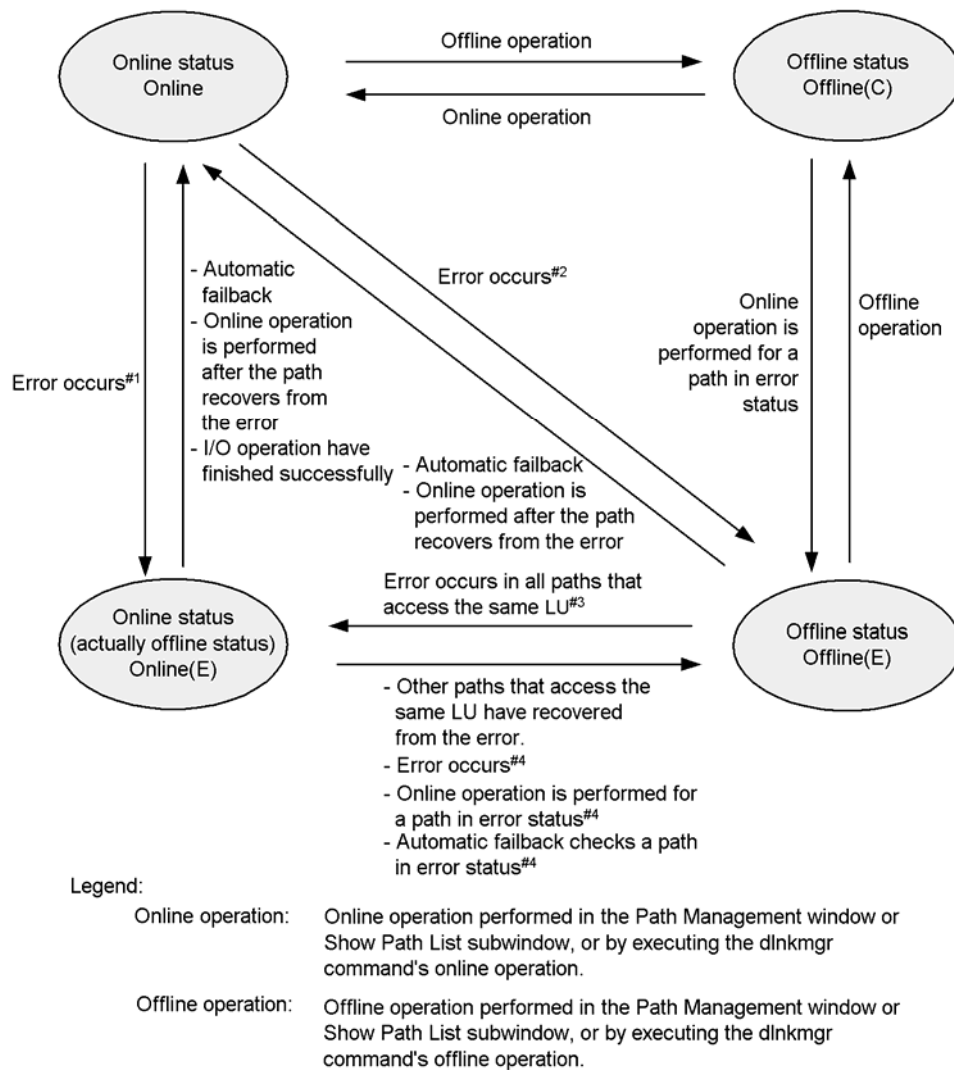
- `Offline(C)`: The status in which I/O cannot be issued because the path was placed offline in the Path Management window of the HDLM GUI, the Show Path List subwindow of the HDLM Web GUI, or the offline operation was executed. For details on the offline operation, see section 6.4

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

- `Offline(E)`: The status in which I/O cannot be performed because an error occurred in the path.

The (E) indicates the error attribute, which indicates that an error occurred in the path.

Figure 2.9 shows the status transitions of a path.



- #1 When no Online or Offline(E) paths exist among the paths that access the same LU.
- #2 When an Online or Offline(E) path exists among the paths that access the same LU.
- #3 One of the Offline(E) paths is changed to the Online(E) path.
- #4 When an Offline(E) path exists among the paths that access the same LU.

Figure 2.9 Path Status Transitions

The last available online path for each LU cannot be placed offline by using the Path Management window, the Show Path List subwindow, or by executing the offline operation. This ensures access to the LU. For details on the offline operation, see section 6.4.

If an error occurs in the last available online path for each LU, the status of the path is changed to `Online(E)`.

If you are using automatic failback, when the path recovers from an error, HDLM automatically places the path online.

When you are using intermittent error monitoring, the path in which the intermittent error occurred is not automatically placed online when the path recovers from the error. In such a case, place the path online manually.

Note: If there is a path failure immediately after a path is made offline by using an HDLM command, HDLM GUI or HDLM Web GUI, `Offline(C)` might change to `Offline(E)`. If an offline operation was performed, wait for a fixed period of time (about 1 minute), check the path status by using an HDLM command, HDLM GUI or HDLM Web GUI, and make sure that the status has changed to `Offline(C)`. If it is `Offline(E)`, retry the offline operation.

2.7.4 Priority of Paths

Path priority depends on the architecture of the target host machine. If the architecture of the machine is CHRP, when selecting a switching destination from among paths that access the same device, HDLM determines the appropriate destination by selecting paths from the following keys, in order from the lowest values: slot number (first key), CHA port number (second key), and AutoPATH_ID (third key).

If the machine has an architecture other than CHRP, HDLM determines the appropriate destination by selecting paths from the following keys, in order from the lowest values: CHA port number (first key), and AutoPATH_ID (second key).

- **Slot number:** This number indicates the position of the slot where an HBA is mounted. You can find the order of the slot numbers by comparing their physical location code. The following describes how to obtain the physical location code.

1. Execute the following command to find hdisk, based on AutoPATH_ID:

```
# /usr/DynamicLinkManager/bin/dlnmgr view -drv
PPathID HDevName Device LDEV
000000 dlmfdrv0 hdisk4 9500V.0010.0301
```

2. Execute the following command to find the parent device of hdisk (the HBA device instance):

```
# lsdev -C -l hdisk4 -F 'parent'
fscsi0
```

3. Execute the following command to find the physical location code, based on the HBA device instance:

```
# lscfg -vp -l fscsi0
```

The obtained physical location code is in the Uaa.bb-Pcc-Idd format:

DEVICE	LOCATION	DESCRIPTION
fscsi0	U1.1-P1-I1	FC SCSI I/O controller protocol device
PLATFORM SPECIFIC		
Name: fibre-channel		
Node: fibre-channel@1		
Physical Location: <u>U1.1-P1-I1/Q1</u>		

↑
physical location code

The first letters, Uaa.bb, depend on the model of the host. HDLM selects the path with the lowest value for aabbccdd.

Note: Depending on the HBA, you need to repeat steps 2 and 3 above. For details on the position of slots, see the appropriate documentation accompanying your host system.

- **CHA port number:** The port number of the channel adapter. You can check this number by using either the `dlnkmgr` command's view operation, the Path Management window of the HDLM GUI, or the Show Path List subwindow of the HDLM Web GUI. For details on the view operation, see section 6.7; for details on the Path Management window, see section 5.5.1.2; and for details on the Show Path List subwindow, see section 5.5.1.3.
- **AutoPATH_ID:** The ID assigned to a path. This ID is re-assigned each time the management-target host or the HDLM Manager is started. You can check this ID by using either the `dlnkmgr` command's view operation, the Path Management window of the HDLM GUI, or the Show Path List subwindow of the HDLM Web GUI. For details on the view operation, see section 6.7; for details on the Path Management window, see section 5.5.1.2; and for details on the Show Path List subwindow, see section 5.5.1.3.

2.8 Monitoring Intermittent Errors (Auto Failback Used)

An intermittent error means an error that occurs irregularly because of some reason such as a loose cable connection. I/O performance might decrease when an intermittent error occurs while automatic failback is used, because automatic failback is performed repeatedly. To prevent this phenomenon, HDLM can automatically remove the path where an intermittent error is occurring from those paths subject to automatic failback. This process is called intermittent error monitoring.

It is recommended that intermittent error monitoring be used along with automatic failback.

With intermittent error monitoring, 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 places the path online. Automatic failback is not performed for the path. This status is called *not subject to auto failback*.

2.8.1 Checking Intermittent Errors

You can check the path in which an intermittent error occurs by using the execution result of the HDLM command's view operation, the HDLM GUI **Path List** view, or the HDLM Web GUI **Show Path List** subwindow.

For details on the view operation, see section 6.7. For details on how to operate the **Path List** view and displayed items in the **Path List** view, see section 4.2.4.5. For details on how to operate the **Show Path List** subwindow and the window components in the **Show Path List** subwindow, see section 4.3.7.2.

2.8.2 Setting up Intermittent Error Monitoring

When you use the intermittent error functionality, you can enable or disable the functionality. If you enable the functionality, specify the monitoring conditions: the error monitoring interval, and the number of times that the error is to occur. If an error occurs in a path the specified number of times within the specified error monitoring interval, the system determines that the path has an intermittent error. For example, if you specify 30 for the error monitoring interval and 3 for the number of times that the error is 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, using the **Options** window of the HDLM GUI, or using the **Show HDLM Environment Settings** subwindow of the HDLM Web GUI.

Intermittent error monitoring can be used only when automatic failback is enabled. The setting value depends on the setting value for automatic failback. For details on how to set up the setting values, see sections 6.6, 4.2.4.6, and 4.3.7.4.

2.8.3 Actions for Intermittent Error Monitoring

Intermittent error monitoring is performed for each path, and it starts when a path is recovered from an error by using automatic fallback.

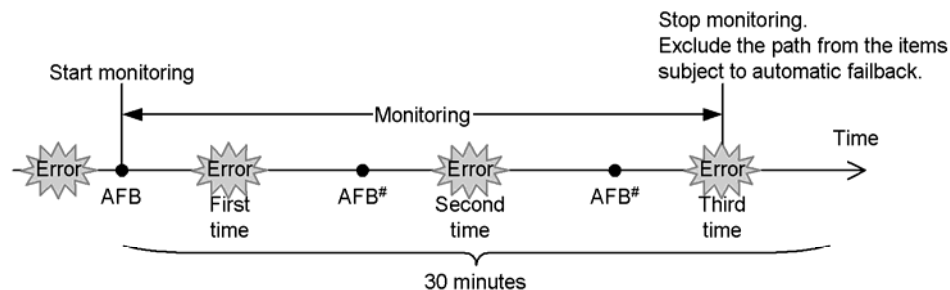
This subsection describes the following actions for intermittent error monitoring:

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

2.8.3.1 When an Intermittent Error Occurs

When an error occurs in a path the specified number of times within the specified interval, the path is determined to have an intermittent error, the error monitoring finishes, and then the path is removed from the items subject to automatic fallback. The path that is removed from the paths that are subject to automatic fallback has an error status until the online operation is performed properly.

Figure 2.10 shows the action for intermittent error monitoring when an intermittent error occurs. In this example, the path is determined to have an intermittent error when the error occurs 3 or more times in 30 minutes. The event occurred in one path is described on the time arrow.



(Legend)

AFB: Indicates where the path was changed from error status to online status by automatic fallback.

#

This includes online operation performed by a user.

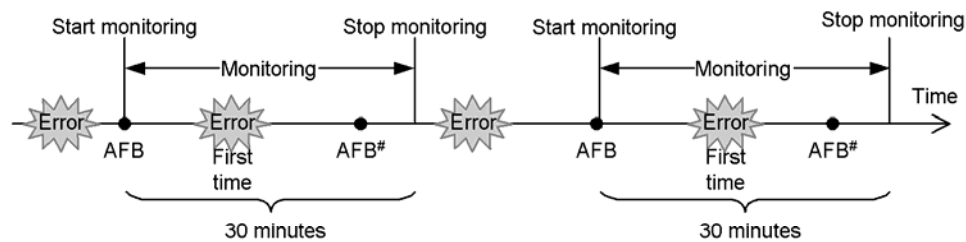
Figure 2.10 Action When an Intermittent Error Occurs in the Path

2.8.3.2 When an Intermittent Error Does Not Occur

If an error does not occur in the path the specified number of times within the specified interval, an intermittent error does not occur. In this case, the error monitoring finishes when the specified error monitoring interval finishes and the number of errors is reset to 0. If an error occurs in the path later, the error monitoring restarts at the time the path is recovered from the error by using automatic fallback.

If errors occur after a long interval, an intermittent error can be detected by increasing the error monitoring interval or by decreasing the number of times that the error is to occur (in order for the system to determine that an intermittent error is occurring).

Figure 2.11 shows the action in intermittent error monitoring when an intermittent error does not occur. In this example, the path is determined to have an intermittent error if the error occurs three or more times in 30 minutes. The event occurring in one path is described on the time arrow.



(Legend)

AFB : Indicates where the path was changed from error status to online status by automatic fallback.

#

This includes online operation performed by a user.

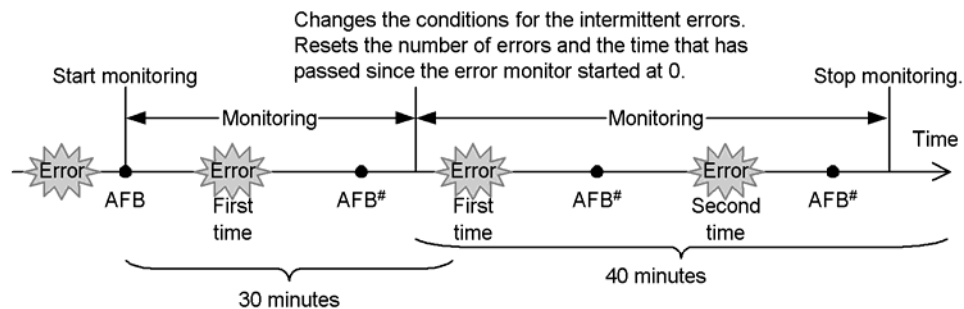
Figure 2.11 Action When an Intermittent Error Does Not Occur in the Path

2.8.3.3 When the Conditions for an Intermittent Error are Changed During Error Monitoring

When the conditions (error monitoring interval and the number of times that the error is to occur) for an intermittent error are changed during error monitoring, the number of errors and the time that has passed since the error monitoring started are reset to 0. The error monitoring does not finish and restarts from the time the conditions are changed.

When you change the conditions outside the error monitoring time, at the time the path is recovered from the error by using automatic failback, the error monitoring starts with the changed conditions.

Figure 2.12 shows the action for intermittent error monitoring when the conditions for an intermittent error are changed during error monitoring. In 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 occurring in one path are written on the time arrow.



(Legend)

AFB: Indicates where the path was changed from error status to online status by automatic failback.

#

This includes online operation performed by a user.

Figure 2.12 Action When the Conditions for the Intermittent Error are Changed During Error Monitoring

2.8.4 When User Operations Change the Intermittent Error Information

The following might be reset when the user changes the values set for an intermittent error or the path status: the number of errors that are counted during error monitoring, the time that has passed since error monitoring started, and the information about whether an intermittent error occurs (the path has been removed from those paths subject to automatic failback). Table 2.7 shows whether the above items are reset. If you want to check whether intermittent error monitoring is being performed for the path, check the **IEP** item displayed when the **dlnkmgr** command's **view -path** operation is executed with the **-iem** parameter, the **Intermittent Error Path** item in the Path List view of the HDLM GUI, or the **Intermittent Error Path** item in the Path List subwindow of the HDLM Web GUI. If a numerical value of 0 or greater is displayed in the **Intermittent Error Path** item, then intermittent error monitoring is being performed.

Table 2.7 When User Operations Change the Intermittent Error Information

User Operation		Number of Errors and Time passed since error monitoring started	Information about paths not subject to automatic failback
Changing the setting for intermittent error monitoring	Setting off	Reset	Reset (<i>Note 1</i>)
	Changing the conditions for an intermittent error during intermittent error monitoring	Reset (<i>Note 2</i>)	Inherit
	Setting on during error monitoring by executing the set operation (the conditions for the intermittent error monitoring are not changed)		
	Clicking the Apply or OK button in the window (<i>Note 3</i>) for HDLM environment settings during the intermittent error monitoring. (<i>Note 4</i>)		
	Changing the setting for intermittent error monitoring to outside the error monitoring.	(Not applicable) (Not counted)	Inherit
Changing the automatic failback settings	Setting off	Reset	Reset
Changing the path status	Placing the path Offline(C)	Reset	Reset
	Placing the path Online outside the intermittent error monitoring	(Not applicable) (Not counted)	Reset
	Placing the path Online during the intermittent error monitoring	Inherit	(Not applicable) (If a path has been removed from the paths subject to automatic failback, that path is not monitored.)
Restarting the HDLM manager		Reset (<i>Note 5</i>)	Inherit
Restarting the host		Reset	Reset

Note 1: When you change the intermittent error monitoring functionality to off, information about paths not subject to automatic failback will be reset. When you change the intermittent error monitoring functionality to off and you do not want to reset information about paths not subject to automatic failback, place the target paths Offline(C).

Note 2: The number of errors is reset to 0, and then monitoring restarts in accordance with the changed monitoring conditions.

Note 3: Indicates the Options window of the HDLM GUI or the Show HDLM Environment Settings subwindow of the HDLM Web GUI.

Note 4: If the settings for a function other than intermittent error monitoring have been changed or the settings for intermittent error monitoring have not been changed, and then the **Apply** or **OK** button is clicked, the number of error occurrences and the time since monitoring started are reset. To leave the setting unchanged in HDLM GUI, close the Options window by clicking the Cancel button. In HDLM Web GUI, change to a different window without clicking the OK 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.

Note 5: The number of errors is reset to 0, and then monitoring restarts.

2.9 Detecting Errors by Using Path Health Checking

HDLM can check the status of paths at regular intervals and detect errors. This verification is called *path health checking*.

Without path health checking, an error is not detected unless I/O is performed. However, with path health checking, the system checks the status of online paths at regular intervals regardless of whether I/O is performed. If an error is detected in a path, path health checking switches the status of that path to **Offline (E)** or **Online (E)**, so you can check the path error using the view operation of the `dlnkmgr` command, the Path Management window of the HDLM GUI, or the Show Path List subwindow of the HDLM Web GUI.

For example, in a normal state, I/O is not performed on the paths of the standby host in the cluster configuration or on the non-owner paths (that is, some of the paths that access the Thunder 9500V Series, Thunder 9200, Freedom Storage 5800, and Freedom Storage 5700E storage subsystems). Because of this, for the standby host or 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 recent path-status information when selecting the switching destination.

You can configure path health checking using the HDLM Environment Setting page in the Options window of the HDLM GUI, the Show HDLM Environment Settings subwindow of the HDLM Web GUI, or by executing the `set` operation of the `dlnkmgr` command. For information about configuring path health checking, see section 5.5.2. For details on the `set` operation, see section 6.6.

2.10 Error Management

For troubleshooting, HDLM collects information into log files. The error information can be filtered according to the error level, and collected into the log files.

Figure 2.13 shows the data flow when collecting error information in logs.

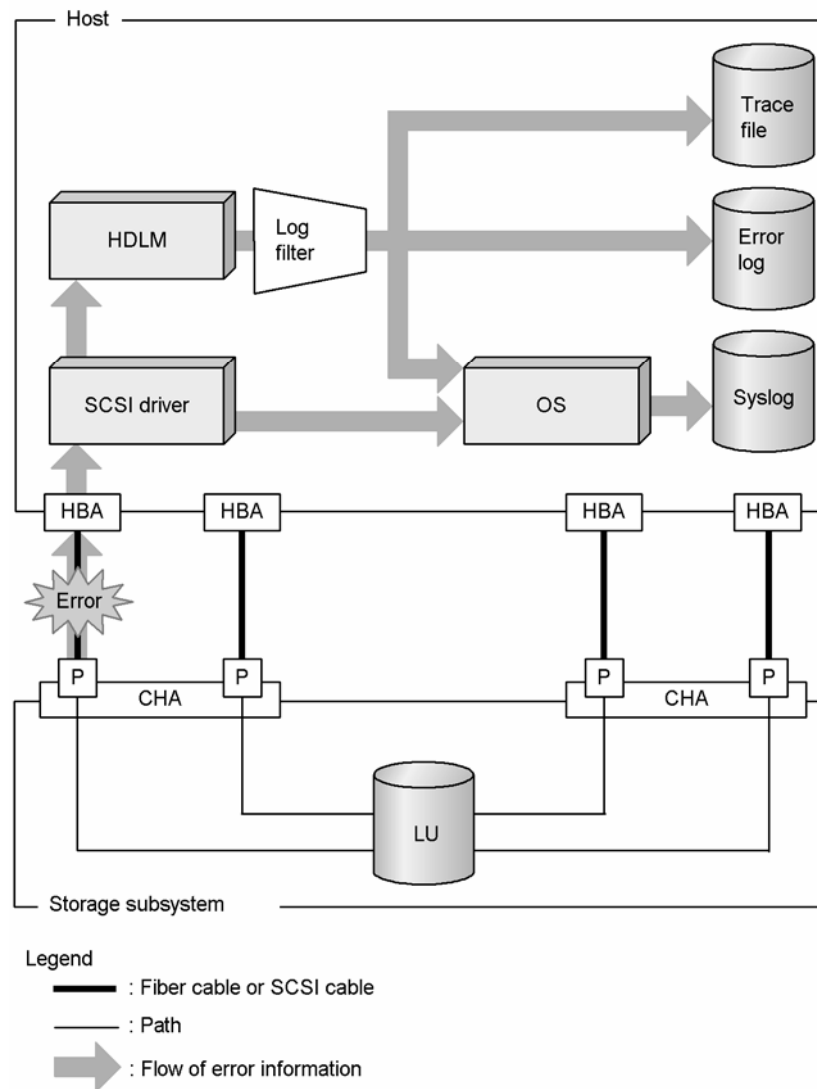


Figure 2.13 Error Management

Logs might be collected in layers lower than HDLM, such as for the SCSI driver. For details on the logs, see the documentation that accompanies your AIX system.

2.10.1 Logs Collected

HDLM collects information on the detected error and trace information in the *integrated trace file*, *trace file*, *error logs*, *log for the dlmcfmgr utility for managing the HDLM configuration*, and *syslog*. When you use a Device Manager client to display the HDLM GUI, the logs pertaining to this operation are also collected in a user-defined file. You can use the error information to examine the status of an error and analyze the cause of the error. For further information on the HDLM log files, see section 5.7.1.

Table 2.8 describes the different logs.

Table 2.8 Log Descriptions

Log Name	Description	Output Destination
Integrated trace file	Operation logs of the HDLM command and GUI are collected.	The default file path is <code>/var/opt/hitachi/HNTRLib2/spool/hntr2 [1-16] .log</code> . To specify the output destination directory and the file prefix for the integrated trace file, use a utility of Hitachi Network Objectplaza Trace Library (HNTRLib2).
Trace Files	Trace information on the HDLM manager is collected for the level set by the user. If an error occurs, you might need to change the settings to collect trace information.	The trace file name is <code>/var/DynamicLinkManager/log/hdlmtr [1-64] .log</code>
Error log	Error information for the user-defined level is collected from detected errors. By default, HDLM collects all detected error information.	HDLM Manager logs: <code>/var/DynamicLinkManager/log/dlmmgr [1-16] .log</code> HDLM GUI logs: <code>/var/DynamicLinkManager/log/dlmgui [1-2] .log</code> HDLM Web GUI logs: <code>/var/DynamicLinkManager/log/dlmwebagent [1-N] .log</code> The value <code>n</code> depends on the setting in the file <code>dlmwebagent.properties</code> .
Syslog	The HDLM messages on or above the level set by the user with <code>/etc/syslog.conf</code> are collected. We recommend that you configure the system so that information at the Information level and higher is output. Syslogs can be checked using a text editor.	Syslog is not output by default. To output syslog, The syslog file path is specified in the file <code>/etc/syslog.conf</code> . For details, see the AIX documentation.
HDLM Inquiry log	An HDLM Inquiry log is a response log when the Inquiry command is issued to the hdisk. To collect HDLM Inquiry logs, perform the log collection settings by using the <code>dlmodmset</code> utility (the utility for setting the HDLM execution environment ODM).	HDLM Inquiry logs: <code>/var/DynamicLinkManager/log/dlminquiry1.log</code> <code>/var/DynamicLinkManager/log/dlminquiry2.log</code>
Logs collected by Device manager client	When you use the HDLM GUI in a Device Manager client, Java Web Start collects logs. The level of the logs collected is the same as the collection level for the trace information.	User-defined file.

Log Name	Description	Output Destination
Logs collected by Device manager server	When you use the HDLM Web GUI in a Device Manager client, a Device Manager server collects logs. The trace information for the user-defined level is collected.	<p>When the OS of the Device Manager server is Windows®</p> <ul style="list-style-type: none"> Trace for each process: <code>installation-folder:\log\dlmservlet [1-N] .log</code> The installation <i>folder</i> varies depending on the user specification during installation. The value <i>N</i> depends on the setting in the <code>dlmservlet.properties</code> file. The default value is 8. Integrated trace: <code>HNTRLlib2-installation- folder:\spool\hntr2 [1-16] .log</code> <p>When the OS of the Device Manager server is Solaris™</p> <ul style="list-style-type: none"> Trace for each process: <code>/var/opt/DynamicLinkManagerWebGUI/log/dlmservlet [1-N] .log</code> The value <i>N</i> depends on the setting in the <code>dlmservlet.properties</code> file. The default value is 8. Integrated trace <code>/var/opt/hitachi/HNTRLlib2/spool/hntr2 [1-16] .log</code>

Note: The file path of syslog logs is specified in the `/etc/syslog.conf` file. The default path for syslogs collected by AIX® systems is `/var/adm/syslogfile`. For details on error levels, see section 2.10.2.

2.10.2 Error Information Filtering

Errors that HDLM detects are classified into error levels. Table 2.9 shows the error levels, listed in order of adverse effect on the system. Error information collected for a log is filtered according to error level. In syslog, the HDLM messages on or above the level set by the user configured in `/etc/syslog.conf` are collected. It is recommended that you set the Information to be output at the info level or higher.

Table 2.10 lists and describes the logging levels for the HDLM error log. For details on setting the logging levels, see section 5.7.1.

HDLM also includes a trace file output function provided by the Hitachi Network Objectplaza Trace Library (HNTRLib) software. Table 2.11 lists and describes the HDLM trace levels.

Note: HDLM has an error information collection utility (DLMgetras) which allows you to collect detailed information, such as trace files, definition files, core files, and libraries, required for analyzing errors (see section 7.1). The collected information is intended for use by the Hitachi Data Systems maintenance personnel.

Table 2.9 Error Levels

Error Level	Meaning
Critical	Fatal errors that may stop the system.
Error	Errors that crucially affect the system. This type of error can be avoided by using failover or other countermeasures.
Warning	Errors that enable the system to continue but, if left, might cause the system to operate improperly.
Information	Information that indicates the operating history when the system operates normally.

Table 2.10 Error Logging Levels

Description
Does not collect an error log
Collects error information at the Error level or higher
Collects error information at the Warning level or higher
Collects error information at the Information level or higher (all levels) (this is the default setting)

Table 2.11 Trace Levels

Description
Does not output any trace. This is the default trace level setting
Outputs error information only
Outputs a summary of program operation
Outputs the details of program operation
Outputs all information (error information, summary of program operation, and details of program operation)

2.10.3 Collecting Error Information Using the DLMgetras Utility

HDLM has a utility for collecting HDLM error information, the DLMgetras utility.

By executing this utility, you can simultaneously collect all the information required for analyzing errors: information such as error logs, integrated trace files, trace files, definition files, core files, system crash dump files, and libraries. You can use the collected information when you contact your HDLM vendor or maintenance company (if there is a maintenance contract for HDLM).

For details on the DLMgetras utility, see section 7.1.

2.11 Cluster Support

HDLM is also available for cluster configurations. Table 2.12 lists the cluster software supported by HDLM, and availability of HDLM load balancing functionality in a cluster configuration that uses the cluster software.

Table 2.12 Cluster Software Supported by HDLM

Cluster Software	Availability of Load Balancing
GPFS + RVSD	Available
HACMP	Available
HA Monitor	Available
Real Application Clusters	Available
VCS	Available

Important: Read the HDLM Release Notes for precautions on cluster configuration.

HDLM uses paths of the *active host* to access an LU.

The details of host switching depends on the application.

Important Notes:

- To use HDLM in a cluster configuration, HDLM must be installed on all the hosts that comprise the cluster configuration.
- If you use HACMP™ or VCS, you will need to register the HDLM script for HACMP™ or VCS. For information on registering the HDLM script for VCS, see section 3.11.

2.12 Remote Operation of HDLM from the HiCommand™ Device Manager Client

HiCommand™ Device Manager provides a link-and-launch function which enables you to launch and use the HDLM GUI or the HDLM Web GUI from any Device Manager Web Client system.

- Use HDLM GUI if you use Device Manager 2.4.
- Use HDLM Web GUI if you use Device Manager 3.0.

Note: Even though the version of Device Manager that you use is 3.0 or later, HDLM GUI starts when the version of HDLM that you use is 5.1 or earlier.

Figure 2.14 shows a system configuration example for remote operation of the HDLM GUI using the HiCommand™ Device Manager link-and-launch function.

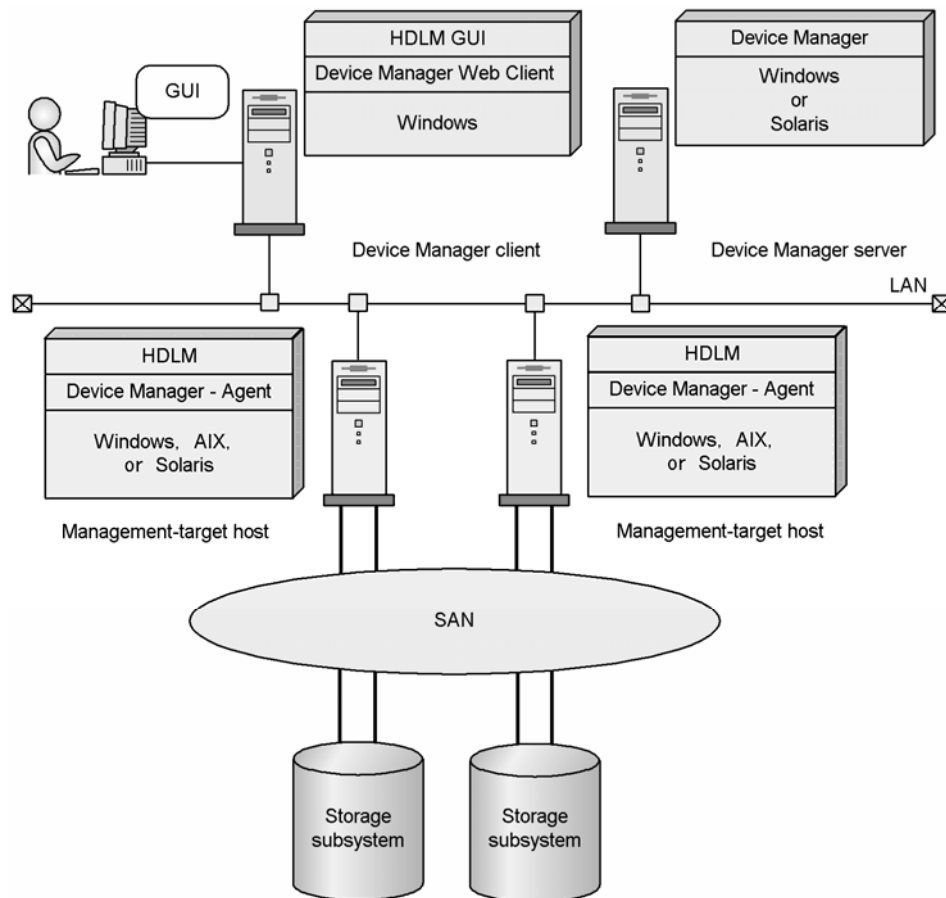


Figure 2.14 System Configuration Example for Linking with Device Manager

- For details on the remote operation of the HDLM GUI from the HiCommand™ Device Manager Client, see section 5.3.
- For details on the remote operation of the HDLM Web GUI from the HiCommand™ Device Manager Client, see section 5.4.
- For details on installing the HDLM Web GUI in a Device Manager server when linking with Device Manager, and on creating an environment after the installation, see section 3.4.1. For details on how to uninstall the HDLM Web GUI, see 3.14.2.

2.13 Login Information and Performing Device Manager Operations

When HDLM is linked with Device Manager and you operate the Show Path List subwindow on a Device Manager client, executable operations differ depending on the HDLM version, and depending on the Device Manager login privileges shown in Table 2.11.

Table 2.13 Operations Executable on the Show Path List Subwindow

HDLM Version	HDLM Web GUI Operating Privileges (<i>Note</i>)	Device Manager Login Privileges	Operations Executable on the Show Path List Subwindow
5.2	Not Applicable	System Administrator Storage Administrator Local System Administrator Local Storage Administrator	Refreshing the display. Changing the HDLM operating environment. Starting the Help window. Performing online operations. Performing offline operations. Clearing data. Outputting information to a CSV file.
		Guest Local Guest	Refreshing the display. Starting the Help window. Outputting information to a CSV file.
5.4	admin(Inheriting the Device Manager operating permissions)	System Administrator Storage Administrator Local System Administrator Local Storage Administrator	Refreshing the display. Changing the HDLM operating environment. Starting the Help window. Performing online operations. Performing offline operations .Clearing data. Outputting information to a CSV file.
		Guest Local Guest	Refreshing the display. Starting the Help window. Outputting information to a CSV file.
	guest(granting Guest privileges only)	System Administrator Storage Administrator Local System Administrator Local Storage Administrator Guest Local Guest	Refreshing the display. Starting the Help window. Outputting information to a CSV file.

Note: This indicates the value that was set in *hdlm.authority* in the *dlimservlet.properties* file on the Device Manager server.

Chapter 3 Creating an HDLM Environment

This chapter describes the procedures for creating an HDLM environment and for canceling the setup.

Make sure that HDLM is installed and its functions have been set up. The volume groups and cluster software programs must be set up appropriately for your system environment. If you are linking HDLM to Device Manager, see section 3.12 or section 3.13.

- System requirements (section 3.1)
- Flow for creating an HDLM environment (section 3.2)
- Notes on creating an HDLM environment (section 3.3)
- Installing HDLM (section 3.4)
- Setting up HDLM (section 3.5)
- Setting up integrated traces (section 3.6)
- Checking the path configuration (section 3.7)
- Setting up volume groups (section 3.8)
- Settings for using HACMP (section 3.9)
- Settings for using GPFS + RVSD (section 3.10)
- Settings for using VCS (section 3.11)
- Creating an HDLM GUI environment for operating HDLM from Device Manager (section 3.12)
- Creating an HDLM Web GUI environment for operating HDLM from Device Manager (section 3.13)
- Uninstalling HDLM (section 3.14)
- Deleting the GPFS + RVSD settings (section 3.15)
- Deleting the VCS settings (section 3.16)

3.1 System Requirements

Important: Read the Release Notes (on the HDLM CD ROM) prior to installation. The Release Notes contain important information on supported hardware and software (e.g., server machines, HBAs, drivers, required patches) and HDLM usage precautions. The Hitachi Data Systems representative should refer to the applicable ECN and HDLM Hardware Notes for important information on storage subsystem setup.

Important: Before installing HDLM you must connect the storage subsystem (present a LUN) to the server in which you are installing HDLM.

3.2 Flow for Creating an HDLM Environment

Set up the environment to use HDLM as follows.

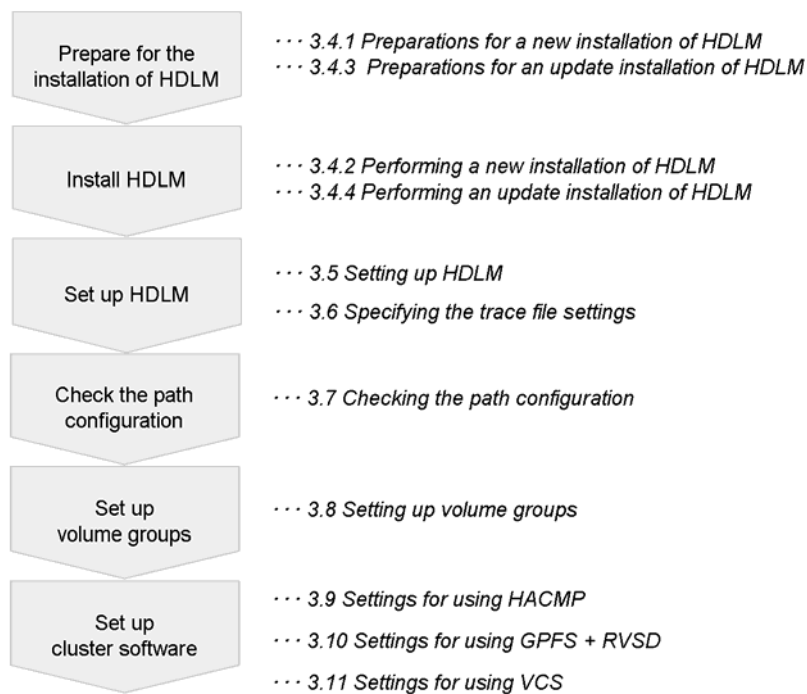


Figure 3.1 Flow of HDLM Environment Setup

3.3 Notes on Creating an HDLM Environment

This section gives notes on creating an HDLM environment. For details about notes on operating HDLM, see section 4.1.

Note the following points when installing HDLM:

- Install HDLM on the boot disk.
- A license key is necessary to install HDLM.
- In this manual, *update installation* refers to an installation of HDLM onto an existing instance of HDLM without uninstalling the existing instance. You can perform an update installation of HDLM 5.6 on versions of HDLM that are 5.6 or earlier.
- A license key is required when performing a new installation of HDLM, updating to HDLM 5.6 from HDLM earlier than 5.4, or updating HDLM 5.4 or later after the valid license period has expired.
- To update the HDLM license, perform the HDLM command's `set -lic` operation. The license key type determines the expiration of the license key. For details about license key types and the `set` operation, see section 6.6.
- When you update HDLM 5.6 from HDLM 5.1 or earlier, correspondence between the logical device file of an HDLM device and physical volume, and the instance number change as follows:

For HDLM 5.1 or earlier:

The logical device file (`d1mfdrv n`) of an HDLM device: physical volume (`hdisk n`) = 1:1

Same instance number

Example: The logical device file `d1mfdrv1` of an HDLM device corresponds to the physical volume `hdisk1`.

For HDLM 5.6 or later:

The logical device file (`d1mfdrv n`) of an HDLM device: physical volume (`hdisk n`) = 1:Multiple

Different instance number

Example: The logical device file `d1mfdrv0` of an HDLM device corresponds to the physical volumes `hdisk1` and `hdisk4`.

- When you want to install HDLM on a host where Device Manager Agent is installed, stop the Device Manager Agent daemon process, `hdvmagt`, before starting the installation. For details about how to stop the `hdvmagt` daemon process, see the manual *HiCommand Device Manager Agent Installation Guide*.
- The information about the driver configuration and HDLM functionality settings, and the log files, will be inherited when the update installation is complete. For details on the information to be inherited, see Table 3.2 in 3.4.4.

- In HDLM 5.6, trace files for versions of HDLM earlier than 5.6 are divided into integrated trace files and trace files. The logs for the HDLM command and HDLM GUI operations are output to integrated trace files. Trace information for an HDLM manager is output to trace files. The output destinations for the files are changed as follows:

When you install HDLM 5.6 after uninstalling earlier than HDLM 4.1 or when you perform an update installation from HDLM 4.1

Trace files before update:

`/opt/hitachi/HNTRLlib/spool/hntrn.log` (*n* indicates a file number)

Integrated trace files after update:

`/var/opt/hitachi/HNTRLlib2/spool/hntr2n.log` (*n* indicates a file number)

Trace files after update:

`/var/opt/DynamicLinkManager/log/hdlmtrn.log` (*n* indicates a file number)

When you install HDLM 5.6 after uninstalling HDLM 4.1 or later, or when you perform an update installation from HDLM 4.1

Trace files before update:

`/var/opt/hitachi/HNTRLlib2/spool/hntr2n.log` (*n* indicates a file number)

Integrated trace files after update:

`/var/opt/hitachi/HNTRLlib2/spool/hntr2n.log` (*n* indicates a file number)

Trace files after update:

`/var/opt/DynamicLinkManager/log/hdlmtrn.log` (*n* indicates a file number)

- When an update installation of HDLM 5.6 is performed on a host that contains HDLM 4.1, the HNTRLlib installed with HDLM 4.1 remains. You can uninstall Hitachi Network Objectplaza Trace Library (HNTRLlib) only when none of the programs other than HDLM are using it. For details on how to check whether programs other than HDLM are using HNTRLlib, see the documentation for the programs. For details on uninstalling HNTRLlib, see 3.14.6.
- HDLM cannot recognize storage subsystems if you change the name of the storage subsystem's vendor to the name other than "HITACHI" by using the storage subsystem management program. Thus, use "HITACHI" as the name of the storage subsystem's vendor.
- When using HACMP, GPFS + RVSD, or VCS, settings such as script registration or the reservation level setting are required. For details about the settings used for each cluster, see the following:
For HACMP: section 3.9.
For GPFS + RVSD: section 3.10.
For VCS: section 3.11.

- When you change the configuration of a system that uses HDLM, make sure that the changed environment has been built correctly, and then back up the HDLM configuration definition file. The configuration definition file is stored under the `/usr/DynamicLinkManager` directory. Back up everything under the `/usr/DynamicLinkManager` directory.
- Of the logical device files of an HDLM device, a block device file becomes `/dev/dlmfdrvn` and a character device file becomes `/dev/rdlmfdrvn`.
- An HDLM-dedicated device file is created in the `/dev/dlm` directory when HDLM is installed. Do not use this device file.
- Do not execute any of the following commands by specifying a physical volume that consists of an HDLM device:
 - The `chdev` command when the HDLM driver is enabled
 - The `rmdev` command
 - Any commands for manipulating volume groups (`extendvg`, `importvg`, `mirrorvg`, `mkvg`, `recreatevg`, `reducevg`, `restvg`, `syncvg`, and `unmirrorvg`)

To avoid invalid operations on physical volumes that consist of an HDLM device, you can specify a setting that returns an error for operations that specify physical volumes. If you specify such a setting, when an HDLM device is enabled an error occurs when the `rmdev`, `chdev`, or a volume group manipulation command is executed on a physical volume that consists of an HDLM device. For details about how to specify the setting, see section 6.6.

- If you create a volume group on a physical volume (`hdiskn`) with no `pvid` and then configure an HDLM device, the relationship between the volume group and the logical device file (section *n*) of the HDLM device might be lost. In such a case, execute the following command to create `pvid` for `dlmfdrvn`:


```
# chdev -l dlmfdrvn -a pv=yes
```

3.4 Installing HDLM

When you install HDLM, Hitachi Network Objectplaza Trace Library will also be installed. The file path of the integrated trace information file of Hitachi Network Objectplaza Trace Library is `/var/opt/hitachi/HNTRLib2/spool/hntr2n.log`, where *n* is the number of the integrated trace information file.

Important: Before installing HDLM you must connect the storage subsystem (present a LUN) to the server in which you are installing HDLM.

3.4.1 Preparations for a New Installation of HDLM

In this subsection, you will perform such preparations as backing up the HDLM management-target devices, applying AIX® patches, and performing hardware setup.

When using HDLM in a cluster configuration, make sure to perform the operations described in the following sub-sections on all hosts that comprise the cluster.

3.4.1.1 Perform Operations for HDLM Management-Target Devices

If you have already defined physical volumes and have been running the HDLM management-target devices, perform the following procedure:

1. Terminate the processes of all applications that are accessing the HDLM management-target devices.
2. If necessary, back up all HDLM management-target devices to a medium such as tape.
3. Unmount the disks. If the HDLM management-target devices are mounted, unmount them as follows:
 - First, execute the command below to check the current settings.
mount -p

The current settings will be output as shown in Figure 3.2.

```
# mount -p
```

node	mounted	mounted over	vfs	date	options
/dev/hd4	/		jfs	July 02 06:07	rw,log=/dev/hd8
/dev/hd2	/usr		jfs	July 02 06:07	rw,log=/dev/hd8
/dev/hd9var	/var		jfs	July 02 06:07	rw,log=/dev/hd8
/dev/hd3	/tmp		jfs	July 02 06:07	rw,log=/dev/hd8
/dev/hd1	/home		jfs	July 02 06:07	rw,log=/dev/hd8
/proc	/proc		procfs	July 02 06:07	rw
/dev/hd10opt	/opt		jfs	July 02 06:07	rw,log=/dev/hd8
/dev/lv02	/mntpt		jfs	July 02 12:11	rw,log=/dev/loglv01

```
#
```

Figure 3.2 Execution Result Example of the mount -p Command (Preparations for a New Installation of HDLM)

The following example manages the device, which is showed in the shaded portion of Figure 3.2, by using HDLM.

- Execute the following command to unmount the disk.
`umount /mntpt`
- 4. Execute the following command to inactivate the applicable volume group:
`varyoffvg volume-group-name`

3.4.1.2 Apply AIX® Patches

Please contact your Hitachi Data Systems technical representative for assistance with applying patches to the AIX® operating system if necessary.

3.4.1.3 Set Up the Hardware

For a Fibre Channel connection, check the topology (Fabric, AL, etc.) and perform setup as appropriate.

1. Set up the storage subsystem. For details on how to set up the storage subsystem, see the *Hardware Notes* that come with HDLM and the maintenance documentation for the storage subsystem.

HDLM cannot manage the command devices used by CCI. When you are using the Thunder 9200 system, set up the Standard Inquiry Data extended mode in the storage subsystem to exclude such devices from the HDLM management-target. For details on how to set up this mode, see the maintenance manual for the Thunder 9200 system.

To make the command devices used by CCI redundant, use the CCI functionality.

2. Set up the switches (as applicable). For more on how to set up a switch, please refer to the documentation accompanying the switch.
3. Set up the host bus adapter (HBA). For details on how to set up an HBA, please refer to the documentation accompanying the HBA.

Note: Make sure that all HBAs that are on a single host and connected to HDLM-managed disks are of the same type, and have the same microprogram version. If you are using more than one type of HBA, paths will not be able to be switched when an error occurs.

4. Make sure the OS recognizes the LU.

Execute the `cfgmgr` command to configure the device, and then execute the `lsdev` command to check that the physical volume (`hdiskn`) has been recognized.

```
# cfgmgr
# lsdev -Cc disk
```

3.4.1.4 Switch the Kernel Mode

If you install HDLM on a host that is using the 32-bit kernel mode, HDLM for 32-bit kernel will be installed. If you install HDLM on a host using the 64-bit kernel mode, HDLM for 64-bit kernel will be installed. Before installing HDLM, decide which kernel mode you will use to operate AIX®, and change to the desired kernel mode if necessary.

When you change the kernel mode of a host on which HDLM has been installed, execute the utility for modifying the HDLM execution environment (`d1mchenv`) so that HDLM and the new kernel mode match.

The following shows how to switch the kernel mode.

1. Check the kernel mode currently being used:

```
# bootinfo -K
```

32 will be displayed when the 32-bit kernel is being used, and 64 will be displayed when the 64-bit kernel is being used.

2. Switch the kernel mode.

When AIX® is running, change the symbolic link for `/usr/lib/boot/unix` and `/unix` to switch the current kernel mode to the desired mode.

- The path for the 64-bit kernel mode:

```
/usr/lib/boot/unix_64
```

- The path for the 32-bit kernel mode:

```
/usr/lib/boot/unix_up (for a uni-processor)
```

```
/usr/lib/boot/unix_mp (for a multi-processor)
```

3. Execute the `bosboot` command.

```
# bosboot -ad /dev/ipldevice
```

4. Restart the system.

```
# shutdown -Fr
```

5. Execute the following command to confirm that the kernel mode has been changed properly.

```
# bootinfo -K
```

3.4.1.5 Set up Cluster Software

To use HDLM in a cluster configuration, you need to perform the following setup for the cluster software.

To set up cluster software:

1. Install the cluster software on all of the hosts in the cluster. For details on the installation, please refer to the accompanying cluster software documentation.
2. Stop the cluster software services. For details on the installation, please refer to the accompanying cluster software documentation.

3.4.1.6 Installing JRE

The Java Runtime Environment (JRE) needs to be installed to enable the HDLM GUI. If no JRE has been installed on the host, install JRE.

To install the JRE:

1. From the IBM Web page, download *IBM Runtime Environment for AIX® , Java™ 2 Technology Edition*. For details about the downloaded JRE version, please contact your Hitachi Data Systems technical representative.
2. Install the downloaded JRE onto the host containing the installed HDLM GUI.
3. Install the font set required for JRE.

If the font set required for JRE has not been installed, the Path Management window of the HDLM GUI will not be able to display characters properly. Refer to the JRE `README` file, and install the necessary font set.

3.4.2 Performing a New Installation of HDLM

To install HDLM, use one of the following procedures:

- Use the `smit` command (a standard AIX® command), or the `installp` command.
You can also copy the contents of the HDLM CD-ROM to a desired directory, and then perform installation from that directory.
- Use the utility for HDLM installation configuration support.
This utility sets the HDLM functionality by using the `set` operation and `d1modmset` utility at the time of HDLM installation.

For details about the installation procedure using the `d1msetup` utility, see section 3.4.5.

Important: Before installing HDLM you must connect the storage subsystem (present a LUN) to the server in which you are installing HDLM.

When using HDLM in a cluster configuration, install HDLM on all of the hosts that comprise the cluster.

The following describes how to install HDLM using the `installp` command. Before installing HDLM, make sure that you have a license key available.

Note: You can install HDLM on a virtual I/O server. A virtual I/O server is a system that enables multiple client logical partitions to share one resource. To use a virtual I/O server, see your virtual I/O server manual to log in to AIX®.

To perform a new installation of HDLM:

1. Log in to AIX® as the root user. If you are using a virtual I/O server, see the virtual I/O server manual to log in to AIX®.
2. Prepare the license key file. Store the license key file, using the name `hdlm_license`, directly under `/var/tmp/`:
`/var/tmp/hdlm_license`
3. Insert the HDLM CD-ROM into the CD-ROM drive. You do not need to mount anything. When installing HDLM from a directory copied from the CD-ROM, you do not need to insert the CD-ROM.
4. Execute the following installation command:
 - When installing HDLM from the CD-ROM
`# installp -aXgd CD-ROM-special-file-name all`
 - When installing HDLM from a directory copied from the CD-ROM
`# installp -aXgd directory-copied-from-CD-ROM all`
5. Follow the instruction shown in the messages that appear on the screen.
6. Execute the following command to make sure that the package is installed:
`# lsllpp -L DLManager.rte`

Make sure that the fileset item in the output listing contains `DLManager.rte`, and that the status is C (commit).
7. Execute a following command as required, to add `/usr/DynamicLinkManager/bin` to the `PATH` environment variable.
 - When using a Bourne shell or Korn shell:
`# PATH=$PATH:/usr/DynamicLinkManager/bin`
`# export PATH`
 - When using a C shell:
`# set path=($path /usr/DynamicLinkManager/bin)`
8. Set up a file that defines non-HDLM-managed disks.

If no physical volumes are to be excluded from the HDLM management-target, this step is unnecessary. Go to step 9.

Define the physical volumes that you want to exclude from the HDLM management-target in the file that defines non-HDLM-managed disks
(`/usr/DynamicLinkManager/drv/dlmfdrv.unconf`).

The following describes how to create the `dlmfdrv.unconf` file when using the system in the configuration shown in Figure 3.3.

Note: HDLM cannot manage the boot disk, dump device, and swap device in a storage subsystem. When creating a boot disk or dump device in a storage subsystem, make sure that you define these devices in the `dlmfdrv.unconf` file.

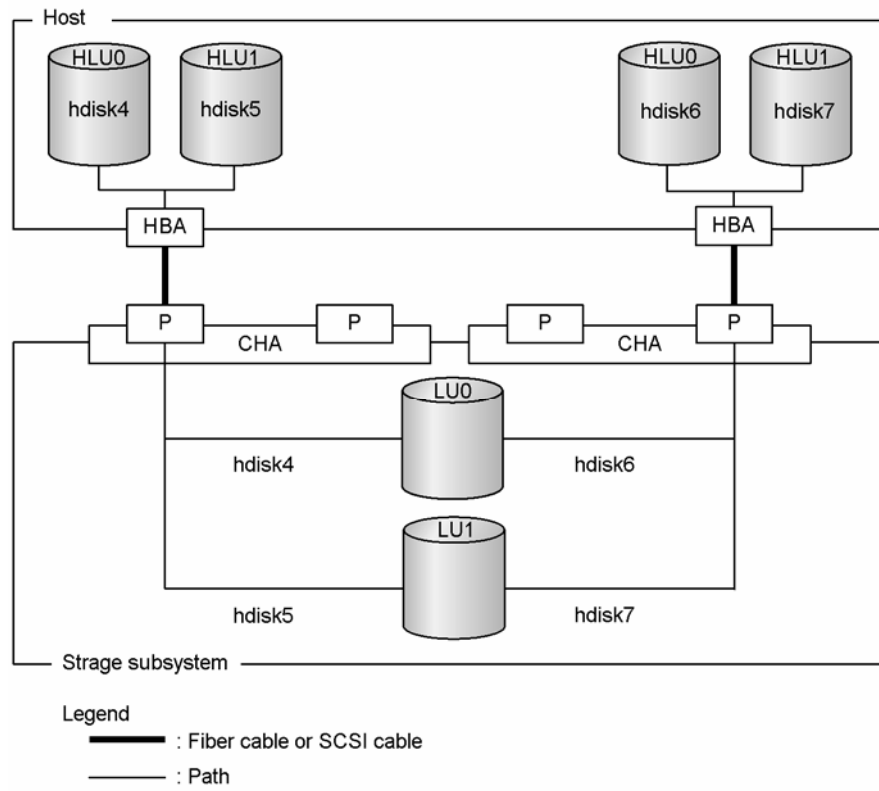


Figure 3.3 Example of system configuration

Execute the `lsattr` command to check which physical volume (`hdiskn`) uses which path to the LU. The following examples show the execution results.

Note that `lun_id` displayed by the `lsattr` command indicates an HLU number.

Execution example of the `lsattr` command

```
# lsattr -El hdisk4
scsi_id      0xca          SCSI ID          False
lun_id       0x000000000000 Logical Unit NumberID False
location     Location Label True
.
.
.

# lsattr -El hdisk5
scsi_id      0xca          SCSI ID          False
lun_id       0x100000000000 Logical Unit NumberID False
location     Location Label True
.
.
.

# lsattr -El hdisk6
scsi_id      0xcb          SCSI ID          False
lun_id       0x000000000000 Logical Unit NumberID False
location     Location Label True
.
.
.

# lsattr -El hdisk7
scsi_id      0xcb          SCSI ID          False
lun_id       0x100000000000 Logical Unit NumberID False
location     Location Label True
```

To specify that only LU0's physical volumes (`hdisk4` and `hdisk6`) be used by HDLM:

In the `dlmfdrv.unconf` file, define `hdisk5` and `hdisk7`, which do not use LU0 (that is, `lun_id` is not `0x000000000000`). The following diagram shows what you should define in the `dlmfdrv.unconf` file.

Contents in the `dlmfdrv.unconf` file



To specify that only LU1's physical volumes (`hdisk5` and `hdisk7`) be used by HDLM:

In the `dlmfdrv.unconf` file, define `hdisk4` and `Y`, which do not use LU1 (that is, `Y` is not `Y`). The following diagram shows what you should define in the `Y`file.

Contents in the `dlmfdrv.unconf` file



9. Execute the `dlnmcfmgr` utility to configure the HDLM devices:

```
# /usr/DynamicLinkManager/bin/dlnmcfmgr
```

If you do not create the `dlnmdrv.unconf` file, the HDLM driver and HDLM alert driver are loaded into the running kernel according to the information for physical volumes managed by AIX®.

If you specify the physical volumes to be excluded from the HDLM management-target in the `dlnmdrv.unconf` file, the HDLM driver and HDLM alert driver are loaded into the running kernel according to the definition of the `dlnmdrv.unconf` file specified in step 8 and the physical volume information in AIX®.

For an example of a system configuration when HDLM devices are configured using only LU1's physical volumes (`hdisk5` and `hdisk7`) with the configuration shown in Figure 3.3, see Figure 3.4.

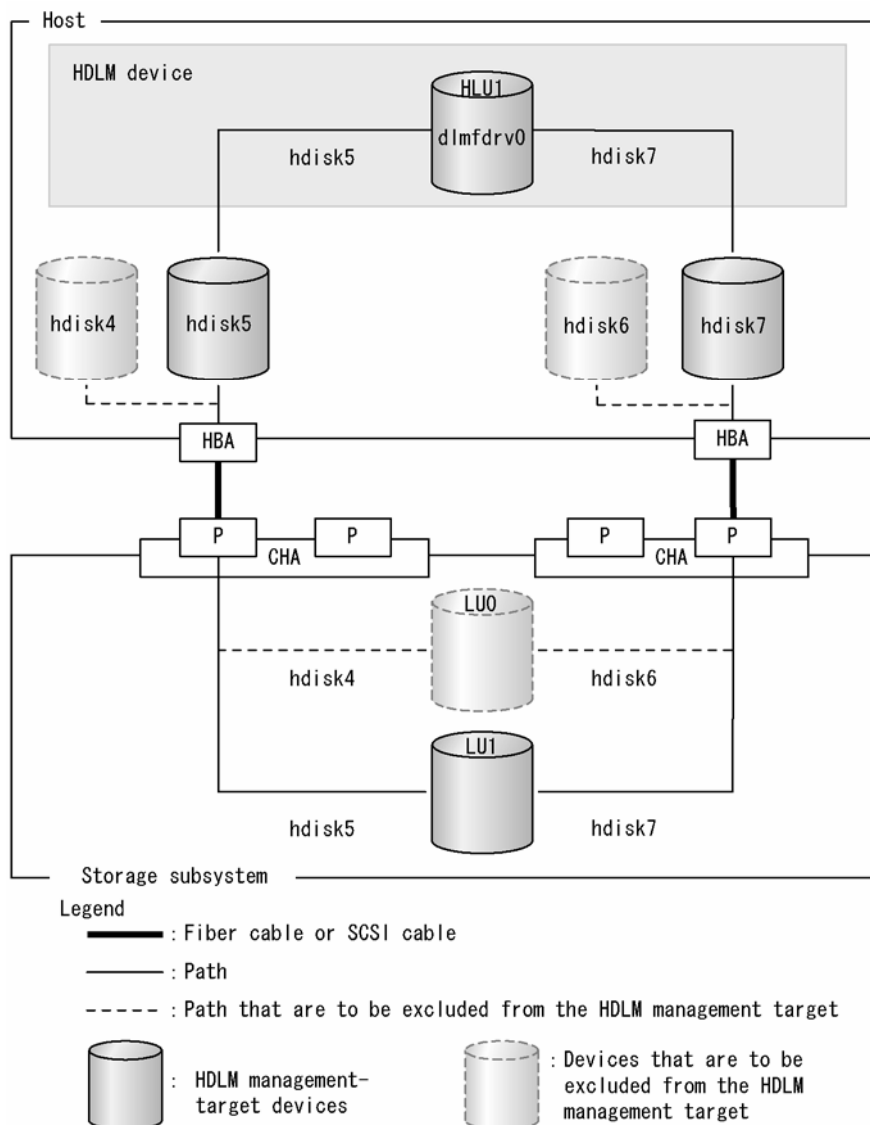


Figure 3.4 Example of system configuration after HDLM device configuration

10. Make sure that the HDLM drivers and HDLM alert driver are loaded into the running kernel and are available.

The following is an example of command execution:

```
# lsdev -C | grep dlm
dlmadv      Available          HDLM Alert Driver
dlmfdrv0    Available          HDLM Driver
```

Make sure that all the displayed HDLM-related devices are Available.

dlmadv is the special file name of the HDLM alert driver.

dlmfdrv0 is the logical device file name of the HDLM device. This name corresponds to the physical volumes to be used (in the example of the system configuration shown in Figure 3.4, dlmfdrv0 corresponds to hdisk5 and hdisk7). One HDLM device (dlmfdrvn) is created for each LU.

11. Make sure that the HDLM device displayed in step 10 (dlmfdrvn) corresponds to the physical volume that is managed by HDLM.

In the example of a system configuration shown in Figure 3.4, dlmfdrv0 corresponds to hdisk5 and hdisk7. Execute the following command to check the correspondence:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -drv | grep -w dlmfdrv0
000024 dlmfdrv0 hdisk5 9200.0010.0007
000025 dlmfdrv0 hdisk7 9200.0010.0007
```

12. Execute the dlnkmgr command's view operation to check the status of each program.

The following is a sample command execution:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -sys
HDLM Version           : 05-60
Service Pack Version   :
Load Balance           : on(rr)
Support Cluster        :
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          : off
Reservation Status     : on(2)
Intermittent Error Monitor : off
HDLM Manager Ver       WakeupTime
Alive 05-60 2005/06/01 10:33:03
HDLM Alert Driver Ver  WakeupTime      ElogMem Size
Alive 05-60 2005/06/01 10:33:03 1000
HDLM Driver Ver        WakeupTime
Alive 05-60 2005/06/01 10:33:03
License Type Expiration
Permanent -
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time
= 2005/06/01 12:00:00
```

Even if cluster software is used, the name of the cluster software is not displayed in Support Cluster. However, the cluster support function is operating normally.

13. From the execution result by the `view` operation, check that the correct version of HDLM is installed. If the HDLM Version is 5.6, the installed version of HDLM is correct.
14. From the execution result by the `view` operation, check that the programs are running properly.
 If HDLM Manager, HDLM Alert Driver, and HDLM Driver are all Alive, all programs are running correctly.
 If you are not using a virtual I/O server, you can skip steps 15 to 17. After installation finishes, check the path configuration according to the procedure described in section 3.7.
15. If you are using a virtual I/O server, define the HDLM device as a virtual target device.
 Execute the following command on the virtual I/O server when creating the HDLM device as a virtual target device:

```
$ mkvdev -vdev dlmfdrvn -vadapter virtual-SCSI-server-adapter-name
```

 Execute the following command on the virtual I/O server when creating the logical volume as a virtual target device:

```
$ mkvdev -vdev logical-volume-name -vadapter virtual-SCSI-server-adapter-name
```
16. Execute the following command in the client logical partition to reconfigure the device:

```
# cfgmgr
```
17. Execute the following command in the client logical partition to confirm that the physical volume (`hdiskn`) is recognized. If the following message is displayed, then the command was executed without any problems.

```
# lsdev -Cc disk
hdisk1 Available Virtual SCSI Disk Drive
```

After you complete installation, check the path information according to the procedure described in section 3.7.

3.4.3 Preparations for an Update Installation of HDLM

Make necessary preparations, such as backing up the HDLM management-target devices.

When using HDLM in a cluster configuration, make sure to perform the operations described in the following sub-sections on all hosts that comprise the cluster.

Important: Before installing HDLM you must connect the storage subsystem (present a LUN) to the server in which you are installing HDLM.

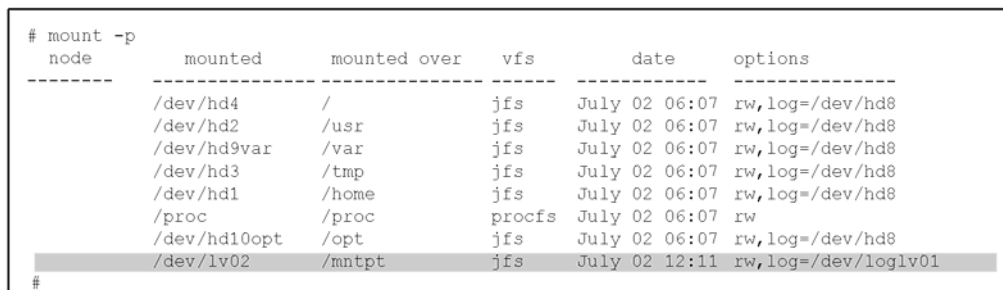
3.4.3.1 Stop Applications

HDLM manager stops during an update installation, so stop any applications that require HDLM manager operations, such as a log output operation.

3.4.3.2 Perform Operations for HDLM Management-Target Device

1. Terminate the processes of all applications that are accessing the HDLM management-target devices.
2. If necessary, back up all HDLM management-target devices to a medium such as tape.
3. Unmount the disks.
4. If the HDLM management-target devices are mounted, unmount them as follows:
 - First, execute the command below to check the current settings.
mount -p

The current settings will be output as shown in Figure 3.5.



# mount -p					
node	mounted	mounted over	vfs	date	options
-----	-----	-----	-----	-----	-----
	/dev/hd4	/	jfs	July 02 06:07	rw,log=/dev/hd8
	/dev/hd2	/usr	jfs	July 02 06:07	rw,log=/dev/hd8
	/dev/hd9var	/var	jfs	July 02 06:07	rw,log=/dev/hd8
	/dev/hd3	/tmp	jfs	July 02 06:07	rw,log=/dev/hd8
	/dev/hd1	/home	jfs	July 02 06:07	rw,log=/dev/hd8
	/proc	/proc	procfs	July 02 06:07	rw
	/dev/hd10opt	/opt	jfs	July 02 06:07	rw,log=/dev/hd8
	/dev/lv02	/mntpt	jfs	July 02 12:11	rw,log=/dev/loglv01
#					

Figure 3.5 Execution result example of the mount -p command (preparations for an update installation of HDLM)

This example uses HDLM to manage the devices that are shaded in Figure 3.5.

- Execute the following command to unmount the disk.
umount /mntpt
5. Execute the following command to inactivate the applicable volume group:
/usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name

3.4.4 Performing an Update Installation of HDLM

Update installations inherit information about the driver configuration and the settings for HDLM functionality.

When an update installation of HDLM 5.6 is performed on a host that contains HDLM 4.1 or earlier, the HNTRLlib used with HDLM 4.1 or earlier remains. If no other programs are using HNTRLlib, uninstall this HNTRLlib according to the procedure described in 3.14.6.

A license key file is required when installing HDLM 5.6 by overwriting earlier than HDLM 5.4; it is also required when installing HDLM 5.4 or later after the valid license period has expired.

Important: Before installing HDLM you must connect the storage subsystem (present a LUN) to the server in which you are installing HDLM.

If you are using the `dlmsetup` utility to execute HDLM, see section 3.4.5.

When using HDLM in a cluster configuration, install HDLM on all of the hosts that comprise the cluster.

You can skip steps 2 to 5 by executing `dlmrmdev -A` (the utility for removing HDLM drivers) as follows:

```
# /usr/DynamicLinkManager/bin/dlmrmdev -A
```

Note: Since HDLM manager stops during an update installation, an error log is not output. Also, the HDLM functionality can no longer be set up.

- Do not interrupt an update installation.
 - You can install HDLM on a virtual I/O server. A virtual I/O server is a system that enables multiple client logical partitions to share one resource. If you are using a virtual I/O server, see your virtual I/O server manual to log in to AIX®.
1. Log in to AIX® as a user with root permissions. If you are using a virtual I/O server, see the virtual I/O server manual to log in to AIX®.
 2. Execute the following command to unmount the file system used by HDLM:

```
# umount file-system-mount-point
```
 3. Execute the following command to display all the activated volume groups:

```
# lsvg -o
```
 4. Among the displayed volume groups, inactivate the volume groups used by HDLM:

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
```
 5. Execute the following command to remove the HDLM device and the logical device file for the HDLM alert driver from the running kernel, and then stop the HDLM manager:

```
# /usr/DynamicLinkManager/bin/dlmrmdev
```

If the `KAPL09012-I` message is displayed, there is no problem.

If the `KAPL09012-I` message is not displayed, the logical device file for the HDLM alert driver or the HDLM device has not been deleted, or the HDLM manager has not stopped. Make sure that no processes, services, file systems, or volume groups are using any HDLM management-target path, and then re-execute the above command.

6. Prepare the license key file. Store the license key file, using the name `hdlm_license`, directly under `/var/tmp/`:
`/var/tmp/hdlm_license`
 7. Insert the HDLM CD-ROM into the CD-ROM drive.

You do not need to mount anything. When installing HDLM from a directory copied from the CD-ROM, you do not need to insert the CD-ROM.
 8. Execute the following installation command:
 - When installing HDLM from the CD-ROM
`# installp -aXgd CD-ROM-special-file-name all`
 - When installing HDLM from a directory copied from the CD-ROM
`# installp -aXgd directory-copied-from-CD-ROM all`

Note: When performing an update installation onto the same version of HDLM, use the `-aXFd` parameter instead of `-aXgd`.
 9. Follow the instruction shown in the messages that appear on the screen.
 10. Execute the following command to make sure that the package is installed:
`# lslpp -L DLManager.rte`

Make sure that the fileset item in the output listing contains `DLManager.rte`, and that the status is `C` (commit).
 11. Execute the `dlnmcfmgr` utility to configure the HDLM devices:
`# /usr/DynamicLinkManager/bin/dlnmcfmgr`
 12. Execute the following command to make sure that the HDLM drivers and HDLM alert driver are loaded into the running kernel and are available:

```
# lsdev -C | grep dlm
dlmadvr      Available          HDLM Alert Driver
dlmfdrv0     Available          HDLM Driver
```
- Make sure that all the displayed HDLM-related devices are `Available`.
- One HDLM device (`dlmfdrv n`) is created for each logical unit.
13. Make sure that the HDLM device displayed in step 12 (`dlmfdrv n`) corresponds to the physical volume that is managed by HDLM.

In the example of a system configuration shown in Figure 3.4, `dlmfdrv0` corresponds to `hdisk5` and `hdisk7`. Execute the following command to confirm the relation:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -drv | grep -w dlmfdrv0
000024 dlmfdrv0  hdisk5  9200.0010.0007
000025 dlmfdrv0  hdisk7  9200.0010.0007
```
 14. Inactivate the volume group used by HDLM:
`# /usr/DynamicLinkManager/bin/dlmvaryonvg volume-group-name`
 15. Mount the file system used by HDLM:
`# mount file-system-mount-point`
 16. Execute the following command to make sure that the volume group contains the appropriate HDLM devices:
`# lspv | grep dlmfdrv`

17. Execute the `dlmkmgr` command's `view` operation to check the status of each program.

The following is a sample command execution:

```
# /usr/DynamicLinkManager/bin/dlmkmgr view -sys
HDLM Version           : 05-60
Service Pack Version   :
Load Balance           : on(rr)
Support Cluster        :
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          : off
Reservation Status     : on(2)
Intermittent Error Monitor : off
HDLM Manager Ver      WakeupTime
Alive      05-60      2005/06/01 10:33:03
HDLM Alert Driver Ver WakeupTime      ElogMem Size
Alive      05-60      2005/06/01 10:33:03 1000
HDLM Driver Ver       WakeupTime
Alive      05-60      2005/06/01 10:33:03
License Type Expiration
Permanent      -
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time
= 2005/06/01 12:00:00
```

Even when cluster software is being used, the name of the cluster software is not displayed in `Support Cluster`. However, the cluster support function is operating normally.

18. From the execution result by the `view` operation, check that the correct version of HDLM is installed. If HDLM Version is 5.6, the installed version of HDLM is correct.
19. From the execution result by the `view` operation, check that the programs are running properly. If HDLM Manager, HDLM Alert Driver, and HDLM Driver are all Alive, all programs are running correctly.

If you are not using a virtual I/O server, you can skip steps 20 to 22. For details on the files to be inherited after an update installation of HDLM, see Table 3.1.

20. If you are using a virtual I/O server, define the HDLM device as a virtual target device.

Execute the following command on the virtual I/O server:

When creating an HDLM device as a virtual target device:

```
$ mkvdev -vdev dlmfdrv -vadapter virtual-SCSI-server-adapter-name
```

When creating a logical device as a virtual target device:

```
$ mkvdev -vdev logical-volume-name -vadapter virtual-SCSI-server-adapter-name
```

21. Execute the following command in the client logical partition to reconfigure the device:

```
# cfgmgr
```

22. Execute the following command in the client logical partition to confirm that the physical volume (`hdiskn`) is recognized. If the following message is displayed, then the command was executed without any problems:

```
# lsdev -Cc disk
hdisk1 Available Virtual SCSI Disk Drive
```

Table 3.1 lists and describes the files to be inherited during an update installation of HDLM.

Table 3.1 List of Files Inherited During Update Installation

File	Description
/usr/DynamicLinkManager/config/dlmmgr.xml (<i>Note 1</i>)	File for setting up HDLM functionality
/usr/DynamicLinkManager/drv/dlmdrv.conf	HDLM driver configuration definition file
/usr/DynamicLinkManager/drv/dlmdrv.unconf	File that defines non-HDLM-managed disks (file defining the physical volumes that are to be excluded from the HDLM management target)
/usr/DynamicLinkManager/log/dlmcfgmgr[1-2].log (<i>Note 2</i>)	Log files of the dlmcfgmgr utility for managing the HDLM configuration
/usr/DynamicLinkManager/log/dlmmgr[1-2].log (<i>Note 2</i>)	Log files of HDLM Manager
/var/DynamicLinkManager/log/dlmcfgmgr[1-2].log (<i>Note 3</i>)	Log files of the dlmcfgmgr utility for managing the HDLM configuration
/var/DynamicLinkManager/log/dlmmgr[1-16].log (<i>Note 3</i>)	Log files of HDLM Manager
/var/DynamicLinkManager/log/dlmgui[1-2].log (<i>Note 3</i>)	Log files of HDLM GUI
/var/DynamicLinkManager/log/dlminquiry[1-2].log (<i>Note 4</i>)	Log files of HDLM Inquiry information
/var/DynamicLinkManager/log/dlmwebagent[1-N].log (<i>Note 4</i>)	HDLM Web GUI log file

Note 1: When you are updating a version of HDLM earlier than 4.1, on(0) is added to the description of the reservation level setting.

Note 2: The log files that are output from HDLM whose version is earlier than 5.1. Delete these files if no longer needed.

Note 3: The log files that are output from HDLM whose version is 5.1 or later.

Note 4: HDLM 5.2 or later versions output log files.

3.4.5 Installing HDLM Using the dlmsetup Utility

If you execute the `dlmsetup` utility to perform a new or update installation of HDLM, you can also perform the following setup during installation:

- Setup for HDLM functionality by using the `set` operation
For details, see section 6.6.
- Setup for HDLM operation by using the `dlmodmset` utility
For details, see section 7.4.

You can install HDLM from the CD-ROM, or you can copy the contents of the CD-ROM to a chosen directory. The following steps explain how to install HDLM from the CD-ROM.

3.4.5.1 Notes about Using the (dlmsetup) Utility

- If you are installing HDLM from a directory in which files on the CD-ROM are copied, make sure that the file organization has not been changed. If the file organization has changed, the `dlmsetup` utility might not function correctly. The following shows an execution example:

```
# mkdir /cdrom
# mount -r -v cdrfs /dev/cd0 /cdrom
# mkdir /tmp/hdlm
# cp -rp /cdrom/* /tmp/hdlm
```

If you copy files from the CD-ROM to a chosen directory, see section 3.4.5.3.

- The `dlmsetup` utility does not set up a file that defines non-HDLM-managed disks. Make sure that you manually set up the file that defines non-HDLM-managed disks. For details on how to set up a file that defines non-HDLM-managed disks, see step 8 in section 3.4.2.

3.4.5.2 Errors Using the dlmsetup Utility

If an error occurs while executing the `dlmsetup` utility for supporting HDLM installation and configuration, resolve the problem indicated in the message, and then re-execute the `dlmsetup` utility. However, if the `KAPL12263-E`, `KAPL12264-E` or `KAPL12265-E` message is output, follow the instructions shown in the message.

3.4.5.3 Performing a New Installation of HDLM Using dlmsetup

When performing a new installation of HDLM using the `dlmsetup` utility, the definition file for non-HDLM-managed disks cannot be used.

1. Insert the CD-ROM.
2. Create a directory where the CD-ROM is to be mounted.

```
# mkdir /cdrom
```

You can change the name indicated by `cdrom`. In the following explanation, `cdrom` is used without change.

3. Mount the CD-ROM.

```
# mount -r -v cdrfs /dev/cd0 /cdrom
```

The `/dev/cd0` portion varies depending on the system.

4. From the CD-ROM, copy `dlmodmset_sample` and `dlmkset_sample` to the directory.

```
# cp -p /cdrom/hdlmtool/dlmodmset_sample /tmp/your-desired-directory
# cp -p /cdrom/hdlmtool/dlnkset_sample /tmp/your-desired-directory
```

You can rename the files `dlmodmset_sample` and `dlmkset_sample`. In the following explanation, `dlmodmset_sample` and `dlmkset_sample` are called *odm-environment-settings-file* and *set-environment-settings-file*, respectively.

5. If you want to change the default settings, edit the *odm-environment-settings-file* and *set-environment-settings-file* by using a text editor.

Only alphanumeric characters, spaces, and hyphens can be used for *odm-environment-settings-file* and *set-environment-settings-file*.

To use `vi`, execute the following commands:

```
# vi /tmp/directory-containing-odm-environment-settings-file/odm-environment-settings-file
# vi /tmp/directory-containing-set-environment-settings-file/set-environment-settings-file
```

The *odm-environment-settings-file* and *odm-environment-settings-file* contain the default values for environment settings shown below:

odm-environment-settings-file

```
-l -ls 1000
-e on
-b 16384
-r off
```

set-environment-settings-file

```
-lb on -lbtype rr
-ellv 3
-elfs 9900
-elfn 2
-systflv 0
-systfs 1000
-systfn 4
-pchk on -intvl 30
-afb off
-iem off
-rsv on 2
```

To change the default values for the environment settings, see section 3.5.2.13.

6. Prepare the license key file.

Store the license key file, using the name `hdlm_license`, directly under `/var/tmp/`:
`/var/tmp/hdlm_license`

7. Execute the `d1msetup` utility:

```
# /cdrom/hdlmtool/d1msetup -i /cdrom -odm /tmp/odm-environment-settings-file -set  
/tmp/set-environment-settings-file [-s]
```

To enable the environment settings values in the *odm-environment-settings-file* and *set-environment-settings-file*, specify `-odm odm-environment-settings-file` and `-set set-environment-settings-file`.

If you have specified the `-s` option to omit a confirmation message, proceed to step 11; if not, proceed to step 8.

8. The message shown below is displayed. Enter `y`.

```
KAPL12252-I A new installation of HDLM will now be performed. Is this OK? [y/n]:
```

Entering `n` cancels the installation.

9. The message shown below is displayed. If you specified `-odm /tmp/odm-environment-settings-file` in step 7, enter `y`; if not, enter `n`.

```
KAPL12254-I The d1modmset utility will now be executed. Is this OK? [y/n]:
```

10. The message shown below is displayed. If you specified `-set /tmp/set-environment-settings-file` in step 7, enter `y`; if not, enter `n`.

```
KAPL12255-I The d1nkmgr set command will now be executed. Is this OK? [y/n]:
```

11. Unmount the CD-ROM:

```
# umount /cdrom
```

12. Delete the created mount directory:

```
# rm -r /cdrom
```

13. Delete the *odm-environment-settings-file* and *set-environment-settings-file*:

```
# rm -r /tmp/directory-containing-odm-environment-settings-file  
# rm -r /tmp/directory-containing-set-environment-settings-file
```

14. Perform the procedure described in section 3.4.2 starting from step 10.

3.4.5.4 Update Installation of HDLM Using the `d1msetup` Utility

If you are using a file that defines non-HDLM-managed disks, set the file before executing the `d1msetup` utility.

To perform an update installation of HDLM by using the `d1msetup` utility:

1. Insert the CD-ROM.
2. Create a directory where the CD-ROM is to be mounted:

```
# mkdir /cdrom
```

You can use a name of your choosing for the *cdrom* portion. In the following explanation, *cdrom* is used without change.

3. Mount the CD-ROM.

```
# mount -r -v cdrfs /dev/cd0/cdrom
```

The `/dev/cd0` portion varies depending on the system.

4. From the CD-ROM, copy the *odm-environment-settings-file* and *set-environment-settings-file* to the directory.

```
# cp -p /cdrom/hdlmtool/odm-environment-settings-file /tmp/your-desired-directory
# cp -p /cdrom/hdlmtool/set-environment-settings-file /tmp/your-desired-directory
```

You can rename the *odm-environment-settings-file* and *set-environment-settings-file*.

5. If you want to change the default settings, edit the *odm-environment-settings-file* and *set-environment-settings-file* by using a text editor.

Only alphanumeric characters, spaces, and hyphens can be used for *odm-environment-settings-file* and *set-environment-settings-file*.

To use *vi*, execute the following commands:

```
# vi /tmp/directory-containing-odm-environment-settings-file/odm-environment-settings-file
# vi /tmp/directory-containing-set-environment-settings-file/set-environment-settings-file
```

The *odm-environment-settings-file* and *set-environment-settings-file* contain the default values for environment settings shown below:

odm-environment-settings-file

```
-l -ls 1000
-e on
-b 16384
-r off
```

set-environment-settings-file

```
-lb on -lbtype rr
-ellv 3
-elfs 9900
-elfn 2
-systflv 0
-systfs 1000
-systfn 4
-pchk on -intvl 30
-afb off
-iem off
-rsv on 2
```

To change the default values for the environment settings, see section 7.4.

6. Prepare the license key file.

Store the license key file, using the name *hdlm_license*, directly under */var/tmp/*.
/var/tmp/hdlm_license

7. Execute the *d1msetup* utility:

```
# /cdrom/hdlmtool/d1msetup -i /cdrom -odm /tmp/odm-environment-settings-file -set /tmp/set-environment-settings-file [-s]
```

To enable the environment settings values in the *odm-environment-settings-file* and *set-environment-settings-file*, specify *-odm odm-environment-settings-file* and *-set set-environment-settings-file*.

If you have specified the *-s* option to omit a confirmation message, proceed to step 12; if not, proceed to step 8.

8. The message shown below is displayed. If you want to execute the `dlmrmddev` utility and delete the HDLM device, enter `y`; if not, enter `n`.
KAPL12256-I The `dlmrmddev` utility will now be executed. Is this OK? [y/n]:
Entering `n` cancels the installation.
9. The message shown below is displayed. Enter `y`.
KAPL12253-I An update installation of HDLM will now be performed. Is this OK? [y/n]:n
Entering `n` cancels the installation.
10. The message shown below is displayed. If you specified `-odm /tmp/odm-environment-settings-file` in step 7, enter `y`; if not, enter `n`.
KAPL12254-I The `dlmodmset` utility will now be executed. Is this OK? [y/n]:
11. The message shown below is displayed. If you specified `-odm /tmp/set-environment-settings-file` in step 7, enter `y`; if not, enter `n`.
KAPL12255-I The `dlmkmgr set` command will now be executed. Is this OK? [y/n]:
12. Unmount the CD-ROM:
`umount /cdrom`
13. Delete the created mount directory:
`rm -r /cdrom`
14. Delete the *odm-environment-settings-file* and *set-environment-settings-file*:
`rm -r /tmp/directory-containing-odm-environment-settings-file`
`rm -r /tmp/directory-containing-set-environment-settings-file`
15. Perform the procedure described in 3.4.4 starting from step 12.

3.5 Setting up HDLM

HDLM has load balancing, automatic failback, error logging, and other functionalities. You can set up these functions by using the Options window of the HDLM GUI, the Show HDLM Environment Settings subwindow of the HDLM Web GUI, or by using the `dlmkmgr` command's `set` operation.

3.5.1 Performing setup Using the HDLM GUI Options Window

Table 3.2 shows the default and recommended values for the HDLM functionalities.

Table 3.2 The Recommended and Default Values of Each Function

Functionality	Default value	Recommended value
Load-balancing	ON The algorithm is round robin.	ON The recommended algorithm depends on the operating environment.
Path health checking	ON 30-minute check interval	ON 30-minute check interval
Automatic failback	OFF	OFF
Intermittent Error Monitor	OFF	OFF
Reservation level	ON (2): persistent reservation	ON (2): persistent reservation
Remove LU#	(Not applicable)	(Not applicable)
Logging level	3: Collect all information for errors with the level "Information" or higher	3: Collect all information for errors with the level "Information" or higher
Trace level	0: Do not output any trace	0: Do not output a trace
File size (for Error log)	9900 (kilobytes)	9900 (kilobytes)
Number of files (for Error log)	2	2
File size (for Trace)	1000 (kilobytes)	1000 (kilobytes)
Number of files (for Trace)	4	4

When the error log file size is changed in the Options window, the change is applied for HDLM GUI logs (`dlmguin.log` (*n* indicates a file number of 1 or 2)) among the error logs after the HDLM GUI is restarted. Other changes made in the Options window are applied when the **OK** or **Apply** button is clicked.

3.5.1.1 Opening the Path Management Window

The following explains how to launch the Path Management Window.

- To open from a managed host:

Execute either of the following commands as a root user. Only root users can open the Path Management window.

```
# /usr/DynamicLinkManager/bin/HDLM_GUI
```

or

```
# /usr/DynamicLinkManager/bin/hdlmgui
```

The Path Management window opens with the **Configuration** view displayed.

- To open from a Device Manager client:

For details about the procedure for creating an environment for starting the Path Management window from the Device Manager client, see section 3.12.

The procedure for opening the path management window from a Device Manager client differs depending on the Device Manager version.

1. In the Device Manager main console, click the **Host View** tab. The top level of the Host View is displayed.
2. In a list of hosts displayed at the top level of the Host View, click the icon of a host. The Host level is displayed in the Host View. If HDLM is installed on the host, the **Dynamic Link Manager** button appears in the lower-right side of the window.
3. Click the **Dynamic Link Manager** button.

The Path Management window opens with the **Configuration** view displayed.

If you select one LDEV at the Host level of Host View and then click the **Dynamic Link Manager** button, the LU corresponding to that LDEV will be selected. In the following cases, if you click the **Dynamic Link Manager** button, the first storage subsystem of the tree frame will be selected in the Path Management window.

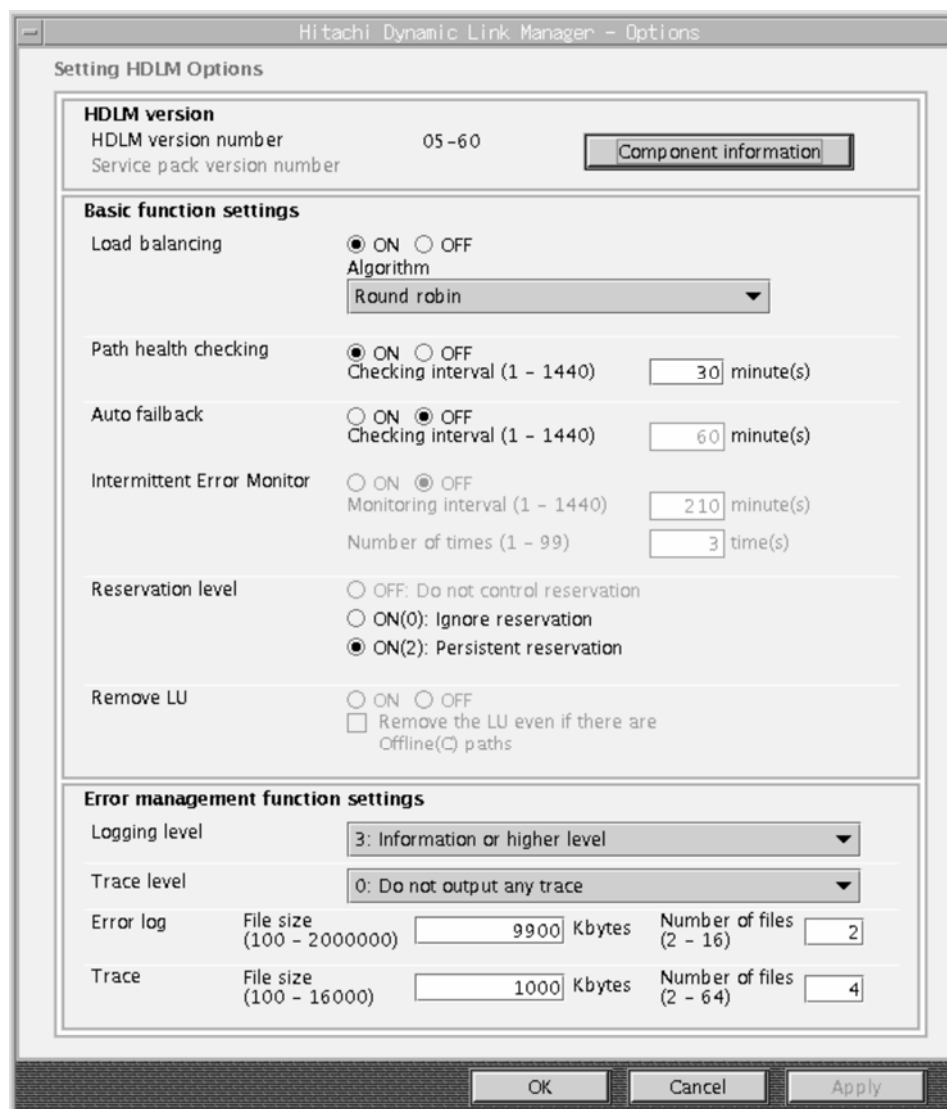
- When no LDEV is selected
- When two or more LDEVs (**Note**) are selected
- When an LDEV that is not an HDLM management target is selected
- When there is no LU corresponding to the selected LDEV (**Note**)
- When an LDEV of the Thunder 9500V Series is selected

To display the paths corresponding to the specified LDEV of the Thunder 9500V Series, select the corresponding LU from the HDLM GUI tree view.

Note: When the **Dynamic Link Manager** button is clicked, a warning message is displayed.

3.5.1.2 Opening the Options Window

In the Path Management window, click the **Options** button. As shown in Figure 3.6, the Options window opens.



The image shows the 'Hitachi Dynamic Link Manager - Options' window. It is titled 'Setting HDLM Options'. The window is divided into several sections:

- HDLM version**: Shows 'HDLM version number' as '05-60' and 'Service pack version number' as an empty field. There is a 'Component information' button.
- Basic function settings**:
 - Load balancing**: Radio buttons for 'ON' (selected) and 'OFF'. A dropdown menu for 'Algorithm' is set to 'Round robin'.
 - Path health checking**: Radio buttons for 'ON' (selected) and 'OFF'. A 'Checking interval (1 - 1440)' field is set to '30' with the unit 'minute(s)'.
 - Auto fallback**: Radio buttons for 'ON' and 'OFF' (selected). A 'Checking interval (1 - 1440)' field is set to '60' with the unit 'minute(s)'.
 - Intermittent Error Monitor**: Radio buttons for 'ON' and 'OFF' (selected). A 'Monitoring interval (1 - 1440)' field is set to '210' with the unit 'minute(s)'. A 'Number of times (1 - 99)' field is set to '3' with the unit 'time(s)'.
 - Reservation level**: Radio buttons for 'OFF: Do not control reservation', 'ON(0): Ignore reservation', and 'ON(2): Persistent reservation' (selected).
 - Remove LU**: Radio buttons for 'ON' and 'OFF'. A checkbox 'Remove the LU even if there are Offline(C) paths' is present.
- Error management function settings**:
 - Logging level**: A dropdown menu set to '3: Information or higher level'.
 - Trace level**: A dropdown menu set to '0: Do not output any trace'.
 - Error log**: Fields for 'File size (100 - 2000000)' set to '9900' Kbytes and 'Number of files (2 - 16)' set to '2'.
 - Trace**: Fields for 'File size (100 - 16000)' set to '1000' Kbytes and 'Number of files (2 - 64)' set to '4'.

At the bottom of the window are three buttons: 'OK', 'Cancel', and 'Apply'.

Figure 3.6 Options Window

3.5.1.3 Setting Load Balancing

Load balancing lets you select whether to enable load balancing. To enable it, set it to **ON** (the default setting). Otherwise, set it to **OFF**.

When you use load balancing, path load is distributed, to prevent deterioration of system-wide performance. We recommend that you set this option to **on**.

After selecting **ON**, select a desired algorithm to be used for load balancing from the pulldown list.

Table 3.3 lists and describes the algorithm options.

Table 3.3 Algorithm options for load balancing

Option	Description
Round robin	Load is balanced according to the round robin algorithm. All I/Os will be distributed across multiple paths. For sequential access, the storage subsystem cache might not be fully usable. When multiple applications that request sequential access are performed concurrently, and all of those applications use the same HBA as the most preferred HBA, we recommend that you specify round robin.
Extended round robin	Load is balanced according to the extended round robin algorithm. The type of I/O determines how I/Os will be distributed among paths. For sequential access, a single path will be used when issuing an I/O. The storage subsystem cache can be used. Random access distributes an I/O to multiple paths When you execute only a single application that requests sequential access, such as a batch job running at night, we recommend that you use the extended round robin algorithm.

The default is **round robin**. The recommended setting depends on the operating environment.

3.5.1.4 Setting Path Health Checking

Path health checking lets you select whether to enable path health checking. To enable path health checking, set it to **ON** (the default setting). Otherwise, set it to **OFF**. The default checking interval is 30 minutes.

I/O requests are not usually issued to non-owner paths or paths on stand-by hosts. Therefore, if you do not use path health checking, you will not be able to detect path errors in such paths when an error occurs. We recommend that you use path health checking on hosts connected to these kinds of paths, so that you will be able to switch path destinations by using the most recent path information. Change the check interval based on the environment being used.

3.5.1.5 Setting Automatic Failback

Auto failback lets you select whether to enable automatic failback. To enable automatic failback, select **ON**. Otherwise, set it to **OFF** (the default setting). When you specify **ON**, you can select the checking interval for automatic failback from the pull-down list. The default checking interval when automatic failback is enabled is 60 minutes.

When **Intermittent Error Monitor** is **ON** and **Number of times** is 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, an error occurs. In such a case, 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 condition above does not need to be satisfied.

Table 3.4 illustrates the advantages and disadvantages of setting the automatic failback function to **ON**.

Table 3.4 Advantages and Disadvantages of Setting the Automatic Failback Function to ON

Advantages	Disadvantages
This setting enables the status of a path that recovered from an error to automatically change to online.	<ul style="list-style-type: none">▪ This setting might cause paths that the user does not want to go online (such as paths placed offline for maintenance work) to go online.▪ When intermittent errors occur in paths or storage subsystems, path status alternates between the online and offline status frequently, so the I/O performance might deteriorate.^{Note}

Note: To prevent an intermittent error from reducing I/O performance, we recommend that you also enable intermittent error monitoring when enabling automatic failback. You can specify intermittent error monitoring only when automatic failback is enabled.

3.5.1.6 Settings for Intermittent Error Monitoring

Intermittent Error Monitor is specifiable only when **Auto failback** is set to **ON**. With **Intermittent Error Monitor**, specify whether to monitor intermittent errors. To enable intermittent error monitoring, specify **ON**. To disable intermittent error monitoring, specify **OFF**, which is the default setting. We recommend that you set intermittent error monitoring to **ON** when automatic failback is **ON** to prevent an intermittent error from reducing I/O performance.

When you specify **ON**, you can specify intermittent error conditions (the conditions used by the system to determine whether an intermittent error is occurring) in **Monitoring interval** and **Number of times**.

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 (from the time that the monitoring interval starts, until the specified interval ends). A path that is assumed to have an intermittent error is excluded from automatic failback. Intermittent error monitoring starts when the path is recovered from the error by using automatic failback. Monitoring is performed on individual paths.

If the settings are not specified and 3 or more errors occur within 210 minutes, the system assumes that an intermittent error is occurring.

When a value of 2 or more is specified in **Number of times**, the following condition must be satisfied:

$error-monitoring-interval \geq checking-interval-for-automatic-failback \times number-of-times-error-is-to-occur-during-intermittent-error-monitoring$

If this condition is not satisfied, a KAPL02064-W error occurs. In such a case, 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.

If you specify 1 for the number of times that the error is to occur, the condition above does not need to be satisfied.

To determine whether a path is ineligible for automatic failback, you can use the results of the `dlkmgr` command's `view` operation, the **Path List** view of the HDLM GUI, or the Show Path List subwindow of the HDLM Web GUI.

3.5.1.7 Setting the Reservation Level

Reservation level enables you to specify the reservation control method for the logical unit. Table 3.5 lists and describes the options for **Reservation level**.

Table 3.5 Options for Reservation Level

Option	Description
ON(0): Ignore reservation	If this value is specified, requests for reservation will be ignored and no logical units will be reserved. Specify this value when either of the following conditions exists: <ul style="list-style-type: none">▪ A host is connected to a storage subsystem that does not support persistent reservation.▪ An application was performed that shared an LU between two or more hosts, and was equipped with the original exclusion control mechanism.
ON(2): Persistent reservation	Use this level to set the reservation status to persistent reservation.

The default and recommended setting is **ON(2): Persistent reservation**.

When using HDLM in a cluster configuration, the reservation levels must be the same in all hosts that comprise the cluster configuration.

3.5.1.8 Setting the Error Log Collection Level

There are three error logs: the HDLM manager log, HDLM GUI log, and HDLM Web GUI log. The error logs you can set in the Options window are limited to the HDLM manager log (`dldmgrn.log` (*n* indicates a file number from 1 to 16)) and HDLM GUI log (`dldguin.log` (*n* indicates a file number of 1 or 2)). Before setting the HDLM Web GUI log, see section 3.13.6.

The **Logging level** list box lets you select the level of error information to be logged. From this list box, you can select one of the following five levels:

- 0: No error logs are collected.
- 1: All information for errors with the level "Error" or higher is collected.
- 2: All information for errors with the level "Warning" or higher is collected.
- 3: All information for errors with the level "Information" or higher is collected.
- 4: All information for errors with the level "Information" or higher is collected (including maintenance information).

The default and recommended value for this setting is 3.

3.5.1.9 Setting the Trace Level

A trace file in which a trace level can be set is `hdlmtrn.log` (n indicates a file number from 1 to 64). The Trace level list box lets you select the level of trace information to be output. From this list box, you can select one of the following five levels:

- 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.

The default and recommended value for this setting is 0.

If an error occurs, you may have to set the trace level to 1 or higher to collect the log information.

The higher this value is set, the more log information will be output. When the amount of output is great, it takes less time for file writing to wrap-around, overwriting old log information with new log information.

3.5.1.10 Setting the Error Log File Size

There are three error logs: the HDLM manager log, HDLM GUI log, and HDLM Web GUI log. The error logs you can set in the Options window are limited to the HDLM manager log (`dlmmgrn.log` (n indicates a file number from 1 to 16)) and HDLM GUI log (`dlmguin.log` (n indicates a file number of 1 or 2)). Before setting the HDLM Web GUI log, see section 3.13.6.

File size (for Error log) allows you to specify the size of error log files in kilobytes. You can specify a value between 100 and 2000000. For HDLM GUI logs, the valid range of a file size is from 100 to 9900. If you specify a value more than 9901, 9900 is applied. The specified value is applied for HDLM manager logs. The default and recommended setting is 9900.

To apply the new error log file size specified in the Options window, restart the HDLM GUI.

If the sizes of all error log files in an error log file group reach the specified value, the oldest file in the corresponding error log file group is overwritten by the new log information.

By specifying both the log file size and the number of log files, you can collect up to 32,000,000 kilobytes (approximately 30GB) of error logs in total.

To apply the error log file size that were changed in the Options window to the HDLM GUI logs (`dlmguin.log` (n indicates a file number of 1 or 2)), restart the HDLM GUI.

3.5.1.11 Setting the Number Of Error Log Files

There are three error logs: the HDLM manager log, HDLM GUI log, and HDLM Web GUI log. The number of files can be set in the Options window for only the HDLM manager logs (`dlmmgrn.log` (n indicates a file number from 1 to 16)). The number of files for HDLM GUI logs is fixed to 2. For a setting of HDLM Web GUI logs, see 3.13.6, and then take appropriate action.

Number of files (for Error log) allows you to specify the number of error log files. You can specify a value between 2 and 16. By default, 2 is set. The recommended value is 2.

By specifying both the log file size and the number of log files, you can collect up to 32,000,000 kilobytes (approximately 30GB) of error logs in total.

3.5.1.12 Setting the Trace File Size

The trace file in which a trace file size can be set is `hdlmtrn.log` (n indicates a file number from 1 to 64). The length of a trace file is fixed. Thus, even if the amount of the written trace information is less than the set file size, the file size of each output trace file is always fixed.

File size (for Trace) allows you specify the size of trace files in kilobytes. You can specify a value between 100 and 16000. By default, 1000 is set. The recommended value is 1000.

If you specify a value smaller than the set value, the KAPL02080-W message for confirming the execution appears and trace files are deleted.

Once trace data has been written to all of the trace files, the oldest file is wrapped around and is overwritten with new trace data.

The maximum size of trace information that can be collected in the specified number of trace files is 1024000 kilobytes.

3.5.1.13 Setting the Number of Trace Files

A trace file in which the number of files can be set is `hdlmtrn.log` (*n* indicates a file number from 1 to 64).

Number of files (for Trace) allows you to specify the number of trace files. You can specify a value between 2 and 64. By default, 4 is set. The recommended value is 4.

If you specify a value smaller than the set value, the KAPL02080-W message for confirming the execution appears and trace files are deleted.

The maximum size of trace information that can be collected in all the trace files with the specified trace file size is 1024000 kilobytes.

3.5.1.14 Closing the Options Window

When you click the **OK** button in the Options window, the new settings in the Options window are applied and the Options window closes.

When the error log file size is changed, the change is applied for HDLM GUI logs (`dlmguin.log` (*n* indicates a file number of 1 or 2)) among the error logs after the HDLM GUI is restarted.

3.5.1.15 Closing the Path Management Window

To close the Path Management Window, click the **Close** button.

3.5.2 Performing Setup Using the HDLM Web GUI Show Environment Settings Subwindow

Table 3.6 shows the default and recommended values for the HDLM functionalities.

Table 3.6 The Recommended and Default Values of Each Function

Functionality	Default value	Recommended value
Load-balancing	ON The algorithm is round robin.	ON The recommended algorithm depends on the operating environment.
Path health checking	ON 30-minute check interval	ON 30-minute check interval
Automatic fallback	OFF	OFF
Intermittent Error Monitor	OFF	OFF
Reservation level	ON (2): persistent reservation	ON (2): persistent reservation
Remove LU#	(Not applicable)	(Not applicable)
Logging level	3: Collect all information for errors with the level "Information" or higher	3: Collect all information for errors with the level "Information" or higher
Trace level	0: Do not output any trace	0: Do not output a trace
File size (for Error log)	9900 (kilobytes)	9900 (kilobytes)
Number of files (for Error log)	2	2
File size (for Trace)	1000 (kilobytes)	1000 (kilobytes)
Number of files (for Trace)	4	4

3.5.2.1 Opening the Show HDLM Environment Settings Subwindow

The following explains how to launch the Show HDLM Environment Settings subwindow.

1. From the navigation frame of the Device Manager main window, select the management-target host to start HDLM Web GUI.
2. Click the **Show HDLM Environment Settings** displayed in the *management-target-host* subwindow of the method frame.

Figure 3.7 shows the Show HDLM Environment Settings subwindow.

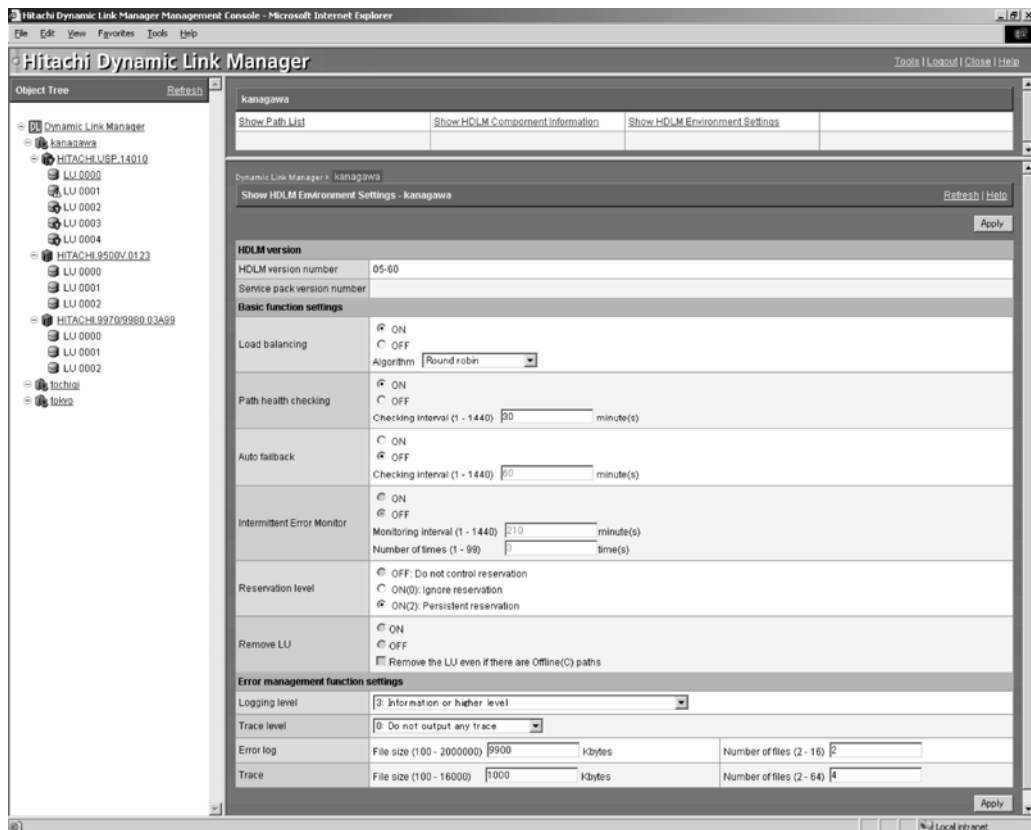


Figure 3.7 Show HDLM Environment Settings Subwindow

3.5.2.2 Setting Load Balancing

Load balancing lets you select whether to enable load balancing. To enable it, set it to **ON** (the default setting). Otherwise, set it to **OFF**.

When you use load balancing, path load is distributed, to prevent deterioration of system-wide performance. We recommend that you set this option to **on**.

After selecting **ON**, select a desired algorithm to be used for load balancing from the pulldown list. Table 3.7 lists and describes the algorithm options.

Table 3.7 Algorithm Options for Load Balancing

Option	Description
Round Robin	Load is balanced according to the round robin algorithm. All I/Os will be distributed across multiple paths. For sequential access, the storage subsystem cache might not be fully usable. When multiple applications that request sequential access are performed concurrently, and all of those applications use the same HBA as the most preferred HBA, we recommend that you specify round robin.
Extended Round robin	Load is balanced according to the extended round robin algorithm. The type of I/O determines how I/Os will be distributed among paths. For sequential access, a single path will be used when issuing an I/O. The storage subsystem cache can be used. Random access distributes an I/O to multiple paths When you execute only a single application that requests sequential access, such as a batch job running at night, we recommend that you use the extended round robin algorithm.

The default is **round robin**. The recommended setting depends on the operating environment.

3.5.2.3 Setting Path Health Checking

Path health checking lets you select whether to enable path health checking. To enable path health checking, set it to **ON** (the default setting). Otherwise, set it to **OFF**. The default checking interval is 30 minutes.

I/O requests are not usually issued to non-owner paths or paths on stand-by hosts. Therefore, if you do not use path health checking, you will not be able to detect path errors in such paths when an error occurs. We recommend that you use path health checking on hosts connected to these kinds of paths, so that you will be able to switch path destinations by using the most recent path information. Change the check interval based on the environment being used.

3.5.2.4 Setting Automatic Failback

Auto failback lets you select whether to enable automatic failback. To enable automatic failback, select **ON**; otherwise select **OFF**. The default is **OFF**. When you specify **ON**, you can select the checking interval for automatic failback from the pull-down list. The default checking interval when automatic failback is enabled is 60 minutes.

When **Intermittent Error Monitor** is **ON** and **Number of times** is 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, a KAPL11144-W error occurs. In such a case, 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 specify 1 for the number of times that the error is to occur, the condition above does not need to be satisfied.

When **Intermittent Error Monitor** is **ON** and **Number of times** is 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, an error occurs. In such a case, 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 specify 1 for the number of times that the error is to occur, the condition above does not need to be satisfied.

Table 3.8 shows the merit and demerits of setting the automatic failback function to **ON**.

Table 3.8 Advantage and Disadvantages of Setting the Automatic Failback Function to ON

Advantage	Disadvantages
This setting enables the status of a path that recovered from an error to automatically change to online.	<ul style="list-style-type: none">▪ This setting might cause paths that the user does not want to go online (such as paths placed offline for maintenance work), to go online.▪ When intermittent errors occur in paths or storage subsystems, path status alternates between the online and offline status frequently, so the I/O performance might deteriorate. (<i>Note</i>)

Note: To prevent an intermittent error from reducing I/O performance, we recommend that you also enable intermittent error monitoring when enabling automatic failback. You can specify intermittent error monitoring only when automatic failback is enabled.

3.5.2.5 Settings for Intermittent Error Monitoring

Intermittent Error Monitoring is specifiable only when **Auto failback** is set to **ON**. With **Intermittent Error Monitoring**, specify whether to monitor intermittent errors. **ON** specifies that intermittent error monitoring is to be used. To disable intermittent error monitoring, specify **OFF**, which is the default setting. We recommend that you set intermittent error monitoring to **ON** when automatic failback is **ON** to prevent an intermittent error from reducing I/O performance.

When you specify **ON**, you can specify intermittent error conditions (the conditions used by the system to determine whether an intermittent error is occurring) in **Monitoring interval** and **Number of times**.

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 (from the time that the monitoring interval starts, until the specified interval ends). A path that is assumed to have an intermittent error is excluded from automatic failback. Intermittent error monitoring starts when the path is recovered from the error by using automatic failback. Monitoring is performed on individual paths.

If the settings are not specified and 3 or more errors occur within 210 minutes, the system assumes that an intermittent error is occurring.

When a value of 2 or more is specified in **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, a KAPL11144-W error occurs. In such a case, 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.

If you specify 1 for the number of times that the error is to occur, the condition above does not need to be satisfied.

To determine whether a path is ineligible for automatic failback, you can use the results of the `dlmkgr` command's `view` operation, the **Path List** view of the HDLM GUI, or the **Show Path List** subwindow of the HDLM Web GUI.

You can only set intermittent error monitoring if auto failback is **ON**. If a path is considered as an intermittent error path during intermittent error monitoring, it will become ineligible for auto failback.

3.5.2.6 Setting the Reservation Level

Reservation level enables you to specify the reservation control method for the logical unit. Table 3.9 lists and describes the options for **Reservation level**.

Table 3.9 Options for Reservation level

Option	Description
ON(0): Ignore reservation	If this value is specified, requests for reservation will be ignored and no logical units will be reserved. Specify this value when either of the following conditions exists: <ul style="list-style-type: none">▪ A host is connected to a storage subsystem that does not support persistent reservation.▪ An LU is shared among multiple hosts and an application that has the unique exclusive control mechanism is executed.
ON(2): Persistent reservation	Use this level to set the reservation status to persistent reservation.

The default and recommended setting is **ON(2): Persistent reservation**.

When using HDLM in a cluster configuration, the reservation levels must be the same in all hosts that comprise the cluster configuration.

3.5.2.7 Setting the Error Log Collection Level

There are three error logs: the HDLM manager log, HDLM GUI log, and HDLM Web GUI log. The error logs you can set in the Show HDLM Environment Settings subwindow are limited to the HDLM manager log (`dlmmgrn.log` (*n* indicates a file number from 1 to 16)) and HDLM GUI log (`dlmguin.log` (*n* indicates a file number of 1 or 2)). Before setting the HDLM Web GUI log, see section 3.13.6.

The **Logging level** pulldown list box lets you select the level of error information to be logged. From this pulldown list box, you can select one of the following five levels:

- 0: No error logs are collected.
- 1: All information for errors with the level "Error" or higher is collected.
- 2: All information for errors with the level "Warning" or higher is collected.
- 3: All information for errors with the level "Information" or higher is collected.
- 4: All information for errors with the level "Information" or higher (including maintenance information) is collected.

The default and recommended value for this setting is 3.

When the HDLM version on the management-target host is earlier than 5.6, you can select 0 to 3.

3.5.2.8 Setting the Trace Level

A trace file in which a trace level can be set is `hdlmtrn.log` (n indicates a file number from 1 to 64). If the HDLM version on the management-target host is earlier than 5.6, a trace level can be set in `hntr2n.log` or `hntrn.log` (n indicates a file number from 1 to 16).

The Trace level pulldown list box lets you select the level of trace information to be output. From this pulldown list box, you can select one of the following five levels:

- 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.

The default and recommended value for this setting is 0.

If an error occurs, you may have to set the trace level to 1 or higher to collect the log information.

The higher this value is set, the more log information will be output. When the amount of output is great, it takes less time for file writing to wrap-around, overwriting old log information with new log information.

3.5.2.9 Setting the Error Log File Size

There are three error logs: the HDLM manager log, HDLM GUI log, and HDLM Web GUI log. The error logs you can set in the Show HDLM Environment Settings subwindow are limited to the HDLM manager log (`dlmmgrn.log` (n indicates a file number from 1 to 16)) and HDLM GUI log (`dlmguin.log` (n indicates a file number of 1 or 2)). Before setting the HDLM Web GUI log, see section 3.13.6.

File size (for Error log) allows you to specify the size of error log files in kilobytes. You can specify a value between 100 and 2000000. For HDLM GUI logs, the valid range of a file size is from 100 to 9900. If you specify a value more than 9901, 9900 is applied. The specified value is applied for HDLM manager logs. When the HDLM version on the management-target host is earlier than 5.6, You can specify a value between 100 and 9900. The default and recommended setting is 9900.

If each error log file reaches the specified size, the information in the old error log file will be replaced with new information.

By specifying both the log file size and the number of log files, you can collect up to 32,000,000 kilobytes (approximately 30GB) of error logs in total.

3.5.2.10 Setting the Number of Error Log Files

There are three error logs: the HDLM manager log, HDLM GUI log, and HDLM Web GUI log. 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)) can be set in the Show HDLM Environment Settings subwindow. For a setting of HDLM Web GUI logs, see section 3.13.6, and then take appropriate action.

Number of files (for Error log) allows you to specify the number of error log files. You can specify a value between 2 and 16. By default, 2 is set. The recommended value is 2.

By specifying both the log file size and the number of log files, you can collect up to 32,000,000 kilobytes (approximately 30GB) of error logs in total.

When the HDLM version on the management-target host is earlier than 5.6, this item is disabled and you cannot set the number of error log files.

3.5.2.11 Setting the Trace File Size

The trace file in which a file size can be set is `hdlmtrn.log` (n indicates a file number from 1 to 64). The length of a trace file is fixed. Thus, even if the amount of the written trace information is less than the set file size, the file size for each output trace file is always fixed.

File size (for Trace) allows you specify the size of trace files in kilobytes. You can specify a value between 100 and 16000. By default, 1000 is set. The recommended value is 1000.

If you specify a value smaller than the set value, the KAPL11163-W message for confirming the execution appears and trace files are deleted.

When all the trace files reach the specified size, the oldest file is wrapped around to allow new trace information to overwrite old information.

The maximum size of trace information that can be collected in the specified number of trace files is 1024000 kilobytes.

When the HDLM version on the management-target host is earlier than 5.6, this item is disabled and you cannot set the trace file size.

3.5.2.12 Setting the Number of Trace Files

A trace file in which the number of files can be set is `hdlmtrn.log` (*n* indicates a file number from 1 to 64).

Number of files (for Trace) allows you to specify the number of trace files. You can specify a value between 2 and 64. By default, 4 is set. The recommended value is 4.

If you specify a value smaller than the set value, the KAPL11163-W message for confirming the execution appears and trace files are deleted.

The maximum size of trace information that can be collected in all the trace files with the specified trace file size is 1024000 kilobytes.

When the HDLM version on the management-target host is earlier than 5.6, this item is disabled and you cannot set the number of trace files.

3.5.2.13 Reflecting the Environment Settings

Click the **Apply** button. The setting contents in the Show HDLM Environment Settings subwindow are reflected.

3.5.3 Performing Setup by the dlkmgr Command's set Operation

Table 3.10 shows the default and recommended values for the HDLM functionalities.

Table 3.10 Default and Recommended Settings for the HDLM Functionalities

Functionality	Default Value	Recommended valueV
Load balance	on, with the round robin algorithm	on The recommended algorithm depends on the operating environment.
Path Health Checking	on 30-minute check interval	on 30-minute check interval
Auto Failback	off	off
Intermittent Error Monitor	off	off
Error log collection level	3: Collect all information for errors with the level "Information" or higher	3: Collect all information for errors with the level "Information" or higher
Reservation level	on 2: Enabled, with persistent reservation	on 2: Enabled, with persistent reservation
Trace level	0: Do not output a trace	0: Do not output a trace
Error log file size	9900 (kilobytes)	9900 (kilobytes)
Number of error log files	2	2
Trace file size	1000 (kilobytes)	1000 (kilobytes)
Number of trace files	4	4

3.5.3.1 Checking the Current Settings

Check the current settings. The following is a sample command execution:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -sys -sfunc
HDLM Version           : 05-60
Service Pack Version   :
Load Balance           : on(rr)
Support Cluster        :
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          : off
Reservation Status     : on(2)
Intermittent Error Monitor : off
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
```

Even when cluster software is being used, the name of the cluster software is not displayed in Support Cluster. However, the cluster support function is operating normally.

3.5.3.2 Setting Load Balancing

The following is an example command to set load-balancing:

```
# /usr/DynamicLinkManager/bin/dlnkmgr set -lb on -lbtype rr
```

`on`, which is the default setting, specifies that load-balancing is to be used. To disable load-balancing, specify `off`.

When you use load balancing, path load is distributed, to prevent deterioration of system-wide performance. We recommend that you set this option to `on`.

Following the parameter value `on`, specify the type of algorithm. Table 3.11 lists and describes the algorithm options.

Table 3.11 Algorithm Options for Load Balancing

Option	Description
rr	Load is balanced according to the round robin algorithm. All I/Os will be distributed across multiple paths. For sequential access, the storage subsystem cache might not be fully usable. When multiple applications that request sequential access are performed concurrently, and all of those applications use the same HBA as the most preferred HBA, we recommend that you specify round robin.
exrr	Load is balanced according to the extended round robin algorithm. The type of I/O determines how I/Os will be distributed among paths. For sequential access, a single path will be used when issuing an I/O. The storage subsystem cache can be used. Random access distributes an I/O to multiple paths. When you execute only a single application that requests sequential access, such as a batch job running at night, we recommend that you use the extended round robin algorithm.

The default is `rr`. The recommended setting depends on the operating environment.

The type of algorithm specified by the `-lbtype` parameter remains stored in the system, even when you disable load balancing function by specifying `-lb off`. Therefore, when you re-enable load balancing without specifying an algorithm, load balancing will be executed according to the setting stored in the system.

3.5.3.3 Setting Path Health Checking

The following is an example command to set path health checking:

```
# /usr/DynamicLinkManager/bin/dlnmgr set -pchk on -intvl 10
```

`on`, which is the default setting, specifies that path health checking is to be used. To disable path health checking, specify `off`. When you set this value to `on`, you can use the `-intvl` parameter to specify the checking interval, which is 30 minutes by default.

I/O requests are not usually issued to non-owner paths or paths on standby hosts. Therefore, if you do not use path health checking, you will not be able to detect path errors in such paths when an error occurs. We recommend that you use path health checking on hosts connected to these kinds of paths, so that you will be able to switch path destinations by using the most recent path information. Change the check interval based on the environment being used.

3.5.3.4 Setting Automatic Failback

The following is an example command to set automatic failback:

```
# /usr/DynamicLinkManager/bin/dlnmgr set -afb on -intvl 10
```

`on` specifies that automatic failback is to be used. To disable automatic failback, specify `off`, which is the default setting. When you set this value to `on`, you can use the `-intvl` parameter to specify the interval of path status checking, which is 60 minutes by default.

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, a KAPL01080-W error occurs. In such a case, 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.

Table 3.12 describes the advantage and disadvantages of setting the automatic failback function to `on`.

Table 3.12 Advantage and Disadvantages of Setting the Automatic Failback Function to On

Advantage	Disadvantages
This setting enables the status of a path that recovered from an error to automatically change to online.	<ul style="list-style-type: none"> This setting might cause paths that the user does not want to go online (such as paths placed offline for maintenance work) to go online. When intermittent errors occur in paths or storage subsystems, path status alternates between the online and offline status frequently, so the I/O performance might deteriorate. (<i>Note</i>)

Note: To prevent an intermittent error from reducing I/O performance, we recommend that you also enable intermittent error monitoring when enabling automatic failback. You can specify intermittent error monitoring only when automatic failback is enabled.

3.5.3.5 Settings for Intermittent Error Monitoring

Intermittent error monitoring is specifiable only when automatic failback is set to `on`. The following shows an example of executing the command to enable intermittent error monitoring:

```
# /opt/DynamicLinkManager/bin/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`, which is the default setting. We recommend that you set intermittent error monitoring to `on` when automatic failback is `on` to prevent an intermittent error from reducing I/O performance.

When you set this parameter to `on`, you can specify intermittent error conditions (the conditions used by the system to determine whether an intermittent error is occurring) 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 is to occur in the `-iemnum` parameter.

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 (from the time that the monitoring interval starts, until the specified interval ends). A path that is assumed to have an intermittent error is excluded from automatic failback. Intermittent error monitoring starts when the path is recovered from the error by using automatic failback. Monitoring is performed on individual paths.

When these parameters are omitted and 3 or more errors occur within 210 minutes, the system assumes that an intermittent error is occurring.

When a value of 2 or more is specified in 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, a KAPL01080-W error occurs. In such a case, 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.

To determine whether a path is ineligible for automatic failback, you can use the results of the `dlnmgr` command's `view` operation, the **Path List** view of the HDLM GUI, or the Show Path List subwindow of the HDLM Web GUI.

3.5.3.6 Setting the Error Log Collection Level

There are three error logs: the HDLM manager log, HDLM GUI log, and HDLM Web GUI log. The logs you can set by performing a `set` operation are limited to the HDLM manager log (`dlmmgr n .log` (n indicates a file number from 1 to 16)) and the HDLM GUI log (`dlmguin.log` (n indicates a file number of 1 or 2)). Before setting the HDLM Web GUI log, see section 3.13.6.

The following is an example command to set the error log collection level:

```
# /usr/DynamicLinkManager/bin/dlnmgr set -ellv 2
```

In this case the error log collection level is set to 2. This value is explained below in Table 3.13.

Table 3.13 Values for the Error Log Collection Level Setting

Value	Description
0	No error logs are collected.
1	All information for errors with the level "Error" or higher is collected.
2	All information for errors with the level "Warning" or higher is collected.
3	All information for errors with the level "Information" or higher is collected.
4	All information for errors with the level "Information" or higher (including maintenance information) is collected.

The default and recommended value for this setting is 3.

You can check the value of the error log collection level by displaying information about HDLM settings, using the `dlnmgr` command's `view` operation. For details about the `view` operation, see section 6.7.

3.5.3.7 Setting the Trace Level

The trace file in which a trace level can be set is `hdlmtrn.log` (*n* indicates a file number from 1 to 64).

The following is an example command to set the trace level:

```
# /usr/DynamicLinkManager/bin/dlnkmgr set -systflv 1
```

In this case the trace level is set to 1. This value is explained below in Table 3.14.

Table 3.14 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.

The default and recommended value for this setting is 0.

If an error occurs, you may have to set the trace level to 1 or higher to collect the log information.

The higher this value is set, the more log information will be output. When the amount of output is great, it takes less time for file writing to wrap-around, overwriting old log information with new log information.

You can check the value of the trace level by displaying information about HDLM settings, using the `dlnkmgr` command's `view` operation. For details about the `view` operation, see section 6.7

Note: The `dlnkmgr` command also can change the HDLM options and path status. To preserve the log information for command results, all results are recorded to a trace file. This type of log information is output even when the trace level is set to 0.

3.5.3.8 Setting the Error Log File Size

There are three error logs: the HDLM manager log, HDLM GUI log, and HDLM Web GUI log. The logs you can set by performing a `set` operation are limited to the HDLM manager log (`dlnmgrn.log` (n indicates a file number from 1 to 16)) and the HDLM GUI log (`dlnmguin.log` (n indicates a file number of 1 or 2)). Before setting the HDLM Web GUI log, see section 3.13.6.

There are log files for the HDLM manager and for the HDLM GUI.

The following is an example command to set the error log file size:

```
# /usr/DynamicLinkManager/bin/dlnmgr set -elfs 1000
```

In this case the error log size is set to 1000. The unit for setting the error log file size is kilobytes, and you can specify anything from 100 to 2000000. For HDLM GUI logs, the valid range of a file size is from 100 to 9900. If you specify a value more than 9901, 9900 is applied. The specified value is applied for HDLM manager logs. The default value for this setting is 9900, and the recommended value for this setting is 9900.

When each error log file reaches the specified size, the old error log file will be wrapped around, and rewritten with new log information.

By specifying both the log file size and the number of log files, you can collect up to 32,000,000 kilobytes (approximately 30GB) of error logs in total.

You can check the value of the error log file size by displaying information about HDLM settings, using the `dlnmgr` command's `view` operation. For details on the `view` operation, see section 6.7.

3.5.3.9 Setting the Number of Error Log Files

There are three error logs: the HDLM manager log, HDLM GUI log, and HDLM Web GUI log. The number of files can be set by the `set` operation for only the HDLM manager logs (`dlnmgrn.log` (n indicates a file number from 1 to 16)). The number of files for HDLM GUI logs is fixed to 2. For a setting of HDLM Web GUI logs, see section 3.13.6, and then take appropriate action.

The following is an example command to set the number of error log files:

```
# /opt/DynamicLinkManager/bin/dlnmgr set -elfn 5
```

In this case, the number of error log files is set to 5. You can specify a value between 2 and 16. The default is 2. The recommended value is 2.

By specifying both the log file size and the number of log files, you can collect up to 32,000,000 kilobytes (approximately 30GB) of error logs in total.

You can check the value of the number of error log files by displaying information about HDLM settings, using the `dlnmgr` command's `view` operation. For details on the `view` operation, see section 6.7.

3.5.3.10 Setting the Trace File Size

The trace file in which a file size can be set is `hdlmtrn.log` (*n* indicates a file number from 1 to 64). The length of a trace file is fixed. Thus, even if the amount of the written trace information is less than the set file size, the file size for each output trace file is always fixed.

The following is an example command to set the trace file size:

```
# /opt/DynamicLinkManager/bin/dlnkmgr set -systfs 2000
```

In this case, the trace file size is set to 2000. You set the trace file size in kilobytes and you can specify a value between 100 and 16000. The default is 1000. The recommended value is 1000.

If you specify a value smaller than the set value, the KAPL01097-W message for confirming the execution appears and trace files are deleted.

When all the trace files reach the specified size, the oldest trace file is wrapped around to allow new trace information to overwrite old information.

The maximum size of trace information that can be collected in the specified number of trace files is 1024000 kilobytes.

You can check the value of the trace file size by displaying information about HDLM settings, using the `dlnkmgr` command's `view` operation. For details on the `view` operation, see section 6.7.

3.5.3.11 Setting the Number of Trace Files

A trace file in which the number of files can be set is `hdlmtrn.log` (*n* indicates a file number from 1 to 64).

The following is an example command to set the number of trace files:

```
# /opt/DynamicLinkManager/bin/dlnkmgr set -systfn 10
```

In this case, the number of trace files is set to 10. You can specify a value between 2 and 64. The default is 4. The recommended value is 4.

If you specify a value smaller than the set value, the KAPL01097-W message for confirming the execution appears and trace files are deleted.

The maximum size of trace information that can be collected in all the trace files with the specified trace file size is 1024000 kilobytes.

You can check the value of the number of trace files by displaying information about HDLM settings, using the `dlnkmgr` command's `view` operation. For details on the `view` operation, see section 6.7.

3.5.3.12 Setting the Reservation Level

The following shows an example of setting the reservation level for the logical unit:

```
# /usr/DynamicLinkManager/bin/dlnkmgr set -rsv on 2
```

Following the `on` parameter, specify the desired reservation level. Table 3.15 lists and describes the options for reservation level.

Table 3.15 Options for Reservation Level

Option	How to Control Reservation	Description
0	Ignore reservation	If this value is specified, requests for reservation will be ignored and no logical units will be reserved. Specify this value when either of the following conditions exists: <ul style="list-style-type: none">▪ A host is connected to a storage subsystem that does not support persistent reservation.▪ An LU is shared among multiple hosts and an application that has the unique exclusive control mechanism is executed.
2	Persistent reservation	Specify this value to set the reservation status to persistent reservation.

The default and recommended level is 2.

When using HDLM in a cluster configuration, the reservation levels must be the same in all the hosts that comprise the cluster configuration.

3.5.3.13 Checking the New Settings

When you change these settings, you can display information about all HDLM functionality settings. The following is an example command:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -sys -sfunc
HDLM Version           : 05-60
Service Pack Version   :
Load Balance           : on(rr)
Support Cluster        :
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 Failback          : on(10)
Reservation Status     : on(2)
Intermittent Error Monitor : on(2/20)
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
#
```

Even when cluster software is being used, the name of the cluster software is not displayed in `Support Cluster`. However, the cluster support function is operating normally.

3.6 Setting Up Integrated Traces

When HDLM is used, the `/var/opt/hitachi/HNTRLib2/spool/hntr2n.log` files (where *n* is the file number) are used as operation logs of the HDLM command and GUI. They are *integrated trace information files* of Hitachi Network Objectplaza Trace Library.

If there is a significant amount of integrated trace information output, the frequency of wraparound deletions increases, and information may end up deleted in a short amount of time. Also, if a large amount of integrated trace information is output at once, the integrated trace information that overflowed the buffer might not be saved in 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 specifying the values too large places a heavy load on the system. When determining these values, consider these operational tradeoffs.

Table 3.16 shows the default and recommended values for the integrated trace file settings.

Table 3.16 Default and Recommended Values for the Integrated Trace File Settings

Setting		Default value	Recommended value
Integrated trace file size		256 (kilobytes)	4096 (kilobytes)
Number of integrated trace files		4	8
Buffer size per monitoring interval	Buffer size per monitoring interval	64 (kilobytes)	256 (kilobytes)
	Monitoring cycle	10 (seconds)	5 (seconds)
Number of messages to be output per monitoring interval	Monitoring interval	0 (seconds)	0 (seconds)

If Hitachi Network Objectplaza Trace Library is already installed, the existing settings will be inherited. When changing these settings, keep in mind that they are used by programs other than HDLM.

The following sections explain how to change these settings.

3.6.1 Displaying the Hitachi Network Objectplaza Trace Library Setup Menu

The following procedure shows how to display the Hitachi Network Objectplaza Trace Library setup menu.

To display the Hitachi Network Objectplaza Trace Library setup menu:

1. Log in as a root user.
2. Execute the following command:
/opt/hitachi/HNTRLib2/bin/hntr2utl2

The Hitachi Network Objectplaza Trace Library setup menu appears.

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility  Rel 2.0

Select the item you want to change.  (Type 1-7 or e)

      [Log Files]
1: Size of a log file.           256 KB
2: Number of log files.         4
3: Name of log files.           /var/opt/hitachi/HNTRLib2/spool/hntr2*.log

      [Monitor]
4: Size of buffer.              64 KB
5: Interval timer.              10 Sec

      [Logging Restriction]
6: Lookout span.                0 Sec
7: Max messages per span.       0

e: Exit

Enter the number>
```

If you do not want to change the settings, type `e` and then press the **Enter** key to quit the menu.

The following section explains how to modify each setting.

3.6.2 Changing the Size of Integrated Trace Files

The following procedure shows how to change the size of integrated trace files.

To change the size of trace files:

1. In the Hitachi Network Objectplaza Trace Library setup menu, type 1 and then press the **Enter** key.

A screen to set the size of the integrated trace file will appear. The current value is displayed in **Current Size**.

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility  Rel 2.0

Type new file size [8-8192]          (Type '!' to return)

Current Size(KB): 256
New Size(KB):
```

2. Enter the desired size in **New Size**.

The specifiable range is between 8 KB and 8192 KB, with a default of 256. Set this to a value larger than that set in step 2 of 3.6.4. We recommend setting a value of 4096 when collecting an integrated trace.

If you do not want to change the integrated trace file size, leave **New Size** blank, type **!**, and then press the **Enter** key to return to the Hitachi Network Objectplaza Trace Library setup menu.

3. Press the **Enter** key.

The new setting is applied and the Hitachi Network Objectplaza Trace Library setup menu appears again.

3.6.3 Changing the Number of Integrated Trace Files

The following procedure shows how to change the number of integrated trace files.

1. To change the number of integrated trace files:
2. In the Hitachi Network Objectplaza Trace Library setup menu, type 2 and then press the **Enter** key.

A screen to set the number of integrated trace files will appear. The current value is displayed in **Current Number**.

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility  Rel 2.0

Type the number of files [1-16]          (Type '!' to return)

Current Number(KB):  4
New Number(KB):
```

3. Enter the desired number in **New Number**.

You can specify a value from 1 to 16. The default is 4. The value set here becomes the maximum of n in `/var/opt/hitachi/HNTRLib2/spool/hntr2n.log`. The recommended value for integrated trace collection is 8.

If you do not want to change the number of integrated trace files, leave **New Number** blank, type `!`, and then press the **Enter** key to return to the Hitachi Network Objectplaza Trace Library setup menu.

4. Press the **Enter** key.

The new setting is applied and the Hitachi Network Objectplaza Trace Library setup menu appears again.

3.6.4 Changing the Buffer Size Per Monitoring Interval Duration

The following procedure shows how to change the buffer size per monitoring interval.

To change the buffer size per monitoring interval:

1. In the Hitachi Network Objectplaza Trace Library setup menu, type 4 and then press the **Enter** key.

A screen to set the buffer size will appear. The current value is displayed in **Current Size**.

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility  Rel 2.0

Type new buffer size [8-2048]      (Type '!' to return)

Current Size(KB):  64
New Size(KB):
```

2. Enter a larger size in **New Size**.

Set a new buffer size to fit the monitoring interval set in 5: **Interval Timer**. The specifiable range is between 8 KB and 2048 KB, with a default of 64. Set this to a value smaller than that set in step 2 of section 3.6.2. We recommend setting a value of 256 when collecting an integrated trace.

To leave the buffer size as is, leave **New Size** blank, type ! and press the **Enter** key. You will be returned to the Hitachi Network Objectplaza Trace Library setup menu.

3. Press the **Enter** key.

The new setting is applied and the Hitachi Network Objectplaza Trace Library setup menu appears again.

4. In the Hitachi Network Objectplaza Trace Library setup menu, type 5 and then press the **Enter** key.

A screen to set the monitoring interval will appear. The current value is displayed in **Current Span**.

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility  Rel 2.0

Type the value of interval timer for the monitor [1-300](Type '!' to return)

Current Span(sec): 10
New Span(sec):
```

5. Enter a shorter interval in **New Span**.

The specifiable range is between 1 second and 300 seconds, with a default of 10. We recommend setting a value of 5 when collecting an integrated trace.

To leave the monitoring interval as is, leave **New Span** blank, enter ! and press the **Enter** key. You will be returned to the Hitachi Network Objectplaza Trace Library setup menu.

6. Press the **Enter** key.

The new setting is applied and the Hitachi Network Objectplaza Trace Library setup menu appears again.

3.6.5 Adjusting the Number of Messages to be Output per Monitoring Interval

This section explains how to adjust the number of messages output to fit a particular monitoring interval.

To adjust the number of messages to be output per monitoring interval:

1. In the Hitachi Network Objectplaza Trace Library setup menu, type 6 and then press the **Enter** key.

A screen to set the monitoring interval for the amount of messages output to the integrated trace file will appear. The current value is displayed in **Current Span (sec)**.

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility  Rel 2.0
Type the number of lookout span [1-3600 or 0]      (Type '!' to return)

Current Span(sec):    0
New Span(sec):
```

2. Enter a desired interval in **New Span**.

The specifiable range is between 0 and 3600 seconds, with a default of 0. We recommend setting a value of 0.

To leave the monitoring interval as is, leave **New Span** blank, type ! and press the **Enter** key. You will be returned to the Hitachi Network Objectplaza Trace Library setup menu.

Note that when you specify a monitoring interval of 0, even if you specify the maximum number of messages in **7: Max messages per span**, the amount of integrated trace information to be output will not be adjusted.

3. Press the **Enter** key.

The new setting is applied and the Hitachi Network Objectplaza Trace Library setup menu appears again.

4. In the Hitachi Network Objectplaza Trace Library setup menu, type 7 and press the **Enter** key.

A screen to set the maximum number of messages output to the integrated trace file based on the monitoring interval specified in 6: **Lookout span** will appear. The current value is displayed in **Current Max**.

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility  Rel 2.0

Type the number of max messages [0-500]      (Type '!' to return)

Current Max(sec):    0
New Max(sec):
```

5. Adjust the maximum number of messages output to the integrated trace files in **New Max**.

The specifiable range is between 0 messages and 500 messages, with a default of 0. If you want to increase the number of messages which are output to the integrated trace file as much as possible, we recommend setting a value of 0.

When you specify a monitoring interval of 0 in 6: **Lookout span**, the value set in **New Max** will be disregarded.

Also, when you specify a value of 0 for **New Max**, even if you specify the monitoring interval in 6: **Lookout span**, the maximum number of messages output will not be adjusted.

To leave the maximum number of messages output as is, leave **New Max** blank, enter ! and press the **Enter** key. You will be returned to the Hitachi Network Objectplaza Trace Library setup menu.

6. Press the **Enter** key.


The new setting is applied and the HNTRLlib setup menu appears again.

3.6.6 Finishing the Hitachi Network Objectplaza Trace Library Settings

This section explains how to close the Hitachi Network Objectplaza Trace Library setup menu when you are finished.

1. In the Hitachi Network Objectplaza Trace Library setup menu, type `e` and press the **Enter** key.

You will be asked to if you wish to save the new settings.



```
Save or not? (Yes/No)>
```

2. To save the new settings, click **Yes**, otherwise, click **No**.

3.6.7 Applying the Hitachi Network Objectplaza Trace Library Settings

After you change the amount of integrated trace information by using Hitachi Network Objectplaza Trace Library, use the following procedure to apply the settings.

1. Log in as a root user.
2. Execute the following command to stop the integrated trace collection process:

```
# /opt/hitachi/HNTRLib2/bin/hntr2kill
```
3. Execute the following command to delete the memory mapped file:

```
# rm /opt/hitachi/HNTRLib2/mmap/hntr2mmap.mm
```
4. Execute the following command to start the integrated trace collection process:

```
# /opt/hitachi/HNTRLib2/bin/hntr2mon -d &
```

3.7 Checking the Path Configuration

HDLM functionalities, such as load balancing and failover, are available only for devices that have more than one active path. After you install HDLM or change the hardware configuration, check the structure and statuses of these paths.

To check the path information, use the `dlnmgr` command's `view` operation or use the **Path List** view in the Path Management window of the HDLM GUI or the Show Path List subwindow in the information frame of the HDLM Web GUI. For details about the `view` operation, see section 6.7.

3.7.1 Checking Path Information Using the `dlnmgr` Command's View Operation

The following describes how to check path information.

1. Execute the HDLM command's `view` operation specifying the `-path` and `-drv` parameters to output path information.

For details about the `view` operation, see section 6.7.

Execute the following commands:

```
# /usr/DynamicLinkManager/bin/dlnmgr view -path > pathinfo1.txt
# /usr/DynamicLinkManager/bin/dlnmgr view -drv > pathinfo2.txt
```

In the above, `pathinfo1.txt` and `pathinfo2.txt` are the names of the files to which the execution results are redirected. You can change this name according to the situation.

The above command outputs the information about all paths.

For details about the output items using the `view` operation, see section 6.7.

2. Open the redirect files (`pathinfo1.txt` and `pathinfo2.txt` in Step 1), and check the following:

The HDLM management-target devices (file to be used: `pathinfo2.txt`)

Compare the names of the HDLM management-target devices to the logical device file names of the physical volume before HDLM was installed to see if the names of the HDLM management-target devices are associated with the logical device file names of the HDLM devices.

The logical units that are accessed by paths (file to be used: `pathinfo1.txt`)

You can identify a path from `PathName`. You can identify an LU reached by a path, from a combination of `DskName` and `iLU`.

Whether the paths are accessing the same logical unit via different host bus adapters
(file to be used: `pathinfo1.txt`)

- Check the `PathNames` of the paths reaching the same LU to see whether the combinations of numbers up to the second dot (*HBA-adapter-number.Bus number*) are different for each path.
- Check whether there are the same number of *HBA-adapter-number.Bus number* combinations as the actual number of HBA ports.

Whether the paths are accessing the same logical unit via different channel adapters
(file to be used: `pathinfo1.txt`)

- Check whether more than one CHA is actually mounted.
- Check whether the `ChaPorts` (CHA port numbers) of the paths to the same LU are all different.

The path status (file to be used: `pathinfo1.txt`)

Check that each `Status` is `Online`, or that the number of `Paths` and the number of `OnlinePaths` are the same.

3.8 Setting Up Volume Groups

If there is no volume group before installing HDLM, perform the following procedure to create a volume group and a file system. If a volume group exists, start from step 3.

To create a volume group:

1. Execute the utilities for operating HDLM volume groups.

We recommend that you execute the utility from the SMIT window.

Enter the following command to execute the command of the utilities for operating HDLM volume groups:

```
# /usr/DynamicLinkManager/bin/dlmmkvg -s 32 -y HDLM-volume-group-name HDLM-device's-logical--device-file-name-for-physical volume
```

To check the correspondence between a physical volume (*hdiskn*) and the logical device file name of a HDLM device, execute the *dlmkmgr* command's *view -drv* operation.

To see the correspondence between a physical volume and an LU, check *lun_id* displayed by the command, *lsattr -El physical-volume-name*.

In the following example, the command creates the volume group *dlmvg01* using *dlmfdrv0*:

```
# /usr/DynamicLinkManager/bin/dlmmkvg -s 32 -y dlmvg01 dlmfdrv0
```

2. Create a file system.

Execute the following command to create a file system:

```
# crfs -v jfs -g volume-group-name -a size= block-size-of-file-system -m mount-point
```

In the following example, the command creates a file system whose size is 8192000 blocks for the volume group *dlmvg01* at the mount point */tmp/dlmvg01*.

```
# crfs -v jfs -g dlmvg01 -a size=8192000 -m /tmp/dlmvg01
```

3. Execute the following command to release the mount point.

If you have performed step 1 and 2, skip this step.

```
# umount mount-point
```

4. To enable the volume group in HDLM, execute the following commands of the utilities for operating HDLM volume groups. The commands deactivate and then activate the volume groups to be used by HDLM.

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name-used-for-HDLM
```

```
# /usr/DynamicLinkManager/bin/dlmvaryonvg volume-group-name-used-for-HDLM
```

5. Execute the following command to enable the mount point:

```
# mount mount-point
```

6. Execute the following command to make sure that the volume group contains the appropriate HDLM device (*dlmfdrv*):

```
# lspv | grep dlmfdrv
```

3.9 Settings for Using HACMP

To use HACMP, install HDLM on all of the hosts that comprise the cluster, configure HDLM drivers, set up the storage subsystem (for using the Thunder 9200), and register the HDLM script for HACMP. Also, set up the same reservation level in all of the hosts in the cluster.

3.9.1 Setting Up the Thunder 9200

When you use the Thunder 9200 as the storage subsystem, perform the setup shown in Table 3.17. For details on setting up the Thunder 9200, see the maintenance manual supplied with the storage subsystem.

Table 3.17 Thunder 9200 Settings for Using HACMP

Item	Settings
<i>Link separation in Host connection mode</i>	ON
<i>UA (06/2A00) suppression mode in Host connection mode 2</i>	ON
<i>Logical Unit Reset propagation mode in Port options</i>	ON

3.9.2 Registering the HDLM Script for HACMP

To use HACMP, you need to register the HDLM script for HACMP. The HDLM script for HACMP is supplied with HDLM. The required operation depends on the order of resource group processing:

- When the resource group processing order is a sequential order
Add a custom cluster event or custom disk methods.
- When the resource group processing order is a parallel order
Add custom disk methods.

3.9.2.1 Adding a Custom Cluster Event

This subsection explains how to set up HACMP 5.1. For details on the setting procedure and how to specify the settings for other versions, see the HACMP documentation.

Note: Do not perform this procedure if the resource group processing order is a parallel order.

To register the HDLM script for HACMP:

1. From the SMIT window, display the Add a Custom Cluster Event window.

Choose the following sequence of menu items to display this window:

Communications Applications and Services, HACMP for AIX, Extended Configuration, Extended Event Configuration, Configure Pre/Post-Event Commands, and finally choose Add a Custom Cluster Event.

2. In the Add a Custom Cluster Event window, specify the items as shown below:

Cluster event name:

`d1m_hacmp_disk_available`

Cluster event description:

`d1m_hacmp_disk_available`

Script file name for the cluster event:

`/usr/DynamicLinkManager/cluster/d1m_hacmp_disk_available`

3. When you finish specifying the settings, click the OK button.
4. From the SMIT window, display the Extended Event Configuration window.
Choose the following sequence of menu items to display this window:
Communications Applications and Services, HACMP for AIX, Extended Configuration, Extended Event Configuration, and finally choose Change/Show Predefined HACMP Events.
5. In the Extended Event Configuration window, select the following event in **Select Event Name to Change**:

`get_disk_vg_fs`

The Change/Show Cluster Events window appears.

6. In the **Pre-event Command** list box, specify `d1m_hacmp_disk_available`.

Do not change any other items.

7. When you finish the setup, click the OK button.
8. From the SMIT window, display the HACMP Verification and Synchronization window to execute cluster resource synchronization.

Choose the following sequence of menu items:

Communications Applications and Services, HACMP for AIX, Extended Configuration, and finally choose Extended Verification and Synchronization.

3.9.2.2 Adding Custom Disk Methods

This subsection explains how to set up HACMP 5.1. For details on the setting procedure and how to specify the settings for other versions, see the HACMP documentation.

1. From the SMIT window, display the Add Custom Disk Methods window.

Choose the following sequence of menu items to display this window:

Communications Applications and Services, HACMP for AIX, Extended Configuration, Extended Resource Configuration, HACMP Extended Resource Configuration, Configure Custom Disk Methods, and finally choose Add Custom Disk Methods.

2. In the Add Custom Disk Methods window, specify the items as shown below:

The items to be set and setting contents are shown below:

Disk Type (PdDvLn field from CuDv): `disk/node/dlmfdrv`

Method to identify ghost disks:

`/usr/DynamicLinkManager/cluster/dlm_hacmp_gdisk_check`

Method to determine if a reserve is held:

`/usr/DynamicLinkManager/cluster/dlm_hacmp_gdisk_reserve_check`

Method to break a reserve: `TARGET`

Break reserves in parallel: `false`

Method to make the disk available: `MKDEV`

3. When you finish specifying the settings, click the OK button.

4. From the SMIT window, display the Single Select List window.

Choose the following sequence of menu items to display this window:

Communications Applications and Services, HACMP for AIX, Extended Configuration, and finally choose Extended Verification and Synchronization.

3.9.3 Setting the Reservation Level

If the HACMP resources belong to a non-concurrent resource group, set the reservation level to 2 before the HACMP service is started. Use the `dlmkmgr` command's `set` operation, the Options window of the HDLM GUI, or Show HDLM Environment Settings subwindow of the HDLM Web GUI, to set the reservation level to 2, and then start the HACMP service. For details about the `view` operation, see section 6.7.

The reservation level must be the same in all of the hosts that comprise the cluster.

The following is a sample command execution:

```
# /usr/DynamicLinkManager/bin/dlmkmgr set -rsv on 2
```

3.9.4 Setting the clconraid.dat File

Before using HACMP in concurrent mode, be sure to add "dlmfdrv" to the `/usr/sbin/cluster/diag/clconraid.dat` file.

3.10 Settings for Using GPFS + RVSD

To use GPFS + RVSD, install HDLM on all of the hosts that comprise the cluster, and then configure the HDLM drivers. Also, carry out the following procedure before starting GPFS + RVSD:

1. Add the following entry to the last line in the `/etc/vsd/oemdisktypes.lst` file:
`disk/node/dlmfdrv fscsi disk/fcp`
2. In the `dlmodmset` utility for setting the HDLM execution environment ODM, set the LUN RESET option to on.
`# /usr/DynamicLinkManager/bin/dlmodmset -r on`
3. Set the reservation level for each host to 2.
Execute the following command:
`# /usr/DynamicLinkManager/bin/dlnkmgr set -rsv on 2`

3.11 Settings for Using VCS

To use VCS, install HDLM on all of the hosts that comprise the cluster, and then configure the HDLM drivers. Also, carry out the following procedure before starting VCS:

1. Specify the settings for starting the preonline script when VCS starts.

When you have specified the settings for starting the preonline script, go to step 2.

For details on the setting method, see the VCS documentation.

The following example shows settings for starting the preonline script when VCS starts:

```
# haconf -makerw
# hagr -modify service-group PreOnline 1
# haconf -dump -makero
# cp -r /opt/VRTSvcs/bin/sample_triggers/preonline /opt/VRTSvcs/bin/triggers
```

2. In the preonline script used when VCS starts, register the script provided by HDLM.

Add the following code to the line under `# put your code here...` in the preonline script:

```
system("/usr/DynamicLinkManager/cluster/dlm_vcs_pgr_release $ARGV[1]");
```

The following shows an example of editing the preonline script. The shaded portion represents the part to be added.

```

@(#)src/cmd/hattrigger/unix/preonline 2.9 03/04/02 11:30:51 - #
#ident "@(#)VCS:src/cmd/hattrigger/unix/preonline 2.9"
#
# Copyright(C) 2000 VERITAS Software Corporation. ALL RIGHTS RESERVED.
# UNPUBLISHED -- RIGHTS RESERVED UNDER THE COPYRIGHT
#
$trigger="preonline";
if (!defined $ARGV[0]) {
    $log_message = sprintf("VCS:15005:%s:Failed to continue;
        undefined system name", $trigger);
    `vcs_home/bin/halog -add C \"${log_message}\" -msgid 15005
    -parameters $trigger`;
    exit;
} elsif (!defined $ARGV[1]) {
    $log_message = sprintf("VCS:15006:%s:Failed to continue;
        undefined group name", $trigger);
    `vcs_home/bin/halog -add C \"${log_message}\" -msgid 15006
    -parameters $trigger`;
    exit;
}
# put your code here...
system("/usr/DynamicLinkManager/cluster/dlm_vcs_pgr_release $ARGV[1]");
#
# # Here is a sample code that takes into account multiple groups.
#
# $group = $ARGV[1];

```

Figure 3.8 Example of Editing the Preonline Script

3. Set the reservation level for each host to 2.

Execute the following command:

```
# /usr/DynamicLinkManager/bin/dlnkmgr set -rsv on 2
```

Note: When using VCS, specify the HDLM device (`dlmfdrvn`) in the Disks specification in LVMVG Agent for the service group.

3.12 Creating an HDLM GUI Environment for Operating HDLM from Device Manager

This section explains the settings for using HDLM GUI from the Device Manager client. For details about the settings for using HDLM Web GUI, see section 3.13.

3.12.1 Procedure for Creating an Environment for HDLM GUI

Based on the following procedure, create an environment for using HDLM GUI.

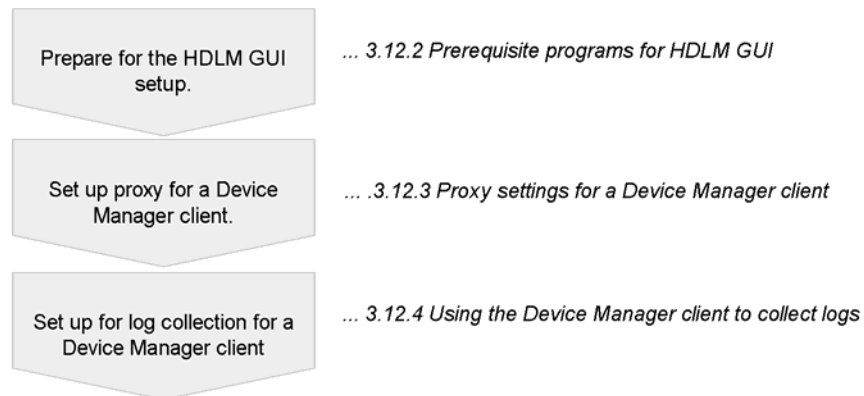


Figure 3.9 Procedure for creating an environment for HDLM GUI

3.12.2 Prerequisite Programs for HDLM GUI

The following shows the environment for using HDLM GUI, which is required for a Device Manager client, a Device Manager server, and a management-target host. Check the environment for each item, and then install the OS or program as required. For details about OS information such as the version number, see the HDLM Release Notes accompanying this document.

3.12.2.1 Device Manager Client Machine

The program requirements on a Device Manager client machine are as follows:

- OS: The OS depends on the Device Manager client requirements for Device Manager 2.4 or later.
- Web browser: The usable Web browser depends on the OS installed in the Device Manager client and the version of Device Manager. Table 3.18 describes the prerequisite Web browsers.

Table 3.18 Prerequisite Web Browser

OS	Web Browser		Device Manager Version			
	Type	Version	2.4	3.0, 3.1	3.5	4.0, 4.1
Windows	Microsoft Internet Explorer	5.0 or later	Usable	Unusable	Unusable	Unusable
		5.5 or later	Usable	Usable	Unusable	Unusable
		6.0 or later	Usable	Usable	Usable	Usable
Solaris	Netscape Navigator	6.23 or later	Unusable	Usable	Usable	Unusable
		7.0 or later	Unusable	Usable	Usable	Usable
	Mozilla™ (Only Mozilla for Solaris™ can be used.)	1.4	Unusable	Unusable	Unusable	Usable

- Prerequisite programs:
 - Device Manager Web Client (**Note 1**)
 - JRE
 - Java Web Start

Note 1: Can be downloaded from the Device Manager server.

Note 2: If you use a version of Device Manager 3.0 or later, when the HDLM Web GUI is installed on the Device Manager server, the HDLM Web GUI will start, and you will not be able to use the HDLM GUI.

For details about the Device Manager client, see the *HiCommand™ Device Manager Web Client User's Guide*, MK-91HC001.

3.12.2.2 Device Manager Server Machine

The program requirements on a Device Manager server machine are as follows:

- OS: The OS depends on the Device Manager server requirement.
- Prerequisite programs: Device Manager (2.4 or later)

Note: If you use a version of Device Manager 3.0 or later when the HDLM Web GUI is installed on the Device Manager server, the HDLM Web GUI will start, and you will not be able to use the HDLM GUI.

For details about installing Device Manager, see the *HiCommand™ Device Manager Server Installation and Configuration Guide*, MK-91HC002.

3.12.2.3 Management-target Host

The program requirements on a management-target host machine are as follows:

- Prerequisite programs:
 - HDLM
 - JRE
 - Device Manager Agent (2.4 or later)

For details about installing Device Manager Agent, see the *HiCommand™ Device Manager Agent Installation Guide*, MK-91HC019.

- Web browser: Netscape Navigator 4.7 or later, Mozilla 1.4, or Mozilla 1.7

Note: Only Mozilla™ for AIX® can be used.

Note: When installing Device Manager Agent on a management-target host where HDLM has already been installed, if you install Device Manager Agent 2.4 or 3.0, execute the following command after the installation:

```
# /usr/DynamicLinkManager/bin/dlmguiinst.sh
```

If the version of Device Manager Agent is 3.1 or later, the above operation is not necessary.

3.12.3 Proxy Settings for a Device Manager Client

Since a Device Manager client and a host managed by HDLM are connected via a local network, you must disable use of proxies in Java Web Start.

To disable the proxy settings in Java Web Start:

1. From the **Start** menu, choose **Programs**, then **Java Web Start**, and then **Java Web Start**. The Java Web Start application manager window will appear.
2. From the **File** menu, choose **Preferences**. The Java Web Start - Preferences dialog box appears.
3. Click the **General** tab. The **General** page opens.
4. In the **Proxies** pane, select **None**.
5. Click the **OK** button.

3.12.4 Using the Device Manager Client to Collect Logs

If an error occurs, you may be requested by the maintenance company to use the Device Manager client to collect logs. In this case, you can collect logs by performing the following settings. If no such requests are made, do not perform these settings.

To collect logs:

1. From the **Start** menu, choose **Programs**, **Java Web Start**, and then **Java Web Start**. The Java Web Start Application Manager window appears.
2. From the **File** menu, choose **Preferences**. The Java Web Start - Preferences dialog box appears.
3. Click the **Advanced** tab. The **Advanced** page appears.
4. Specify **Output Options** in the **Advanced** page:
 - When you select the **Show Java Console** check box, messages output to the log will also be shown in the console window. This is optional.
 - When you select the **Log Output** check box, the log will be output to the file whose name is specified in **Log File Name**. Be sure to select this check box.
 - The **Log File Name** text box specifies the name of the log file to which the log is output when the **Log Output** check box is selected. Click the **Choose Log File Name**, and select the existing file path, or specify the file name directly in **Log File Name**. Make sure that you specify the target file name.
5. Click the **OK** button. The log will be output to the file that you specified.

3.13 Creating an HDLM Web GUI Environment for Operating HDLM from Device Manager

This section explains the settings for using HDLM Web GUI from the Device Manager client. For details about the settings for using the HDLM GUI, see section 3.12.

3.13.1 Procedure for Creating an Environment for the HDLM Web GUI

Based on the following procedure, create an environment for using HDLM Web GUI.

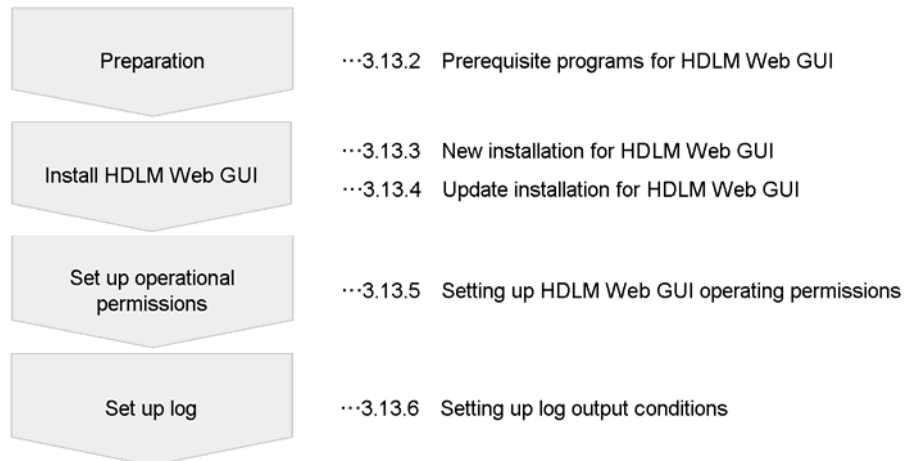


Figure 3.10 Procedure for Creating an Environment for the HDLM Web GUI

3.13.2 Prerequisite Programs for the HDLM Web GUI

The following shows the environment for using HDLM Web GUI, which is required for a Device Manager client, a Device Manager server, and a management-target host. Check the environment for each item, and then install the OS or program as required. For details about OS information such as the version number, see the HDLM Release Notes.

3.13.2.1 Device Manager Client Machine

The program requirements on a Device Manager client machine are as follows:

- OS: The OS depends on the Device Manager client requirements in Device Manager 3.0 or later.
- Web browser: The web browser depends on the operating system, the Device Manager client, and the version of Device Manager. Table 3.19 shows the required Web browsers.

Table 3.19 Required Web Browsers

OS	Web Browser		Device Manager Version		
	Product	Version	3.0, 3.1	3.5	4.0, 4.1
Windows	Microsoft Internet Explorer	5.5 or later	Usable	Unusable	Unusable
		6.0 or later	Usable	Usable	Usable
Solaris	Netscape Navigator	6.2.3 or later	Usable	Usable	Unusable
		7.0 or later	Usable	Usable	Usable
	Mozilla™ (Only Mozilla for Solaris™ can be used)	1.4	Unusable	Unusable	Usable

For details about the Device Manager client, see the *HiCommand™ Device Manager Web Client User's Guide*, MK-91HC001.

3.13.2.2 Device Manager Server Machine

The program requirements on a Device Manager server machine are as follows:

- OS: The OS depends on the Device Manager server requirement.
- Prerequisite programs: Device Manager (3.0 or later)

Note: If you use a version of Device Manager 3.0 or later and the HDLM Web GUI is not installed on the Device Manager server, the HDLM GUI will start. You will not be able to use the HDLM Web GUI.

For details about installing Device Manager, see *HiCommand™ Device Manager Server Installation and Configuration Guide*, MK-91HC002.

3.13.2.3 Management-target Host

The program requirements on a management-target host machine are as follows:

- Prerequisite programs:
 - HDLM
 - Device Manager Agent (2.4 or later)

Note: If you use a version of Device Manager 3.0 or later and the HDLM Web GUI is not installed on the Device Manager server, the HDLM GUI will start. You will not be able to use the HDLM Web GUI.
 - When installing Device Manager Agent on a management-target host where HDLM has already been installed, if you install Device Manager Agent 3.0, execute the following command after the installation:
`# /usr/DynamicLinkManager/bin/dlmguiinst.sh`

If the version of Device Manager Agent is 3.1 or later, the above operation is not necessary.
- For details about installing Device Manager Agent, see the *HiCommand™ Device Manager Agent Installation Guide*, MK-91HC019. For details about installing Device Manager Web Client, see the *HiCommand™ Device Manager Web Client User's Guide*, MK-91HC001.

3.13.3 New Installation for the HDLM Web GUI

You install the HDLM Web GUI package on the Device Manager server machine. The installation procedures are explained separately for Windows® and Solaris™ (the OS on which the Device Manager server operates).

3.13.3.1 Precautions

- This installation program includes a process that temporarily stops the Web services commonly used among the HiCommand products. Before starting installation, make sure that no process that uses the HiCommand products is running.
- Do not stop the InterBase® or the InterClient service while installing the HDLM Web GUI. If you stop these services during installation, the KAPL09059-E message will appear and installation will fail. In such a case, start the InterBase® or the InterClient® service, and then re-install the HDLM Web GUI.
- If HDLM Web GUI is to be installed on the Device Manager server in a cluster configuration, switch the Device Manager server to the active node before installing HDLM Web GUI. If the Device Manager server is in a stand-by node, the HDLM Web GUI cannot be installed.
- When uninstalling Device Manager 3.0 or later while the HDLM Web GUI has been installed on the Device Manager server, first uninstall the HDLM Web GUI. The following describes the phenomenon and actions for each version of Device Manager when uninstalling Device Manager:
 - When Device Manager 3.0 is installed:

After Device Manager is uninstalled, you cannot perform an update installation of the HDLM Web GUI. If you attempt to perform such an update installation, the KAPL09053-E or KAPL09055-E error message is output and installation finishes. In this case, uninstall HDLM Web GUI, install Device Manager, and then re-install the HDLM Web GUI.

After Device Manager is uninstalled, and Device Manager 3.0 or later has been installed, the HDLM Web GUI cannot be used. The HDLM GUI starts on Device Manager client.

Also, you cannot update or uninstall the HDLM Web GUI. If you attempt to do so, the KAPL09066-E error message is output, and the processing will terminate.

To use HDLM Web GUI, do the following:

a) Create a `hdlmwebgui_uninstall` file.

For Windows®, execute the following command:

```
> cd folder-specified-during-installation-of-HDLM-Web-GUI
> echo > hdlmwebgui_uninstall
```

For Solaris™, execute the following command:

```
# cd /opt/DynamicLinkManagerWebGUI/
# touch hdlmwebgui_uninstall
```

b) Uninstall the HDLM Web GUI.

For details about how to uninstall the HDLM Web GUI, see section 3.14.2.

c) For Windows®, execute the following command to delete the file created in step 1.

```
> cd folder-specified-during-installation-of-HDLM-Web-GUI
> del hdlmwebgui_uninstall
```

If necessary, delete the folder specified during the HDLM Web GUI installation.

d) Install the HDLM Web GUI.

- For Device Manager 3.1 or later:

An error occurs during uninstallation and Device Manager uninstallation terminates. When this occurs, uninstall the HDLM Web GUI first and then uninstall Device Manager.

- If an error occurs during the HDLM Web GUI installation, collect the files under the following folder or directory, and then contact your HDLM vendor, or the maintenance company if there is a maintenance contract for HDLM.
 - When the Device Manager server OS is Windows®:
folder-specified-during-installation-of-HDLM-Web-GUI\DynamicLinkManagerWebGUI\log
 - When the Device Manager server OS is Solaris™:
/var/opt/DynamicLinkManagerWebGUI/log
- When the Device Manager server OS is Windows®, The name of the HDLM Web GUI installation folder and the names of all its parent folders must fulfill all of the following conditions:
 - The name must not be an OS reserved name.
OS reserved names include, for example, CON, AUX, COM1 to COM9, LPT1 to LPT9, PRN, and NUL.
 - The name must contain the following characters only:
A - Z, a - z, 0 - 9, -, _, ., @, or a single byte space
 - The end of the name cannot be a single byte space.

If you attempt to install the HDLM Web GUI in a folder that does not fulfill these conditions, problems such as those described in Table 3.20 might occur. In such a case, reinstall the HDLM Web GUI according to the procedures given below.

Table 3.20 HDLM Web GUI Installation: Problems and Actions

Problem	Action
An internal error occurred and the installation was interrupted.	Specify a folder that fulfills the above conditions and reinstall the HDLM Web GUI.
After the installation completed normally, the following problems arose: <ul style="list-style-type: none"> The HDLM Web GUI operation logs were not output to the Device Manager server side. The settings specified in the <code>dmlservlet.properties</code> file were not enabled. 	Uninstall the HDLM Web GUI and then install it again specifying a folder that fulfills the above conditions.

3.13.3.2 Windows®

To perform a new installation of the HDLM Web GUI in Windows®:

1. Log into Windows® as an Administrators Group user.
2. Insert the CD-ROM, and then start the following installation program:
CD-ROM-drive:\WebGUI\Windows\Setup.exe
Specify the folder in which the HDLM Web GUI package is to be installed.
3. The following message will be displayed on the screen:
Warning:
This installation program temporarily starts and stops the web services shared by HiCommand products. Before installing, confirm that no running jobs are using HiCommand products.
After confirming that no processes from HiCommand products are running, click the **Next** button to continue with the installation. Click the **Cancel** button to terminate the installation.
4. If you choose to continue installation in step 3, proceed as instructed by the messages that appear on the screen.
A window indicating that the installation finishes appears. Click the **Finish** button instructed by the window. The installation finishes.

3.13.3.3 Solaris™

To perform a new installation of the HDLM Web GUI in Solaris™:

1. Log into Solaris™ as a user with root privileges.
2. Insert the CD-ROM.

It takes a few seconds for the CD-ROM to load automatically and for the CD-ROM mount location to appear in the file list.

If the CD-ROM does not load automatically, execute the following command:

```
# mount -F hsfs -o ro CD-ROM-device-name CD-ROM-mount-location
```

3. Execute the following installation command:

```
# pkgadd -d CD-ROM-mount-location/WebGUI/Solaris HDLMGUI
```

4. The following message will be displayed on the screen:

Warning:

This installation program temporarily starts and stops the web services shared by HiCommand products. Before installing, confirm that no running jobs are using HiCommand products.

Do you want to start installation? [y/n]:

After confirming that no processes from HiCommand products are running, enter **yes** or **y** to continue with the installation, and then proceed to step 5.

Enter **no** or **n** to terminate the installation. The KAPL09067-I message appears and installation is canceled.

The entered value is not case-sensitive.

If you enter a value other than the above values to respond to the message, the KAPL09068-W message appears and the system prompts you to re-enter the value. When you fail to re-enter a value twice in a row, the KAPL09069-E message will appear and installation will be canceled.

5. If you choose to continue installation in step 4, proceed as instructed by the messages that appear on the screen.

After the installation finishes, the following message appears:

```
Installation of <HDLMWebGUI> was successful.
```

6. After the installation finishes, execute the following command to confirm that the HDLM Web GUI package has been installed:

```
# pkginfo -l HDLMGUI
```

3.13.4 Update Installation for the HDLM Web GUI

When you install the HDLM Web GUI on an environment where it already exists, the existing HDLM Web GUI will be overwritten (that is, update installation). During update installation, the `dlmservlet.properties` file is inherited.

3.13.4.1 Precautions

- This installation program includes a process that temporarily stops the Web services commonly used among the HiCommand products. Before starting installation, make sure that no process that uses the HiCommand products is running.
- Do not stop the InterBase® or the InterClient® service while installing the HDLM Web GUI. If you stop these services during installation, the KAPL09059-E message will appear and installation will fail. In such a case, start the InterBase® or the InterClient® service, and then re-install the HDLM Web GUI.
- If HDLM Web GUI is to be installed on the Device Manager server in a cluster configuration, switch the Device Manager server to the active node before installing HDLM Web GUI. If the Device Manager server is in a stand-by node, HDLM Web GUI cannot be installed.
- When uninstalling Device Manager 3.0 or later while HDLM Web GUI has been installed on the Device Manager server, first uninstall HDLM Web GUI. The following describes the phenomenon and actions for each version of Device Manager when uninstalling Device Manager:
 - When Device Manager 3.0 is installed:

After Device Manager is uninstalled, you cannot perform an update installation of HDLM Web GUI. If you attempt to perform such an update installation, the KAPL09053-E or KAPL09055-E error message is output and installation finishes. In this case, uninstall HDLM Web GUI, install Device Manager, and then re-install HDLM Web GUI.

After Device Manager is uninstalled and Device Manager 3.0 or later has been installed, HDLM Web GUI cannot be used. HDLM GUI starts on a Device Manager client.

Also, you cannot update or uninstall HDLM Web GUI. If you attempt to do so, the KAPL09066-E error message is output, and the processing will terminate.

To use HDLM Web GUI, do the following:

a) Create a `hdlmwebgui_uninstall` file.

For Windows®, execute the following command:

```
> cd folder-specified-during-installation-of-HDLM-Web-GUI
> echo > hdlmwebgui_uninstall
```

For Solaris™, execute the following command:

```
# cd /opt/DynamicLinkManagerWebGUI/
# touch hdlmwebgui_uninstall
```

b) Uninstall the HDLM Web GUI.

For details about how to uninstall the HDLM Web GUI, see section 3.14.2.

c) For Windows®, execute the following command to delete the file created in step 1:

```
> cd folder-specified-during-installation-of-HDLM-Web-GUI
> del hdlmwebgui_uninstall
```

If necessary, delete the folder specified during the HDLM Web GUI installation.

d) Install the HDLM Web GUI.

- When Device Manager 3.1 or later is installed:

An error occurs during uninstallation and Device Manager uninstallation terminates. When this occurs, uninstall the HDLM Web GUI first and then uninstall Device Manager.

- If an error occurs during the HDLM Web GUI installation, collect the files under the following folder or directory, and then contact your Hitachi Data Systems technical representative.

- When the Device Manager server OS is Windows®:

folder-specified-during-installation-of-HDLM-Web-GUI\DynamicLinkManagerWebGUI\log

- When the Device Manager server OS is Solaris™:

/var/opt/DynamicLinkManagerWebGUI/log

3.13.4.2 Windows®

To perform an update installation of the HDLM Web GUI in Windows®:

1. Log into Windows® as an Administrators Group user.
2. Insert the CD-ROM, and then start the following installation program:

`CD-ROM-drive:\WebGUI\Windows\Setup.exe`

The following message will be displayed on the screen:

Warning:

This installation program temporarily starts and stops the web services shared by HiCommand products. Before installing, confirm that no running jobs are using HiCommand products.

3. After confirming that no processes from HiCommand products are running, click the **Next** button to continue with the installation. Click the **Cancel** button to terminate the installation.
4. If you choose to continue installation in step 3, proceed as instructed by the messages that appear on the screen.

A window indicating that the installation finishes appears. Click the **Finish** button instructed by the window. The installation finishes.

3.13.4.3 Solaris™

To perform an update installation of the HDLM Web GUI in Solaris™:

1. Log into Solaris™ as a user with root privileges.
2. Insert the CD-ROM.

It takes a few seconds for the CD-ROM to load automatically and for the CD-ROM mount location to appear in the file list.

If the CD-ROM does not load automatically, execute the following command:

```
# mount -F hsfs -o ro CD-ROM-device-name CD-ROM-mount-location
```

3. Execute the following installation command:

```
#pkgadd -a CD-ROM-mount-location/WebGUI/Solaris/update -d CD-ROM-mount-location/WebGUI/Solaris HDLMGUI
```

The following message will be displayed on the screen:

Warning:

This installation program temporarily starts and stops the web services shared by HiCommand products. Before installing, confirm that no running jobs are using HiCommand products.

Do you want to start installation? [y/n]:

4. After confirming that no processes from HiCommand products are running, enter *yes* or *y* to continue with the installation, and then proceed to step 5.

Enter *no* or *n* to terminate the installation. The KAPL09067-I message appears and installation is canceled.

The entered value is not case-sensitive.

If you enter a value other than the above values to respond to the message, the KAPL09068-W message appears and the system prompts you to re-enter the value. When you fail to re-enter a value twice in a row, the KAPL09069-E message will appear and installation will be canceled.

5. If you choose to continue installation in step 4, proceed as instructed by the messages that appear on the screen.

After the installation finishes, the following message appears:

```
Installation of <HDLMWebGUI> was successful.
```

6. After the installation finishes, execute the following command to confirm that the HDLM Web GUI package has been installed:

```
# pkginfo -l HDLMGUI
```

3.13.5 Setting Up HDLM Web GUI Operating Permissions

You can set up operating permissions when using HDLM Web GUI. Depending on the operating permissions you set up, the executable operations (executable from HDLM Web GUI, performed on HDLM on a managed host or on managed paths) differ.

In the `dlmservlet.properties` file, one of the following operating permissions can be selected:

- Inheriting the Device Manager operating permissions: HDLM Web GUI operating permissions are equivalent to Device Manager operating permissions.
- Guest only: HDLM Web GUI can be viewed only. If you need to change the HDLM operating environment or path operations (performing an `online` or `offline` operation, clearing data), perform operations from the management-target host.

When you perform a new installation of HDLM Web GUI or an update installation of older version of HDLM Web GUI 5.4 (not including HDLM Web GUI 5.4), the Device Manager operating permissions are inherited by default. When an update installation of HDLM Web GUI 5.4 or later is performed, the previous operating permissions are inherited.

3.13.5.1 Operations Executable on a Device Manager Client

When HDLM is linked with Device Manager and you operate the HDLM Web GUI on a Device Manager client, executable operations differ depending on the HDLM version, and depending on the Device Manager login privileges shown in Table 3.21.

Table 3.21 Operations executable in HDLM Web GUI

HDLM Version (Note 1)	HDLM Web GUI Operating Privileges (Note 2)	Device Manager Login Privileges	Operations Executable on HDLM Web GUI
05-02	(Not applicable)	System Administrator Storage Administrator Local System Administrator Local Storage Administrator	Refreshing the display. Changing the HDLM operating environment. Starting the Help window. Performing online operations. Performing offline operations. Clearing data. Outputting information to a CSV file.
		Guest Local Guest	Refreshing the display. Starting the Help window. Outputting information to a CSV file.
5.4 or later	admin (Inheriting the Device Manager operating permissions)	System Administrator Storage Administrator Local System Administrator Local Storage Administrator	Refreshing the display. Changing the HDLM operating environment. Starting the Help window. Performing online operations. Performing offline operations. Clearing data. Outputting information to a CSV file.
		Guest Local Guest	Refreshing the display. Starting the Help window. Outputting information to a CSV file.
	guest (granting Guest privileges only)	System Administrator Storage Administrator Local System Administrator Local Storage Administrator Guest Local Guest	Refreshing the display. Starting the Help window. Outputting information to a CSV file.

Note 1: When the HDLM version is 05-01 or earlier, HDLM GUI starts on the Device Manager client, HDLM GUI is invoked. HDLM Web GUI cannot be used.

Note 2: This indicates the value that was set in `hdlm.authority` in the `dlmservlet.properties` file on the Device Manager server.

3.13.5.2 Setting up Operating Permissions

To set up operating permissions:

1. Edit the `dlmservlet.properties` file. The `dlmservlet.properties` file is stored in the following:
 - When the Device Manager server 's OS is Windows®:
`installation-folder\config\dlmservlet.properties`
A user can specify an installation folder during HDLM Web GUI installation.
 - When the Device Manager server 's OS is Solaris™:
`/opt/DynamicLinkManagerWebGUI/config/dlmservlet.properties`
2. Specify the setting value as follows:
 - Inheriting the Device Manager operating permissions:
`hdlm.authority=admin`
 - Guest only:
`hdlm.authority=guest`
3. Restart the HiCommand Suite Single Sign On Service.

3.13.6 Setting up Log Output Conditions

The HDLM Web GUI outputs logs to the Device Manager server and its management-target hosts. This section explains how to set log output levels, log file sizes, and other aspects of logs on the Device Manager server and its management-target hosts.

3.13.6.1 Setup for the Device Manager Server

You can change the output level and file size of operation logs on the Device Manager server, as well as the output level of trace logs, by editing settings in the files shown below. After editing the appropriate file, you must restart the Web container server. For details about restarting the Web container server, see the *HiCommand™ Device Manager Server Installation and Configuration Guide*, MK-91HC002.

- When the OS of the Device Manager server is Windows®:
`installation-folder\config\dlmservlet.properties`

Here, *installation-folder* is the folder you specified when you installed HDLM Web GUI.

- When the OS of the Device Manager server is Solaris™:
`/opt/DynamicLinkManagerWebGUI/config/dlmservlet.properties`

Table 3.22 describes the log-related items among the items in the settings file.

Table 3.22 Settings File Items

Setting Item	Default Value	Recommended Value	Description
loggingLevel	3	3	Output level for operation logs: 0: Do not output operation logs. 1: Output Error level operation logs. 2: Output Warning level and higher operation logs. 3: Output Information level and higher operation logs.
logFileSize	9900 (kilobytes)	9900 (kilobytes)	Size of an operation log file The specifiable range is between 100 and 9900.
logFileNum	8	8	Number of operation log files The specifiable range is between 1 and 16.
traceLevel	0	1	Output level for trace logs: 0: Do not output trace logs. 1: Output trace logs.

Note: You should note the following points about changing items in the settings file:

- The default value is used if no value is set for an item described in Table 3.22 or if the file itself does not exist.
- The default value is used if the value you specify for an item is not within the indicated range or if an invalid character string is specified.
- Device Manager ignores any line that begins with a hash mark (#) or an exclamation point (!), as well as any line that contains an invalid character string.
- If the same item is coded more than once, the first item from the top is applied.
- Device Manager ignores any spaces at the beginning of a line, before and after the equals sign (=), and following a value.
- The setting items can be specified in any order.
- Edit only the right hand side of the equal sign (=).

The following shows an example of the entries in a settings file:

```
#Log output conditions
loggingLevel=0
logFileSize=1000
logFileNum=5
traceLevel=1
```

3.13.6.2 Setup for a Management-Target Host

You can change the output level and file size of operation logs on a management-target host, as well as the output level of trace logs, by editing the `/usr/DynamicLinkManager/config/dlmwebagent.properties` file.

After editing this file, you must restart Device Manager Agent. For details about restarting Device Manager Agent, see the *HiCommand™ Device Manager Server Installation and Configuration Guide*, MK-91HC002.

The items and formats in the settings file for the management-target host are the same as the items and formats in the settings file for the Device Manager server (except `logFileNum`). From the items in the settings file, the `logFileNum` default and recommended value is 2. The specifiable range is the same as the settings file for the Device Manager server.

3.13.7 Log Output Destinations

This section explains the output destinations of logs output to the Device Manager server and a management-target host.

3.13.7.1 Device Manager Server

Table 3.23 lists the output destinations of operation logs and trace logs on the Device Manager server for both Windows® and Solaris™ versions.

Table 3.23 Output Destinations of Operation Logs and Trace Logs on the Device Manager Server

Log	Windows®	Solaris™
Trace for each process	<i>installation-folder</i> ^{Note1} \log\dlmservlet [1- <i>N</i> ^{Note2}] .log	/var/opt/DynamicLinkManagerWebGUI/log/dlmservlet [1- <i>N</i> ^{Note2}] .log
Integrated traces	<i>HNTRLib2-installation-folder</i> \spool\hntr2 [1-16] .log	/var/opt/hitachi/HNTRLib2/spool/hntr2 [1-16] .log

Note 1: *installation-folder* is the folder you specified when you installed HDLM Web GUI.

Note 2: The value of *N* depends on a setting in the `dlmservlet.properties` file. The default value is 8.

3.13.7.2 Management-Target Host

Operation logs and trace logs are output to the following files:

- Output destination of trace logs by process:
`/var/DynamicLinkManager/log/dlmwebagent [1-N] .log`

The value of *N* depends on a setting in the `dlmservlet.properties` file. The default value is 2.

Output destination of composite logs:

`/var/opt/hitachi/HNTRLib2/spool/hntr2n.log` (*n* indicates a file number from 1 to 16)

3.14 Uninstalling HDLM

This section explains how to return the HDLM environment to the way it was before HDLM was installed, and describes each step of the process.

3.14.1 Overview of HDLM Uninstallation

Return the HDLM environment to the way it was before HDLM was installed by following the flow shown below in Figure 3.11.

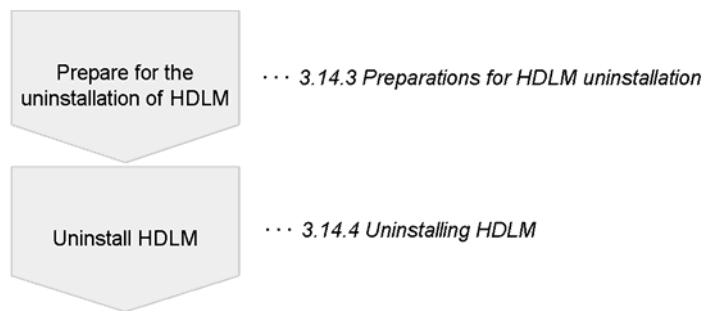


Figure 3.11 Overview of HDLM uninstallation

3.14.2 Uninstalling the HDLM Web GUI

This subsection describes how to uninstall the HDLM Web GUI. The uninstallation procedures are explained separately for Windows® and Solaris™ (the OS on which the Device Manager server operates).

Precautions:

- This uninstallation program includes a process that temporarily stops the Web services commonly used among the HiCommand products. Before starting uninstallation, make sure that no process that uses the HiCommand products is running.
- Before uninstalling the HDLM Web GUI installed on the Device Manager server, stop the HiCommand Suite Single Sign On Service.
- Do not stop the InterBase® or the InterClient® service while uninstalling the HDLM Web GUI. If you stop these services during uninstallation, the KAPL09065-E message will appear and uninstallation will fail. In such a case, start the InterBase® or the InterClient® service, and then re-install the HDLM Web GUI.

3.14.2.1 Windows®

To uninstall the HDLM Web GUI in Windows®:

1. Log into Windows® as an Administrators Group user.
2. Start the uninstallation program.

Open **Add/Remove Programs** from the **Control Panel**, and select the **Change or Remove Programs** tab. From the list of programs, select **Hitachi Dynamic Link Manager Web GUI**, and then click the **Add/Remove** button.

3. The following message will be displayed on the screen:

Warning:

This uninstallation program temporarily starts and stops the web services shared by HiCommand products. Before uninstalling, confirm that no running jobs are using HiCommand products.

After confirming that no processes from HiCommand products are running, click the **Next** button to continue with the uninstall. The uninstall finishes.

Click the **Cancel** button if you want to terminate the uninstall instead.

3.14.2.2 Solaris™

To uninstall the HDLM Web GUI in Solaris™:

1. Log into Solaris™ as a user with root privileges.
2. Execute the following command:

```
# pkgrm HDLMGUI
```

A message is displayed asking that you confirm that you wish to uninstall the program.

The following message will be displayed on the screen:

Warning:

This uninstallation program temporarily starts and stops the web services shared by HiCommand products. Before uninstalling, confirm that no running jobs are using HiCommand products.

Do you want to start uninstallation? [y/n]:

3. After confirming that no processes from HiCommand products are running, enter **yes** or **y** to continue with the uninstall. The uninstall finishes.

Enter **no** or **n** to terminate the uninstall. The KAPL09067-I message appears and uninstall is canceled.

The entered value is not case sensitive.

Note: If you enter a value other than the above values to respond to the message, the KAPL09068-W message appears and the system prompts you to re-enter the value. When you fail to re-enter a value twice in a row, the KAPL09069-E message will appear and uninstall will be canceled.

3.14.3 Preparations for HDLM Uninstallation

Back up all HDLM management-target devices onto a medium such as tape.

3.14.4 Uninstalling HDLM

When you uninstall HDLM, if the KAPL09019-E or KAPL09020-E message is output, follow the directions in section 3.14.5 to uninstall HNTRLlib2. However, if the KAPL09026-I message is output, since a program other than HDLM is using Hitachi Network Objectplaza Trace Library (HNTRLlib2), only HDLM will be uninstalled.

Uninstalling HDLM deletes the `dlmfdrv.unconf` file. If you need the `dlmfdrv.unconf` file, back up this file in a directory other than a subdirectory of the `/` directory, and then uninstall HDLM.

You can skip steps 3 to 6 by executing the `dlmrmddev -A` utility as follows:

```
# /usr/DynamicLinkManager/bin/dlmrmdev -A
```

Note: When you want to uninstall HDLM from a host where Device Manager Agent is installed, stop the Device Manager Agent daemon process, `hdvmagt`, before starting the uninstall. For details about how to stop the `hdvmagt` daemon process, see the *HiCommand™ Device Manager Agent Installation Guide*, MK-91HC019.

To uninstall HDLM:

1. Log in to AIX® as a root user.
2. Stop all the processes and services that use the HDLM management-target paths.
Stop any process or service of an application, such as a DBMS, that is using the HDLM management-target path.
3. Execute the following command to unmount the file system used by HDLM:

```
# umount file-system-mount-point
```
4. Execute the following command to display all the activated volume groups:

```
# lsvg -o
```
5. Among the displayed volume groups, inactivate the volume groups used by HDLM:

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
```
6. Execute the following command to remove the HDLM device and the logical device file for the HDLM alert driver from the running kernel, and then stop the HDLM manager:

```
# /usr/DynamicLinkManager/bin/dlmrmdev
```

The KAPL09012-I message appears, indicating that the command has successfully completed.

If the KAPL09012-I message is not displayed, the logical device file for the HDLM alert driver or the HDLM device has not been deleted, or the HDLM manager has not stopped. Make sure that no process, service, file system, or volume group is using the HDLM management-target path, and then re-execute the above command.
7. Execute the following uninstallation command.

```
# installp -u DLManager
```

3.14.5 Uninstalling the Hitachi Network Objectplaza Trace Library (HNTRLib2)

When you uninstall HDLM, if the KAPL09019-E or KAPL09020-E message is output, follow the directions below to uninstall HNTRLib2.

To uninstall HNTRLib2:

1. Log in to AIX® as the root user.
2. Execute the following command to unregister the name of the bundled program products:
`# /opt/hitachi/HNTRLib2/etc/hntr2cancel "Hitachi Dynamic Link Manager"`
3. Execute the following command:
`# /opt/hitachi/HNTRLib2/etc/hntr2setup`
The HNTRLib2 setup menu will appear.
4. From the **Setup** menu, select **9**.
HNTRLib2 will be uninstalled.

If HNTRLib2 is not being used by any other programs:

HNTRLib2 will be uninstalled normally, and the following message will appear.
Unsetup is complete.

If HNTRLib2 is being used by another program:

HNTRLib2 will not be uninstalled, and the following message will appear.
Because a bundle PP name is registered,
I did not do the Uninstall.

If HNTRLib2 was not uninstalled, execute the following command to check if any programs are using it.

```
# /opt/hitachi/HNTRLib2/etc/hntr2getname
```

If you are unable to complete uninstallation even though no programs other than HDLM are using HNTRLib2, contact your Hitachi Data Systems technical representative.

Note: If the log output directory set in HNTRLib2 was not the default directory, the log files will not be deleted during uninstallation. In this case, delete these files after uninstallation.

3.14.6 Uninstalling Hitachi Network Objectplaza Trace Library (HNTRLib)

After you uninstall HDLM version 4.1 or earlier, if no applications other than HDLM are using HNTRLib, uninstall it as follows:

1. Check that no applications other than HDLM are using HNTRLib.
See the manuals and documentation for each program to check whether the program is using Hitachi Network Objectplaza Trace Library.
2. Log in to AIX® as a root user.
3. Execute the following command:

```
# /opt/hitachi/HNTRLib/etc/hntrsetup
```


The HNTRLib setup menu will appear.
4. From the setup menu, select 9.
HNTRLib will be uninstalled.
5. Delete the HNTRLib common library files and the directory in which they are stored.

When you uninstall HNTRLib, all directories within the `/opt/hitachi/HNTRLib` directory will be deleted, but the libraries within the `/opt/hitachi/common/lib` directory will not.

To delete HNTRLib, delete the following files and directory:

- Shared library files (symbolic links):
`/opt/hitachi/common/lib/libhntr*`
- Directory that contains shared library files:
`/opt/hitachi/common/lib/D001`

If the `/opt/hitachi` directory only contains the files and directories shown above, delete the `/opt/hitachi` directory.

Note: If the log output directory set in HNTRLib was not the default directory, the log files will not be deleted during uninstallation. In this case delete these files after uninstallation.

Even if you attempt to uninstall HNTRLib2 when HNTRLib is installed, HNTRLib will not be uninstalled. If no other programs are using HNTRLib, delete it manually.

3.14.7 Deleting the HACMP Settings

If the HDLM script for HACMP that is supplied with HDLM has been registered, you need to delete the settings as described in the following subsections.

3.14.7.1 Deleting a User-Defined Cluster Event

This subsection explains how to set up HACMP 5.1. For details on the setting procedure and how to specify the settings for other versions, see the HACMP documentation.

To clear registration of the user-defined cluster event:

1. From the SMIT window, display the Extended Event Configuration window.
To display this window, choose the following sequence of menu items:
Communications Applications and Services, HACMP for AIX, Extended Configuration, Extended Event Configuration, and finally Change/Show Predefined HACMP Events.
2. In the Extended Event Configuration window, select the following event in the **Select Event Name to Change** list box:
`get_disk_vg_fs`
The Change/Show Cluster Events window appears.
3. Choose the **List** button on the right of the **Pre-event Command** list box to display a list.
Delete `d1m_hacmp_disk_available` from the list.
4. In the SMIT window, display the Configure Pre/Post-Event Commands window.
Choose the following sequence of menu items to display this window:
Communications Applications and Services, HACMP for AIX, Extended Configuration, Extended Event Configuration, and Configure Pre/Post-Event Commands. Then choose **Remove a Custom Cluster Event**.
5. In the Configure Pre/Post-Event Commands window, delete `d1m_hacmp_disk_available` from the **Custom Event Name to Remove** list box.
6. Click the **OK** button.
7. Delete "d1mfdrv" added to the file, `/usr/sbin/cluster/diag/clconraid.dat`.

3.14.7.2 Deleting a Custom Disk Method

This subsection explains how to set up HACMP 5.1. For details on the setting procedure and how to specify the settings for other versions, see the HACMP documentation.

To delete a custom disk method:

1. From the SMIT window, display the Configure Custom Disk Methods window.

To display this window, choose the following sequence of menu items:

Communications Applications and Services, HACMP for AIX, Extended Configuration, Extended Resource Configuration, HACMP Extended Resources Configuration, Configure Custom Disk Methods, and finally choose Remove Custom Disk Methods.

2. In the Select Custom Disk Methods window, select **disk/node/dlmdrv**, and then delete it.

3.15 Deleting the GPFS + RVSD Settings

To delete the HDLM settings registered in GPFS + RVSD:

1. Delete the following line in the `/etc/vsd/oemdisktypes.lst` file:
`disk/node/dlmfdrv fscsi disk/fcp`
2. Use the `dlmodmset` utility to set the LUN RESET option to off.
`# /usr/DynamicLinkManager/bin/dlmodmset -r off`

3.16 Deleting the VCS Settings

To delete the HDLM settings registered in VCS:

1. In the Disks specification in LVMVG Agent for the service group, specify the physical volume (`hdiskn`).
2. Delete the code of the HDLM script that was added in the preonline script:
`system("/usr/DynamicLinkManager/cluster/dlm_vcs_pgr_release $ARGV[1]");`
3. If you do not need to start the preonline script when VCS starts, delete the preonline script and specify the settings so that the preonline script does not start.

For details on the setting procedure, see the VCS documentation.

In the following example, the settings do not start the preonline script when VCS starts:

```
# rm /opt/VRTSvcs/bin/triggers/preonline
# haconf -makerw
# hagr -modify service-group PreOnline 0
# haconf -dump -makero
```


Chapter 4 Working with the Graphical User Interface

This chapter describes operating procedures for HDLM for AIX®, including how to operate HDLM and the HDLM manager, and how to change the configuration of the operating environment.

- Important Notes on using HDLM (section 4.1)
- Working with HDLM GUI Windows (section 4.2)
- Working with the HDLM Web GUI Windows (see section 4.3)

4.1 Important Notes on Using HDLM

This section contains important procedural information.

4.1.1 Displaying Path Information

The AutoPATH_ID that is displayed during the HDLM dlnkmgr command's view operation differs depending on the order in which paths are detected when the host starts. For this reason, you should always use the path name to specify a path.

4.1.2 Detecting Path Errors

When a path error is detected by HDLM, you must immediately resolve the error and restore the path.

A check for path errors is performed whenever an I/O is issued. If there are any paths through which I/O is not normally issued, such as a non-owner path, you should enable path health checking in order to detect errors even when there is no I/O. For details about path health checking, see section 5.5.2.

4.1.3 Storage Subsystem

Start up the storage subsystem before you start up the managed hosts, so that AIX® can detect the storage subsystem.

4.1.4 Canceling Reservation (Normal Host)

In a non-cluster environment, if you shut down the host while persistent reservation is set and a volume group that has been created by an LU shared by multiple hosts is active, other hosts can no longer manipulate that volume group. Before you shut down the host, execute the following command to deactivate the volume group:

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
```

If you shut down the host without inactivating the volume group, restart the host, activate the volume group, and then deactivate the volume group.

In a cluster environment, you do not need to deactivate the volume group because the cluster software locks or unlocks the LU.

4.1.5 Canceling Reservation (Erroneous Host)

In a non-cluster environment, if an error occurs in a host that uses an LU exclusively by setting persistent reservation, other hosts can no longer access that LU. In this case, execute the dlmpr utility to cancel the reservation.

For details on this utility, see section 7.8.

4.1.6 Error Checking For Physical Volume (hdisk) Specification Operations

Do not execute any of the following commands by specifying a physical volume (`hdisk`) that makes up an HDLM device:

- The `chdev` command when the HDLM driver is enabled
- The `rmdev` command
- Any commands that manipulate volume groups (`extendvg`, `importvg`, `mirrorvg`, `mkvg`, `recreatevg`, `reducevg`, `restvg`, `syncvg`, and `unmirrorvg`)

To avoid the above invalid operations, use the `dlmodmset` utility to specify whether an error is to be detected when the `rmdev` or `chdev` command, or a command for operating volume groups, is executed for a physical volume (`hdisk`) that makes up an HDLM device. The default for the `dlmodmset` utility is on.

The following subsections explain how to enable error checking for operations that specify physical volumes, depending on whether or not the system restarts.

4.1.6.1 System Restart

To enable error checking, when the system restarts, for operations that specify physical volumes:

1. Execute the `dlmodmset` utility to enable the error checking function for operations that specify a physical volume (`hdisk`):

```
# /usr/DynamicLinkManager/bin/dlmodmset -e on
```

For details on the `dlmodmset` utility, see section 7.3.

2. To enable the settings, restart the system.

```
# shutdown -Fr
```

4.1.6.2 No System Restart

If you execute the `dlmrmddev -A` utility as follows, you can omit step 3 through step 6:
/usr/DynamicLinkManager/bin/dlmrmdev -A

To enable error checking, when the system does not restart, for operations that specify physical volumes:

1. Execute the `dlmodmset` utility to enable the error checking function for operations that specify a physical volume (`hdisk`).
/usr/DynamicLinkManager/bin/dlmodmset -e on

For details on the `dlmodmset` utility, see section 7.3.

2. Stop all processes and services that use the HDLM management-target paths. Stop any process or service of an application, such as a DBMS, that is using the HDLM management-target path.
3. Execute the following command to unmount the file system used by HDLM:
`umount file-system-mount-point`
4. Execute the following command to display all the activated volume groups:
`lsvg -o`
5. Among the displayed volume groups, inactivate the volume groups used by HDLM:
/usr/DynamicLinkManager/bin/dlmvaryoffvg *volume-group*
6. Execute the `dlmrmddev` utility to delete all HDLM devices:
/usr/DynamicLinkManager/bin/dlmrmdev

When the KAPL09012-I message is displayed, there is no problem.

If the KAPL09012-I message is not displayed, the logical device file for the HDLM alert driver or the HDLM device has not been deleted, or the HDLM manager has not stopped. Make sure that no processes, services, file systems, and volume groups are using any HDLM management-target path, and then re-execute the above command.

7. Execute the `dlmcfgmgr` utility to reconfigure the HDLM devices.
/usr/DynamicLinkManager/bin/dlmcfgmgr

4.1.7 Changing the attributes of HDLM management-target devices

You can use the `chdev` command to change the attributes of an HDLM management-target device. To do this, specify either the HDLM device that defines the HDLM management-target device or the physical volume (`hdisk`). For details about whether the disk attributes of an HDLM driver can be changed by the `chdev` command, see the manual for the applicable SCSI device driver.

4.1.7.1 When Changing Attributes By Specifying An HDLM Device

This subsection shows an example of command execution when the queue depth is changed by specifying the HDLM device (`d1mfdrv1`) with the `chdev` command.

To change attributes:

1. Deactivate the volume group containing the HDLM device whose attributes you want to change:

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
```

2. Change the disk attributes by the `chdev` command:

```
# chdev -l d1mfdrv1 -a queue_depth=8
```

This command changes the attributes of the HDLM device defining the HDLM management-target device (`d1mfdrv1`) and all the corresponding physical volumes (`hdisk`).

3. Activate the volume group.

```
# /usr/DynamicLinkManager/bin/dlmvaryonvg volume-group-name
```

Note: When you change the attributes of the HDLM management-target device by specifying the HDLM device (`d1mfdrv1`) with the `chdev` command, you cannot specify the `-P` and `-T` options.

4.1.7.2 When Changing Attributes By Specifying a Physical Volume (hdisk)

To change the attributes of an HDLM management-target device by specifying the physical volume (hdisk n), either delete the corresponding HDLM device or place it in a defined state beforehand.

This subsection shows an example of command execution when the queue depth and the timeout value are changed by specifying the physical volume (hdisk n) with the chdev command.

To change attributes:

1. Deactivate the volume group used in HDLM:

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
```
2. Check and record the physical volume (hdisk n) that corresponds to the HDLM device (dlmfdrv n) to be placed in a defined state:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -drv | grep -w dlmfdrv6
000024 dlmfdrv6 hdisk10 9200.0010.0007
000025 dlmfdrv6 hdisk49 9200.0010.0007
000026 dlmfdrv6 hdisk80 9200.0010.0007
000027 dlmfdrv6 hdisk111 9200.0010.0007
```
3. Place the HDLM device (dlmfdrv n) in a defined state:

```
# rmdev -l dlmfdrv6
```
4. Use the chdev command to change the attributes. Execute the following command for each physical volume that was recorded in step 2:

```
# chdev -l hdisk10 -a queue_depth=32 -a rw_timeout=60
```
5. Enable the HDLM device (dlmfdrv n):

```
# mkdev -l dlmfdrv6
```
6. Activate the volume group used in HDLM:

```
# /usr/DynamicLinkManager/bin/dlmvaryonvg volume-group-name
```


4.1.8 Notes on Configuring an HDLM Device

This section provides notes on configuring an HDLM device by executing the `cfgmgr` or `dlmcfmgr` utility for managing the HDLM configuration.

4.1.8.1 Changing the PVID of a Secondary Volume

To execute the `cfgmgr` or `dlmcfmgr` utility to configure an HDLM device, each corresponding physical volume must have a unique PVID.

When you use a function such as `ShadowImage` to copy a volume on the substorage system, the physical volume on the corresponding host can be created under the same PVID. If an attempt is made to configure an HDLM device in such a state, an error might occur. If an error occurs, change the PVID of the physical volume that corresponds to the secondary volume and then configure the HDLM device.

To change the PVID of the physical volume that corresponds to the secondary volume:

1. Execute the following command to deactivate the volume group. If multiple hosts share the target volume group (called a shared volume group hereafter), deactivate the shared volume group for all the sharing hosts.

```
# varyoffvg volume-group-name
```

2. Change the PVID.

To let the hosts share an LU, perform the following on one of these hosts:

- If there is no volume group, execute the following command for one of the physical volumes:

```
# chdev -l hdiskn -a pv=clear -a pv=yes
```

Then, execute the following command for all the remaining physical volumes:

```
# chdev -l hdiskn -a pv=yes
```

- If there is a volume group or if the volume group extends over more than one LU, execute the following command for each LU:

```
# exportvg volume-group-name
# recreatevg -y volume-group-name ...
# varyoffvg volume-group-name
# chdev -l hdiskn -a pv=yes (Execute this for all the physical volumes in the
volume group.)
```

3. To let the hosts share the LU, perform the following on all those hosts except for the host for which you changed the PVID in step 2.

- If there is no shared volume group, execute the following command.

```
# chdev -l hdiskn -a pv=yes (Execute this for all the physical volumes that
correspond to the secondary volume.)
```

- If there is a shared volume group execute the following command:

```
# exportvg shared-volume-group-name
# chdev -l hdiskn -a pv=yes (Execute this for all the physical volumes in the
shared volume group.)
# importvg shared-volume-group-name
# varyoffvg shared-volume-group-name
```

4.1.8.2 HDLM Device Configured: Different Volumes (Disks) with Same PVID

If you configured an HDLM device while multiple physical volumes that correspond to different volumes had the same PVID, an error might occur during execution of the `dlmrecreatevg` command. If the error occurs, change the PVID according to the following procedure.

To change the PVID:

1. Execute the following command to deactivate the volume group. If the target is the shared volume group, deactivate the shared volume group for all the sharing hosts.

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume- group-name
```

2. Change the PVID.

To let the hosts share an LU, perform the following on one of these hosts:

- If there is no volume group, execute the following command for the HDLM device that corresponds to the secondary volume:

```
# chdev -l secondary-volume's-dlmfdrvn -a pv=clear -a pv=yes
```

- If the secondary volume has a volume group or if the volume group extends over more than one LU, execute the following command. If the volume group extends over more than one LU, execute the following command for each LU.

```
# /usr/DynamicLinkManager/bin/dlmexportvg volume-group-name-of-secondary-volume
# /usr/DynamicLinkManager/bin/dlmrecreatevg -y volume-group-name-of-secondary-volume ...
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name-of-secondary-volume
```

3. To let the hosts share the LU, perform the following on all those hosts except for the host for which you changed the PVID in step 2.

- If there is no shared volume group, execute the following command for the HDLM device in the secondary volume. If the volume group extends over more than one LU, execute the following command for each LU.

```
# chdev -l secondary-volume's-dlmfdrvn -a pv=yes
```

- If the secondary volume has the shared volume group, execute the following command:

```
# /usr/DynamicLinkManager/bin/dlmexportvg volume-group-name-of-secondary-volume
# /usr/DynamicLinkManager/bin/dlmimportvg volume-group-name-of-secondary-volume
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name-of-secondary-volume
```

4.1.9 Physical Volume and HDLM Device In a Defined State

If the physical volume (`hdiskn`) and HDLM device are placed in a defined state, execute the following command to enable the HDLM device:

- When both the physical volume (`hdiskn`) and the HDLM device are in a defined state
`cfgmgr`
 - When only the HDLM device is in a defined state
`cfgmgr`
- or
- # `/usr/DynamicLinkManager/bin/dlmcfgmgr`

4.2 Working with the HDLM GUI Windows

4.2.1 Notes on Operating HDLM GUI Windows

- When the focus is on an object such as a button, the Enter key does not function as an operation, in the path management window or dialog box. Please use the Space key or click with the mouse to perform an operation in the window or dialog box.
- When the HDLM GUI is running for an extended period of time, response time might increase. In such a case, restart the HDLM GUI.
- When the focus is on the Status check box, the frame indicating the focus is not displayed, but you can perform operations.
- If you reconfigured an HDLM device while the HDLM GUI was displayed, refresh the HDLM GUI.
- When the HDLM GUI is started on a management-target host, and an operation to close a window is performed in the window frame of the path management window, the HDLM GUI will terminate even if the Option window remains open.
- If the HDLM GUI screen size is reduced, in some cases, buttons such as the Online and Offline buttons may become hidden. In such cases, please adjust the screen size appropriately, so that the buttons are visible.
- If the name of the management-target host is changed, the HDLM Web GUI navigation frame and the List Hosts subwindow will display both the previous and present host names. In this case, delete the previous host name by using the Host View of Device Manager Web Client, and then restart HDLM Web GUI.
- If you changed the HDLM configuration while the HDLM Web GUI was displayed, refresh the HDLM Web GUI.
- If you change the configuration for the management-target host while the HDLM Web GUI is displayed, refresh the Show Path List subwindow or the Show Configuration subwindow of the information frame. The configuration changes do not take effect when you click Refresh in the navigation frame.
- After selecting a host from the HDLM Web GUI navigation frame, if the storage subsystems connected to the host are not displayed in the navigation frame, click Refresh in the navigation frame.
- The operation status window appears while refresh, online, offline, or data clear operations are being performed. Do not close the processing window. When you want to close the operation status window, click the OK button on the window after the operations finish.

- If the version of the HDLM host displayed on the HDLM Web GUI navigation frame is HDLM 5.1 or earlier, the HDLM GUI appears when HDLM starts. In this case, note the following:
 - The character string OFF on the radio button in the Options window appears as O...
 - If the applicable OS for the Device Manager client is Windows, in the **Advanced** tab of Internet Explorer's Internet options, clear the **Reuse windows for launching shortcuts** check box. When this check box is selected, the contents of the Help window overwrite the contents of the Device Manager or HDLM window.
- When the version of Device Manager is 3.0, if you select an LDEV of the Thunder 9500V Series and then click the **Dynamic Link Manager** button, the HDLM Web GUI starts with the host specified in the Device Manager client selected. To display the paths corresponding to the LDEV specified in the Device Manager client, select the corresponding LU from the HDLM Web GUI navigation frame.
- Do not operate the navigation frame until the information frame is completely displayed.
- When the access concentrated on the Device Manager server during HDLM Web GUI operation, the KAPL11103-E might message appear. In such a case, retry the operation when access becomes less concentrated.

4.2.2 Launching the HDLM GUI

The operation of the HDLM GUI is guaranteed in the following Java™ runtime environment: JRE 1.3.1. Operation is not guaranteed in other Java™ runtime environments.

Note: When the HDLM GUI (Path Management window) opens, a warning may be displayed. This is not an issue for operation of HDLM. If the HDLM GUI is active when a driver is rebuilt, exit and then restart the GUI.

To display the HDLM GUI from a management-target host:

1. Log in as a user with **root** privileges.
2. Execute one of the following commands:


```
# /usr/DynamicLinkManager/bin/HDLM_GUI
# /usr/DynamicLinkManager/bin/hdlmgui
```

The **Configuration** tab of the Path Management window is displayed.

4.2.3 Exiting the HDLM GUI

To close the Path Management window and exit the HDLM GUI, first make sure that the Options window has been closed, and then select the **Exit** button. The Path Management window cannot be closed if the Options window is open.

4.2.4 Operating the HDLM GUI Windows

This section explains the windows that make up the HDLM GUI and the window transitions (that is, how the user moves from one window to another).

Note: The operation of the HDLM GUI is guaranteed in the following Java™ runtime environments: JRE 1.3.1 for the management-target host, and JRE 1.3.1_06 for the Device Manager clients. Operation is not guaranteed in other Java™ runtime environments.

The HDLM GUI provides the following three windows:

- **Path Management window.** This is the main window for the HDLM GUI. The Path Management window displays the detailed HDLM configuration and path information, allows you to change the path status, and provides access to the other HDLM windows (see section 4.2.4.1). The Path Management window also allows you to exit the HDLM GUI (see section 4.2.3).
- **Options window.** The Options window displays and allows you to change the HDLM operating environment settings, including function settings and error management settings (see section 4.2.4.6).

Note: While the Options window is open, you cannot perform any operations in the Path Management window. You must close the Options window before using the Path Management window.

- **Help window.** The Help window displays the HTML version of this manual. The Help window is opened automatically by the Web browser software (Netscape Navigator).

4.2.4.1 Using the Path Management Window

The Path Management window (see Figure 4.1) displays detailed HDLM configuration and path information for the current management-target host and provides access to all HDLM operations. The Path Management window can be accessed from either the management-target host or a HiCommand™ Device Manager Web Client system.

For instructions on opening the Path Management window from the management-target host or from the HiCommand™ Device Manager Web Client system, see section 4.3.7.2.

Note: You can open up to *four* Path Management windows at one time, which enables you to display information for up to four management-target hosts concurrently on the Device Manager Web Client system.

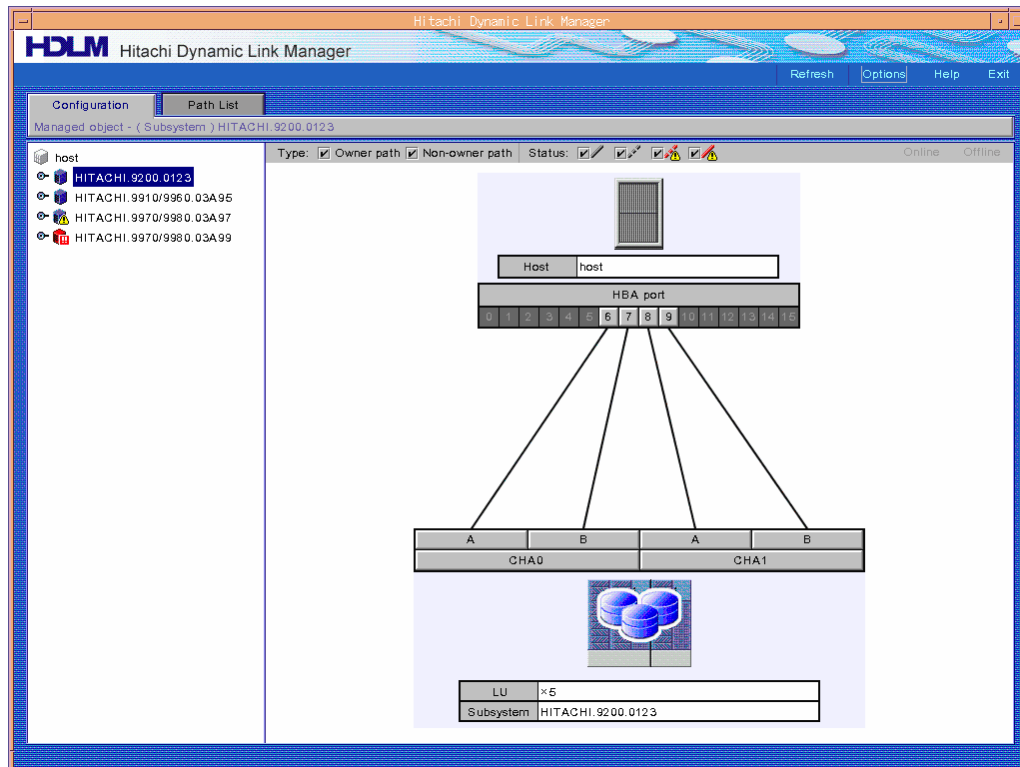


Figure 4.1 Path Management Window

The **host tree** frame of the Path Management window (see section 4.2.4.2) allows you to specify the range of path information to be displayed in the view frame.

The **function bar** of the Path Management window (see section 4.2.4.3) allows you to select the paths to be displayed in the view frame and perform path operations.

The **view frame** for the **Configuration** tab of the Path Management window (see section 4.2.4.4) displays the detailed configuration information for the paths managed by HDLM.

The **view frame** for the **Path List** tab of the Path Management window (see section 4.2.4.5) displays the detailed path information for the paths managed by HDLM.

The **Refresh** button refreshes the information displayed on the Path Management window.

The **Options** button opens the Options window (see section 4.2.4.6), which displays and allows you to change the HDLM environment settings (basic and error management functions).

The **Help** button opens the Help window, which displays the online version of this manual.

The **Exit** button closes the Path Management window and exits the GUI (see section 4.2.3).

4.2.4.2 Host Tree Frame of the Path Management Window

The host tree frame of the Path Management window (see Figure 4.2) allows you to specify the range of path information to be displayed in the view frame of the Path Management window.

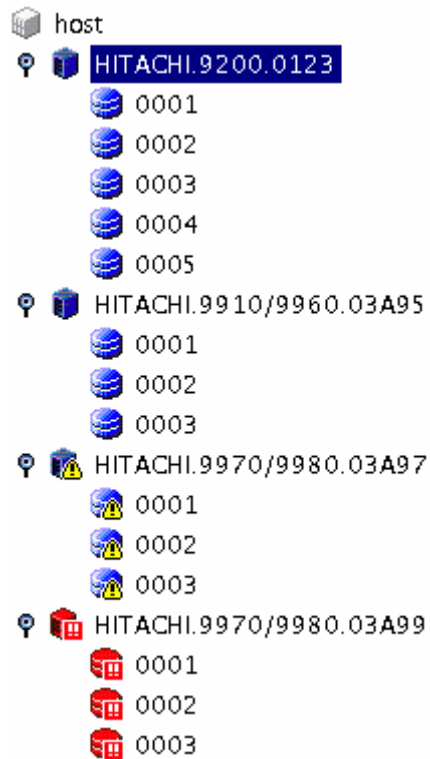


Figure 4.2 Host Tree Frame of the Path Management Window

Host

The tree frame displays an icon (not selectable) that indicates the current host. When the Path Management window is opened from the management-target host, “**host**” is displayed beside the host icon. When the Path Management window is opened from a Device Manager Web Client, the host name is displayed beside the host icon.

Subsystems

The tree frame displays the storage subsystems containing LUs that can be accessed from the current host. When you select a subsystem, the view frame displays all paths that are connected to all LUs in that subsystem that can be accessed from the current host. The subsystem name consists of the following three items, separated by periods:

- Vendor ID: The name of the storage subsystem vendor (for example, HITACHI)
- Product ID: The model of the storage subsystem (for example, 9200). Table 4.1 shows the model names and product IDs for the subsystems supported by HDLM for AIX®.
- Serial number: The serial number of the storage subsystem (for example, 0123)

The icon for the subsystem indicates the path status for the LUs in the subsystem, as described in Table 4.2.

LUs

The tree frame displays only those LUs that can be accessed from the host. The LUs are displayed by LU number. If you selected a LUN in the Host view of the Device Manager Web Client (v2.3) and then launched the HDLM GUI, the corresponding LU will be selected in the host tree frame of the Path Management window.

The icon for the LU indicates the path status, as described in Table 4.3. When you select an LU, the view frame of the **Configuration** and **Path List** tab displays all paths to the selected LU.

Table 4.1 Product IDs of the Storage Subsystems Supported by HDLM for AIX®

Model Name	Product ID	Alternate Product ID
TagmaStore USP	USP	RAID500
Lightning 9900 V Series	9970/9980	RAID450
Lightning 9900 Series	9910/9960	RAID400
Freedom Storage 7700E	7700E	RAID300
Thunder 9500 V Series	953x/ 957x	DF600
Thunder 9200	9200	DF500
Freedom Storage 5800	5800	DF400
Freedom Storage 5700E	5700E	DF-350

Table 4.2 Subsystem Icons on the Tree Frame







Icon	Icon Name	Description
	Subsystem	All of the paths connected to LUs are operating normally. This icon is displayed only when the LU (all paths are online) icon is displayed under the subsystem.
	Subsystem (warning)	The subsystem contains an LU which has a path where an error occurred. This icon is displayed only when more than one LU (some paths are offline) icon is displayed, and no LU (no paths are online) icons are displayed under the subsystem.
	Subsystem (LU path error)	The subsystem contains an LU for which all paths are not working due to errors. This icon is displayed only when more than one LU (no paths are online) icon is displayed under the subsystem.

Table 4.3 LU Icons on the Tree Frame

Icon	Icon Name	Description
	LU (all paths are online)	All of the paths to the LU are operating normally.
	LU (some paths are offline)	At least one path to the LU is operating normally, and at least one path to the LU is in the Offline(C) or Offline(E) status.
	LU (no paths are online)	All of the paths to the LU are offline. No paths are in the Online status.

4.2.4.3 Function Bar of the Path Management Window

The function bar of the Path Management window (refer to Figure 4.1) allows you to select the paths to be displayed in the view frame and perform path operations.

Type checkboxes

The **Type** checkboxes allow you to select the path type(s) to be displayed in the view frame: **Owner path** and/or **Non-owner path** (default = both types). The **Type** checkboxes apply only to the 9500V, 9200, 5800, and 5700E subsystems. For the USP, 9900V, 9900, and 7700E subsystems, owner paths and non-owner paths are not distinguished.

Note: The **Type** selection has priority over the **Status** selection. For example, if you select **Owner path** and clear **Non-owner path**, the Configuration view displays only the owner paths with the selected status(es). If you select (or clear) both **Type** checkboxes, all paths with the selected status(es) are displayed.

Status checkboxes

The **Status** checkboxes allow you to select the status of the paths to be displayed in the view frame (default = all path statuses):

- **Online path:** Select this checkbox to display the Online paths in the view frame. Clear this checkbox to omit Online paths from the display.
- **Offline path:** Select this checkbox to display the Offline(C) paths in the view frame. Clear this checkbox to omit Offline(C) paths from the display.
- **Offline (Error) path:** Select this checkbox to display the Offline(E) paths in the view frame. Clear this checkbox to omit Offline(E) paths from the display.
- **Online (Error) path:** Select this checkbox to display the Online(E) paths in the view frame. Clear this checkbox to omit Online(E) paths from the display.

Online button

This button changes the status of the selected path(s) to Online.

Offline button

This button changes the status of the selected path(s) to Offline(C).

Clear Data button (Path List view only)

This button sets the path statistics (I/O count and number of I/O errors) to 0 for all paths managed by HDLM. For details on clearing the path statistics, see section 5.6.8.

Export CSV button (Path List view only)

This button exports the path information for the paths displayed in the Path List view to a CSV file. For details on exporting the path information, see section 5.5.3.

4.2.4.4 Configuration View of the Path Management Window

The **Configuration** view of the Path Management window displays the detailed configuration information for the paths managed by HDLM. To display the **Configuration** view, open the HDLM Path Management window (see section 4.2.2), and then select the **Configuration** tab.

When you select a subsystem in the host tree frame, the **Configuration** view displays all paths (of the selected **Type** and **Status**) that are connected to all LUs in that subsystem that can be accessed from the current host. When you select an LU in the host tree frame, the **Configuration** view displays all paths (of the selected **Type** and **Status**) to the selected LU. (When the **Configuration** view is selected, you cannot select the host in the host tree frame. Select the **Path List** tab to display all paths for the host.)

Figure 4.3 shows the **Configuration** view for the 9500V, 9200, 5800, and 5700E subsystems. Figure 4.4 shows the **Configuration** view for the 9900V, 9900, and 7700E subsystems. Figure 4.5 shows the **Configuration** view for the USP subsystem.

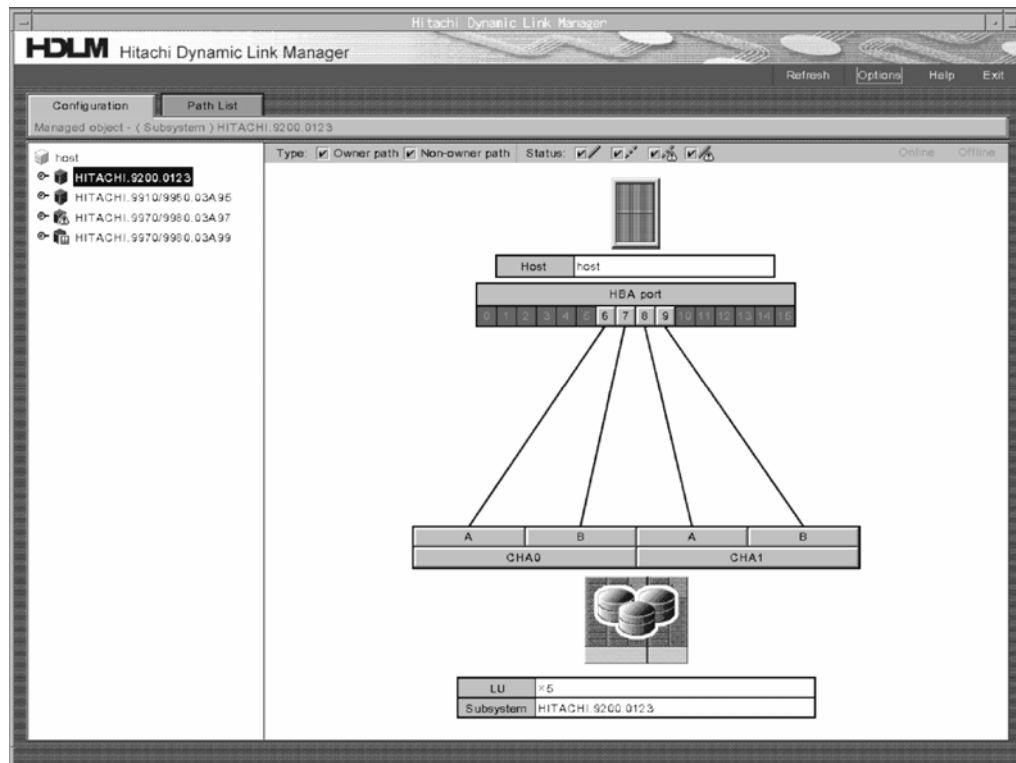


Figure 4.3 Configuration View for the 9500V, 9200, 5800, and 5700E Subsystems

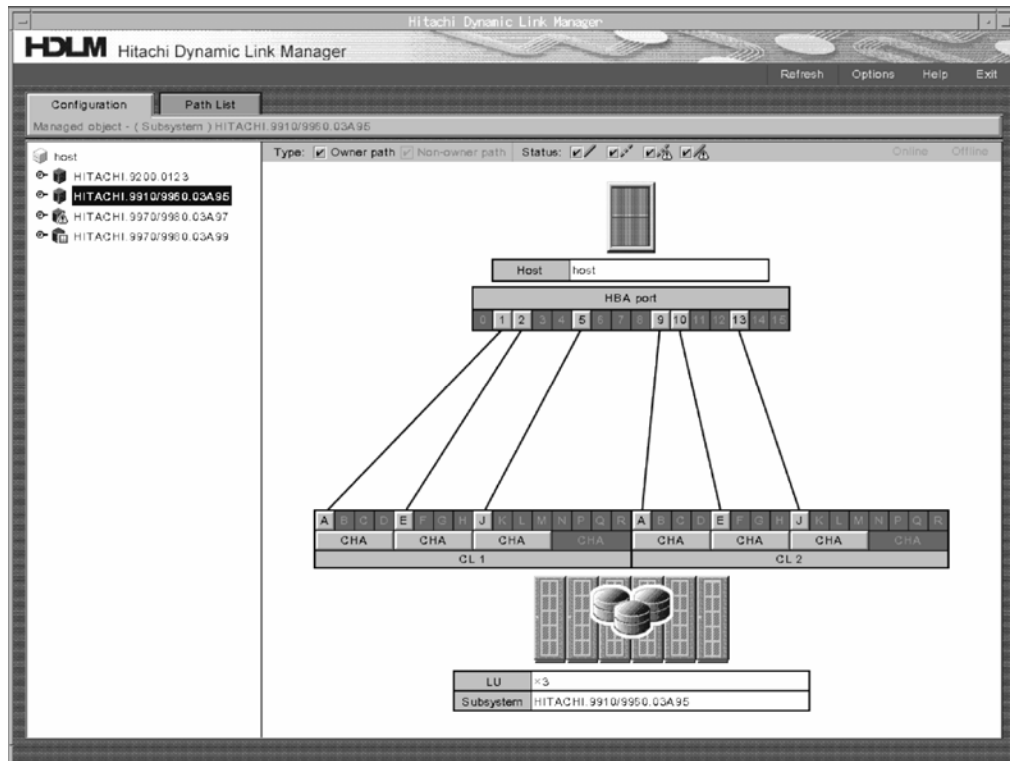


Figure 4.4 Configuration View for the 9900V, 9900, and 7700E Subsystems

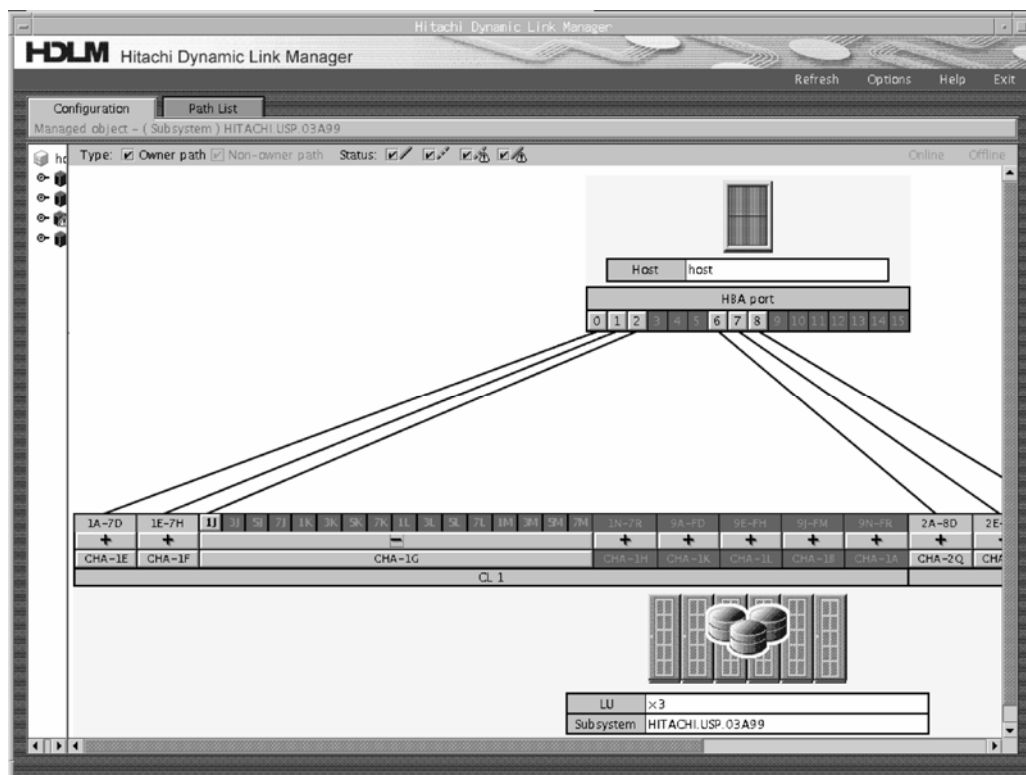


Figure 4.5 Configuration View for the USP Subsystem

Host box

The **Host** box display differs depending on how you open the Path Management window:

- If you opened the Path Management window from the management-target host, the **Host** box displays the word “**host**”.
- If you opened the Path Management window from a Device Manager Client, the **Host** box displays the Device Manager name of the management-target host.

Buttons for HBA ports

These buttons display the HBA ports by HBA port number. The HBA port number is assigned by HDLM to the combination of the adapter number and bus number of the HBA port to which the path is connected.

The buttons for the HBA ports that are actually connected are usually displayed as active (selectable). However, if the **Type** or **Status** checkbox specifies that a connected path is not to be displayed, the HBA port button for that path is inactive. Placing the pointer over an HBA port button displays the HBA number and bus number. Selecting an HBA port button selects all paths connected to the selected HBA port.

The following example shows how the HBA port numbers are assigned to two HBA ports to which the paths are connected. The path names shown below consist of the HBA number, bus number, target ID, and serial number, separated by periods:

Path 1: 80.00.000000000000001A.000D

Path 2: 90.00.000000000000001A.000D

HDLM sorts the combination of HBA adapter number and bus number, 80.00 and 90.00 in this example, in ascending order, and assigns HBA port number 0 to the HBA port to which Path 1 is connected, and HBA port number 1 to the HBA port to which Path 2 is connected.

Note: If there are 17 or more HBA ports being used for path connections, the paths are not displayed in the Configuration view when they are connected to an HBA port whose HBA port number is 16 or higher. To view or operate these paths, use the Path List view. For details on the Path List view, see section 4.2.4.5.

Path lines

Lines are used to indicate the paths connecting the host and the storage subsystem, according to the path display conditions set by **Type** and **Status**. Table 4.4 shows how the appearance of the path lines (solid or broken, black or red) indicates the path status.





When you are using the USP subsystem and display the CHA port in the minimized mode, in a case where multiple paths connect to the CHA, then out of all of the paths, the one that is displayed is the one that has the most impact on the system. The displayed paths are sorted in the following order of path status values:

1. Online(E) (intermittent error)
2. Online(E)
3. Offline(E) (intermittent error)
4. Offline(E)
5. Offline(C)
6. Online

Placing the pointer over a path displays the path status and path type.

When you select a path, the line for the selected path is highlighted (displayed thicker than before). Selecting an HBA port, channel adapter port, or channel adapter also highlights the associated path(s).

Table 4.4 Path Lines on the Configuration Tab

Path Line	Path Status
 (black unbroken line)	Online
 (black broken line)	Offline(C)
 (red broken line)(<i>Note</i>)	Offline(E)
 (red unbroken line) (<i>Note</i>)	Online(E)

Note: If the system determines that the intermittent error is occurring, the line that indicates the error path flashes. (The line lights for 3 seconds and then goes out for 0.2 seconds, repeatedly.)

Buttons for channel adapter ports

These buttons display the channel adapter ports by port name:


- Port names for 9500V, 9200, 5800, and 5700E: **A** and **B** (two ports per channel adapter)
- Port names for 9900V: **A – R** and **a – r** (eight ports per channel adapter)
- Port names for 9900 and 7700E: **A – R** (four ports per channel adapter)
- Port names for USP: In the expanded mode, the channel adapter port number (example, 1E). In the minimized mode, the first number and the last number of the channel adapter port, connected by a hyphen (example: 1A-7D). (128 ports per channel adapter)


The buttons for the channel adapter ports that are actually connected are usually displayed as active. However, if a **Type** or **Status** checkbox specifies that a connected path is not to be displayed, the channel adapter port button for that path is inactive.

When you select a channel adapter port button, all paths connected to the selected channel adapter port are highlighted.

Expand button and Minimize button

For the USP subsystem, these buttons switch the mode for displaying the CHA ports of each CHA.

The Expand button() appears when the CHA ports are displayed in the minimized mode. When you click this button, it changes to the Minimize button and all the CHA port numbers belonging to the selected CHA appear. When you place the mouse pointer on the Expand button, Expand is displayed in the tool tip.

The Minimize button() appears when the CHA ports are displayed in the expanded mode. When you click this button, it changes to the Expand button and one CHA port number that integrates all the CHA ports belonging to the selected CHA appears. When you place the mouse pointer on the Minimize button, Minimize is displayed in the tool tip.

When there is already a CHA port in the expanded mode and you switch another CHA port to the expanded mode, the first CHA port in the expanded mode is switched to the minimized mode. Only one CHA can be in the expanded mode.

The Expand or Minimize button is always active, whether or not the path connected to the CHA is displayed.

Buttons for channel adapters

These buttons display the channel adapters by name:

- Channel adapter names for 9500V, 9200, 5800, and 5700E: **CHAO** and **CHA1**
When an LU is selected in the host tree frame, **(Owner Path)** or **(Non-owner Path)** is added to each name to indicate which channel adapter which has the owner paths for the selected LU, for example, **CHAO (Owner Path)** and **CHA1 (Non-owner Path)**.
- Channel adapter name for 9900V, 9900, and 7700E: **CHA** on cluster 1 (**CL1**) or on cluster 2 (**CL2**)
No numbers are assigned to the CHAs on the 9900V, 9900, and 7700E subsystems, since owner and non-owner paths are not distinguished.
- For the USP, a number is used to identify the cluster and channel adapter. The button displays the first CHA port number and the last CHA port number, connected by a hyphen (-).

The button for a channel adapter is displayed as active (selectable) if one or more of the ports for that channel adapter are displayed as active.

When you select a channel adapter button, all paths connected to all ports of the selected channel adapter are highlighted.

LU box

The LU box display differs depending on the item selected in the host tree frame:

- When a storage subsystem is selected in the host tree frame, the LU box displays the number of LUs in the selected subsystem that can be accessed from the host.
- When an LU is selected in the host tree frame, the LU box displays the LU number of the selected LU.

Subsystem box

The **Subsystem** box displays the name of the storage subsystem selected in the host tree frame. A subsystem name consists of the following three items, separated by periods:

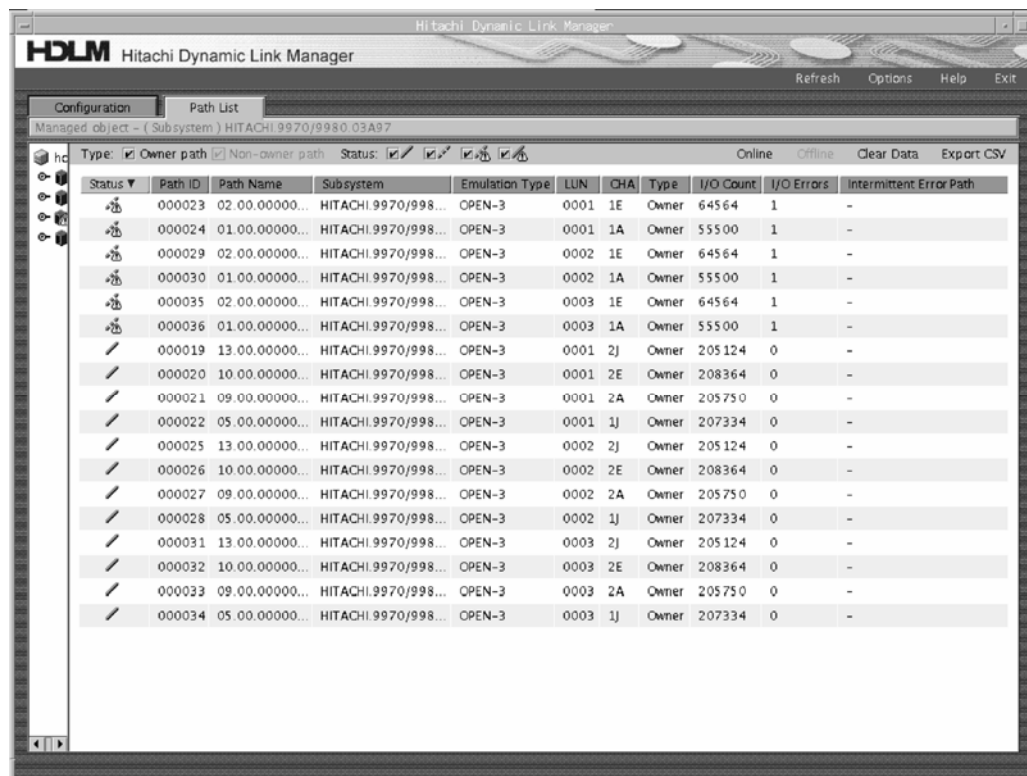
- Vendor ID: The name of the storage subsystem vendor (for example, HITACHI)
- Product ID: The model name of the storage subsystem (for example, 9200 indicates the Thunder 9200) (refer to Table 4.1)
- Serial number: The serial number of the storage subsystem (for example, 0123)

4.2.4.5 Path List View of the Path Management Window

The **Path List** view of the Path Management window (see Figure 4.6) displays the detailed path information for the paths managed by HDLM. To display the **Path List** view, open the HDLM Path Management window (see section 4.2.2 and 4.2.4.1), and select the **Path List** tab.

When you select the host in the host tree frame, the **Path List** view displays all paths (of the selected **Type** and **Status**) connected to the selected host. When you select a subsystem in the host tree frame, the **Path List** view displays all paths (of the selected **Type** and **Status**) that are connected to all LUs in that subsystem that can be accessed from the current host. When you select an LU in the host tree frame, the **Path List** view displays all paths (of the selected **Type** and **Status**) to the selected LU.

Table 4.5 describes the information displayed for each path. You can sort the information on the **Path List** view by selecting the column to sort on. The selected column is highlighted, and the sort order (ascending or descending) is indicated by the arrow in the column's heading. The screen in Figure 4.6 shows the paths sorted by status in descending order. To reverse the order, select the highlighted column.



Status ▾	Path ID	Path Name	Subsystem	Emulation Type	LUN	CHA	Type	I/O Count	I/O Errors	Intermittent Error Path
OPEN-3	000023	02.00.00000...	HITACHI.9970/998...	OPEN-3	0001	1E	Owner	64564	1	-
OPEN-3	000024	01.00.00000...	HITACHI.9970/998...	OPEN-3	0001	1A	Owner	55500	1	-
OPEN-3	000029	02.00.00000...	HITACHI.9970/998...	OPEN-3	0002	1E	Owner	64564	1	-
OPEN-3	000030	01.00.00000...	HITACHI.9970/998...	OPEN-3	0002	1A	Owner	55500	1	-
OPEN-3	000035	02.00.00000...	HITACHI.9970/998...	OPEN-3	0003	1E	Owner	64564	1	-
OPEN-3	000036	01.00.00000...	HITACHI.9970/998...	OPEN-3	0003	1A	Owner	55500	1	-
OPEN-3	000019	13.00.00000...	HITACHI.9970/998...	OPEN-3	0001	2J	Owner	205124	0	-
OPEN-3	000020	10.00.00000...	HITACHI.9970/998...	OPEN-3	0001	2E	Owner	208364	0	-
OPEN-3	000021	09.00.00000...	HITACHI.9970/998...	OPEN-3	0001	2A	Owner	205750	0	-
OPEN-3	000022	05.00.00000...	HITACHI.9970/998...	OPEN-3	0001	1J	Owner	207334	0	-
OPEN-3	000025	13.00.00000...	HITACHI.9970/998...	OPEN-3	0002	2J	Owner	205124	0	-
OPEN-3	000026	10.00.00000...	HITACHI.9970/998...	OPEN-3	0002	2E	Owner	208364	0	-
OPEN-3	000027	09.00.00000...	HITACHI.9970/998...	OPEN-3	0002	2A	Owner	205750	0	-
OPEN-3	000028	05.00.00000...	HITACHI.9970/998...	OPEN-3	0002	1J	Owner	207334	0	-
OPEN-3	000031	13.00.00000...	HITACHI.9970/998...	OPEN-3	0003	2J	Owner	205124	0	-
OPEN-3	000032	10.00.00000...	HITACHI.9970/998...	OPEN-3	0003	2E	Owner	208364	0	-
OPEN-3	000033	09.00.00000...	HITACHI.9970/998...	OPEN-3	0003	2A	Owner	205750	0	-
OPEN-3	000034	05.00.00000...	HITACHI.9970/998...	OPEN-3	0003	1J	Owner	207334	0	-

Figure 4.6 Path List View

Note: You can select a continuous group of lines in the Path List view by dragging your mouse over the lines or by clicking lines while pressing the **Shift** key. You can select lines throughout the list by clicking them while pressing the **Ctrl** key.

Table 4.5 Path Information on the Path List View





Column Header	Description
Status	<p>This column displays the path status:</p> <p> Online  Offline(C)  Offline(E)  Online(E)</p> <p>If an intermittent error occurs, this icon flashes. (The icon lights for 3 seconds and then goes out for 0.2 seconds, repeatedly.)</p>
Path ID	This column displays the AutoPATH_ID as a decimal number.
Path Name	This column displays the path name. A path name consists of the following four items, separated by periods: HBA number, bus number, target ID, and serial number.
Subsystem	This column displays the name of the storage subsystem to which the path is connected. A storage subsystem name consists of the following three items, separated by periods: vendor ID (e.g., HITACHI), product ID (e.g., 9200), and serial number (e.g., 0123).
Emulation Type	<p>For the 9500V, 9200, 5800, and 5700E this column displays the subsystem product ID (e.g., 9200).</p> <p>For the USP, 9900V, 9900, and 7700E this column displays the emulation type of the LU (e.g., OPEN-3).</p>
LUN	This column displays the subsystem-internal LU/LDEV ID (e.g., 0001 for 9900 indicates LDEV 01 in CU 00).
CHA	This column displays the channel adapter port ID (e.g., port A on CHA0 for 9200, port A on CL1 for 9900).
Type	<p>This column displays the path type:</p> <p>For 9500V, 9200, 5800, and 5700E, Owner or Non-owner is displayed.</p> <p>For the USP, 9900V, 9900, and 7700E, Owner is always displayed, since all paths are owner paths.</p>
I/O Count	This column displays the total number (in decimal format) of I/O operations for the path.
I/O Errors	This column displays the total number (in decimal format) of I/O errors for the path.
Intermittent Error Path	<p>This column displays the information about intermittent errors.</p> <p>-: Indicates that intermittent error monitoring is not in effect, or the time is outside the period during which intermittent errors are monitored.</p> <p>A value of 0 or larger: Indicates the number of errors that occurred during intermittent error monitoring.</p> <p>*: Indicates that an intermittent error is occurring in the path, and that the path is excluded from being subject to automatic failback.</p> <p>A hyphen (-) is displayed when the management-target host environment is one of the following:</p> <ul style="list-style-type: none"> ▪ The OS is Solaris 2.6 or Solaris 7. ▪ HDLM manager is stopping.

Table 4.6 Elements of a Path Name

Element	AIX® Representation
HBA adapter number (Display example: 08)	HB A adapter number
Bus number (example: 14)	PCI bus number
Target ID (example: 00000000000000E2)	Target ID
Host LU number (example: 0001)	Logical Unit ID or LUN

Each element in Table 4.6 corresponds to the following information:

- HBA adapter number: The HBA adapter number that is displayed by executing the `lsdev -Cc disk` command.
- Bus number: The parent bus number that is displayed by executing the `lsdev -Cc disk` command
- Target ID: When using fibre-channel, this target ID is the value of `scsi_id` that is displayed by executing the following command:
`l sattr -El device-name`

Note: When using SCSI, this target ID is the leftmost value of `connwhere` that is displayed by executing the following command:

`odmget CuDv device-name`

- Host LU number: When using fibre-channel, the host LU number is the value of `lun_id` that is displayed by executing the following command:
`lsattr -El device-name`

Note: When using SCSI, the host LU number is the second value from the left of `connwhere` that is displayed by executing the following command:

`dmiget -q "name=physical-volume-name" CuDv`

4.2.4.6 Using the Options Window

The Options window (see Figure 4.7) displays and allows you to change the HDLM basic function settings and error management function settings.

Hitachi Dynamic Link Manager - Options

Setting HDLM Options

HDLM version
HDLM version number 05-40 Component information

Basic function settings

Load balancing ☒ ON ☐ OFF
Algorithm
Round robin

Path health checking ☒ ON ☐ OFF
Checking interval (1 - 1440) 30 minute(s)

Auto failback ☐ ON ☒ OFF
Checking interval (1 - 1440) 1 minute(s)

Intermittent Error Monitor ☐ ON ☐ OFF
Monitoring interval (1 - 1440) 30 minute(s)
Number of times (1 - 99) 3 time(s)

Reservation level
☐ OFF: Do not control reservation
☐ ON(0): Ignore reservation
☒ ON(2): Persistent reservation

Remove LU ☐ ON ☐ OFF
☐ Remove the LU even if there are Offline(C) paths

Error management function settings

Logging level 3: Information or higher level

Trace level 4: All information

Log file size (100 - 9900) 9900 Kbytes

OK Cancel Apply

Figure 4.7 Options Window

The HDLM version box displays the HDLM software version number (e.g., 05-01 = v5.1). The Component information button opens the HDLM Component Information panel (see Figure 4.8), which displays the detailed HDLM component information: component name, version number, status (Alive, for an active HDLM manager, or Dead, for an inactive HDLM manager), and wakeup time (time the component was started).

- The **Basic function settings** box displays and allows you to change the following settings:
 - **Load balancing:** ON or OFF (default = ON)
 - **Path health checking:** ON or OFF (default = ON), checking interval (1-1440 minutes, default = 30)

When you change the checking interval, the new interval takes effect immediately. If you decrease the checking interval and the new interval has already elapsed (from the end of the previous path health check until the time you change the interval), the path health check will start immediately.

After you change the checking interval, the new interval remains in effect even if you turn path health checking OFF and then later turn it back ON. When the specified interval has elapsed (starting from the time you turn path health checking ON), the path health check will start.

- **Auto failback:** ON or OFF, checking interval (1-1440 minutes, default = 1)

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, a message (KAPL02064-W) is output and an error occurs. In such a case, 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.

When you change the checking interval, the new interval takes effect immediately. If you decrease the checking interval and the new interval has already elapsed (from the end of the previous path status check until the time you change the interval), the path status check will start immediately.

After you change the checking interval, the new interval remains in effect even if you turn auto failback OFF and then later turn it back ON. When the specified interval has elapsed (starting from the time you turn path health checking ON), the path status check will start.

- **Intermittent Error Monitor:** ON or OFF (default = OFF)

Intermittent Error Monitor can only be set when automatic failback is set to **ON**.

This function sets whether to use intermittent error monitoring. Select **ON** to use intermittent error monitoring, or select **OFF** not to use it. The default value is **OFF**. When you use automatic failback, we recommend that you set Intermittent Error Monitor to **ON** to prevent an intermittent error from reducing I/O performance.

When you set Intermittent Error Monitor to **ON**, you can specify an error monitoring interval and the number of times that the error is to occur (in order for the system to determine that an intermittent error is occurring). Specifiable values are as follows:

Monitoring interval for intermittent errors (in minutes): from 1 to 1440

Number of times that the error is to occur: from 1 to 99

The system determines that an intermittent error is occurring when the specified number of errors occur during the interval from the time intermittent error monitoring started to the time the specified period has elapsed. If the system determines that an intermittent error is occurring in a path, that path is excluded from being subject to automatic failback. Error monitoring starts at the time the path is recovered from an error by using automatic failback. Intermittent error monitoring is performed for each path.

When Intermittent Error Monitor is set to **ON**, the monitoring interval is 30 and the number of times that the error is to occur is 3 by default.

When you specify a value of 2 or more in Number of times, the following condition must be satisfied:

$error-monitoring-interval \geq checking-interval-for-automatic-failback \times number-of-times-error-is-to-occur-during-intermittent-error-monitoring$

If this condition is not satisfied, an error occurs. In such a case, 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. If you specify 1 for the number of times that the error is to occur, the above condition does not need to be satisfied.

If changes are made in the settings of the intermittent error monitoring interval or the number of times that an error is to occur during intermittent error monitoring, the error count and the elapsed time measured since monitoring starts are set to 0, and monitoring starts by using the new settings.

If changes are made in the settings of the intermittent error monitoring interval or the number of times that an error is to occur outside the period during which intermittent errors are monitored, the new settings take effect after the next time automatic failback succeeds. Because the errors and elapsed time are not counted or measured while intermittent errors are not monitored, those values do not change.

The settings for the monitoring interval and number of times that an error is to occur will remain in effect when Intermittent Error Monitor is switched to **OFF** and then back to **ON**.

When you click the **Apply** button in the **Show HDLM Environment Settings** subwindow while intermittent errors are being monitored, the error count and the elapsed time measured since monitoring starts are set to 0 even if you have not changed the settings, and monitoring continues.

When Intermittent Error Monitor is set to **ON** and automatic failback is set to **OFF**, intermittent error monitoring is disabled. If you return the automatic failback to **ON**, intermittent error monitoring is enabled.

Available operations for automatic failback and intermittent error monitoring depend on the function settings. Table 4.7 shows the relations between the settings and available operations for automatic failback and intermittent error monitoring.

Table 4.7 Relations Between the Setting and Available Operations for Automatic Failback and Intermittent Error Monitoring

Settings		Available Operation	Result of Operation
AFB (Automatic failback)	IEM (Intermittent error monitoring)		
ON	ON	Set AFB to ON.	The operations of AFB and IEM do not change.
		Change the AFB setting.	AFB operates using new settings. (<i>Note 2</i>)
		Set AFB to OFF.	AFB and IEM are disabled. The error count, elapsed time, and information about paths not subject to automatic failback are cleared.
		Set IEM to ON.	When a path is being monitored (in the 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 restarts. When a path is not being monitored (outside the period of conditional intermittent error monitoring), nothing changes.
		Change the IEM settings.	When a path is being monitored (in the 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 restarts according to the conditions for intermittent error after change. (<i>Note 2</i>) When a path is not being monitored (outside the period of conditional intermittent error monitoring), the IEM settings will take effect when the path is recovered from the error status by performing automatic failback.
		Set IEM to OFF.	IEM is disabled. The error count, elapsed time, and information about paths not subject to automatic failback 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.#2
OFF	ON (<i>Note 1</i>)	Set AFB to ON.	AFB and IEM are enabled.#2
		Set AFB to OFF.	The operations of AFB and IEM do not change.
	OFF	Set AFB to ON.	AFB is enabled.
		Set AFB to OFF.	The operations of AFB and IEM do not change.

Note 1: Since automatic failback is OFF, intermittent error monitoring is disabled, and the settings of Intermittent Error Monitor are not specifiable.

Note 2: When the following condition is not satisfied, a message (KAPL01080-W) is output and an error occurs. When a message (dlnkmgr command: KAPL01080-W, HDLM GUI : KAPL02064-W, HDLM Web GUI : KAPL11144-W) is output and an error occurs, the status of the intermittent error monitoring is not changed at that time.

Condition required when intermittent error monitoring (-iem parameter) is ON:
`error-monitoring-interval >= checking-interval-for-automatic-failback x number-of-times-error-is-to-occur-during-intermittent-error-monitoring`

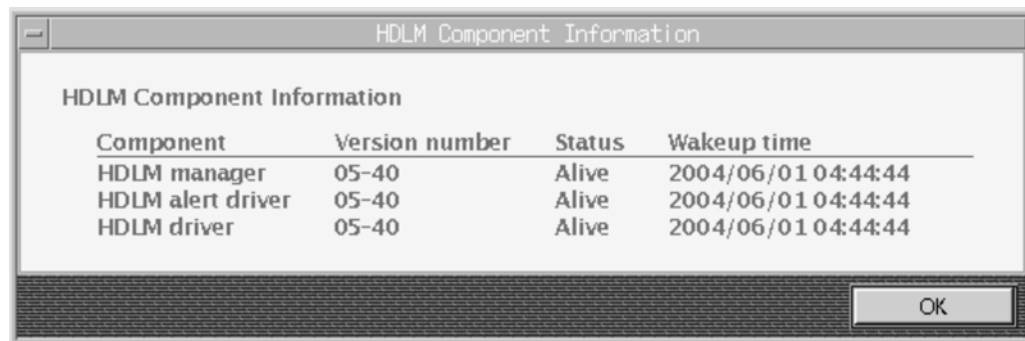


Figure 4.8 HDLM Component Information Panel

Table 4.8 Options for Reservation Level

Reservation Level	Description
ON(0): Ignore reservation	Use this level when the following two conditions are met: A host is connected to a storage subsystem that does not support persistent reservation. An LU is not shared among multiple nodes, or an LU is shared in the concurrent mode of HACMP.
ON(2): Persistent reservation	Use this level to set the reservation status to persistent reservation.

Note: If the HDLM reservation-level is set to **on(2)** and a volume group created on a shared disk (LU) is activated (**varyon**), the status of that disk will be set to **reserved**. If the disk is **reserved**, other hosts will not be able to operate the volume group. Also, neither the **cfgmgr** or **dlnmcfgmgr** commands, nor host startup, will be able to configure the HDLM drivers.

Before performing the above operations, deactivate the volume group (**varyoff**) with the **dlnmvaryoffvg** command to release the disk's reserved status.

If the host is stopped while the volume group is activated, the disk will remain in the **reserved** status. As such, make sure to deactivate the volume group before stopping the host. If the host is stopped with the volume group activated, restart the host and choose whether you want the volume group activated or deactivated. In addition, when a node changes in a cluster environment, since the cluster software may change the reservation state even when it does not perform the above-mentioned operation, there is no problem.

4.2.5 Viewing or Changing the Operating Environment

When you log on to a Device Manager client as a member of the Guest group and then display the Path Management window, you are not allowed to change the operating environment for HDLM. To change the operating environment for HDLM, log on to a Device Manager client as a member of a group other than the Guest group.

Note: Before logging on to a Device Manager client as a member of the Guest group, verify that Device Manager 2.40 is installed. This is required for the Path Management window to be displayed in the client.

4.2.6 Using the HDLM GUI Windows to Perform the Same Operations as HDLM Commands

You can use the HDLM GUI windows to perform the same operations as you would perform using the HDLM commands (see Table 4.9). You can also use the HDLM windows together with HDLM commands to operate HDLM. For example, when you execute an HDLM command, you can check the results in the HDLM windows. Likewise, when you operate HDLM using the HDLM windows, you can check the results by executing the **dlnkmgr view** command.

Table 4.9 Correspondence between the HDLM Commands and the HDLM GUI

HDLM Command	HDLM GUI
dlnkmgr clear (section 6.2)	Clear Data button on the Path List tab of Path Management window (section 5.6.8)
dlnkmgr help (section 6.3)	Help window (online version of this manual)
dlnkmgr online (section 6.5)	Online button on the Path Management window
dlnkmgr offline (section 6.4)	Offline button on the Path Management window
dlnkmgr set (section 6.6)	Options window (section 4.2.4.6)
dlnkmgr view (section 6.7)	Path Management window (sections 4.2.4.4, 4.2.4.5) and Options window (section 4.2.4.6)
—	Export CSV button on the Path List tab of Path Management window (section 5.5.3)

4.3 Working with the HDLM Web GUI Windows

4.3.1 Notes on the HDLM Web GUI

- If the name of the management-target host is changed, the HDLM Web GUI navigation frame and the List Hosts subwindow will display both the previous and present host names. In this case, delete the previous host name by using the Host View of Device Manager Web Client, and then restart HDLM Web GUI.
- If you changed the HDLM configuration while the HDLM Web GUI was displayed, refresh the HDLM Web GUI.
- If you change the configuration for the management-target host while the HDLM Web GUI is displayed, refresh the Show Path List subwindow or the Show Configuration subwindow of the information frame. The configuration changes do not take effect when you click Refresh in the navigation frame.
- After selecting a host from the HDLM Web GUI navigation frame, if the storage subsystems connected to the host are not displayed in the navigation frame, click Refresh in the navigation frame.
- The operation status window appears while refresh, online, offline, or data clear operations are being performed. Do not close the processing window. When you want to close the operation status window, click the OK button on the window after the operations finish.
- If the version of the HDLM host displayed on the HDLM Web GUI navigation frame is HDLM 05-01 or earlier, the HDLM GUI appears when HDLM starts. In this case, note the following:
 - The character string OFF on the radio button in the Options window appears as O...
 - If the applicable OS for the Device Manager client is Windows, in the Advanced tab of Internet Explorer's Internet options, clear the Reuse windows for launching shortcuts check box. When this check box is selected, the contents of the Help window overwrite the contents of the Device Manager or HDLM window.
- When the version of Device Manager is 3.0, if you select an LDEV of the Thunder 9500V Series and then click the Dynamic Link Manager button, the HDLM Web GUI starts with the host specified in the Device Manager client selected. To display the paths corresponding to the LDEV specified in the Device Manager client, select the corresponding LU from the HDLM Web GUI navigation frame.
- Do not operate the navigation frame until the information frame is completely displayed.
- When the access concentrated on the Device Manager server during HDLM Web GUI operation, the KAPL11103-E might message appear. In such a case, retry the operation when access becomes less concentrated.

4.3.2 Launching the HDLM Web GUI

The capability to use the HDLM GUI at the HiCommand™ Device Manager Web Client enables you to perform HDLM operations remotely from any Device Manager client system. To launch the GUI from a Device Manager client, the following software must already be installed:

- HiCommand™ Device Manager on the Device Manager Server
- HiCommand™ Device Manager Agent on the host to be managed remotely
- HiCommand™ Device Manager Web Client on the client(s)

For details on HiCommand™ Device Manager software installation, refer to the appropriate HiCommand™ Device Manager user document (listed in the front matter of this document).

Note: When HDLM is launched from the Device Manager client, HDLM uses the HiCommand™ Device Manager user ID to determine user access to the HDLM functions. For example, if you are logged in to the Device Manager client as a Guest, HDLM operations are limited.

To launch the HDLM GUI from a HiCommand™ Device Manager client:

1. If you want to perform HDLM operations, log in to HiCommand™ Device Manager as a registered user (not Guest). If you only want to view HDLM information, you can log in to Device Manager as a Guest user.
2. On the HiCommand™ Device Manager Main Console, select the **Hosts** object from the Navigation frame.
3. Select the icon for the desired host to display the host-level view. If HDLM is installed on the selected host, the **Dynamic Link Manager** button is displayed on the bottom right of the window.

Note: If the **Dynamic Link Manager** button is not displayed, check for the following:

- The HiCommand™ Device Manager Server was not running when the Device Manager Agent started. Start the Device Manager Server, and restart Device Manager Agent.
- You opened the Device Manager **Host View** right after starting the Device Manager Agent. Wait five minutes after starting the Agent, and then open the **Host View**.

Figure 4.9 displays the host-level view. The **Dynamic Link Manager** button is not displayed.

4. If you want to display a specific LU in HDLM, select the LDEV corresponding to that LU on the Device Manager host-level view, then click the **Dynamic Link Manager** button. If not, click the **Dynamic Link Manager** button without any LDEVs selected.

The **Configuration** tab of the Path Management window is displayed (see section 4.2.4.1).

If you selected an LDEV on the Device Manager host-level view, the corresponding LU is selected on the Path Management window. However, in the following cases the window opens with the host selected (as when you specify a host):

- When two or more LDEVs are selected (see **Note 1**)
- When an LDEV that is not an HDLM management target is selected
- When there is no LU corresponding to the selected LDEV (see **Note 1**)
- When an LDEV of the Thunder 9500V Series is selected

To display the paths corresponding to the specified LDEV of the Thunder 9500V Series, select the corresponding LU from the HDLM Web GUI navigation frame.

Note 1: When the Dynamic Link Manager button is clicked, a warning message is displayed.

Note 2: When the HDLM GUI is launched from a Device Manager client for the first time, the Java™ Web Start software downloads the HDLM GUI from the host, and the Security Warning panel is displayed. Select the **Start** button to download the HDLM GUI. When the HDLM GUI is launched from the Device Manager client for the second time, the Java™ Web Start Desktop Integration panel is displayed. Select the **No** button.

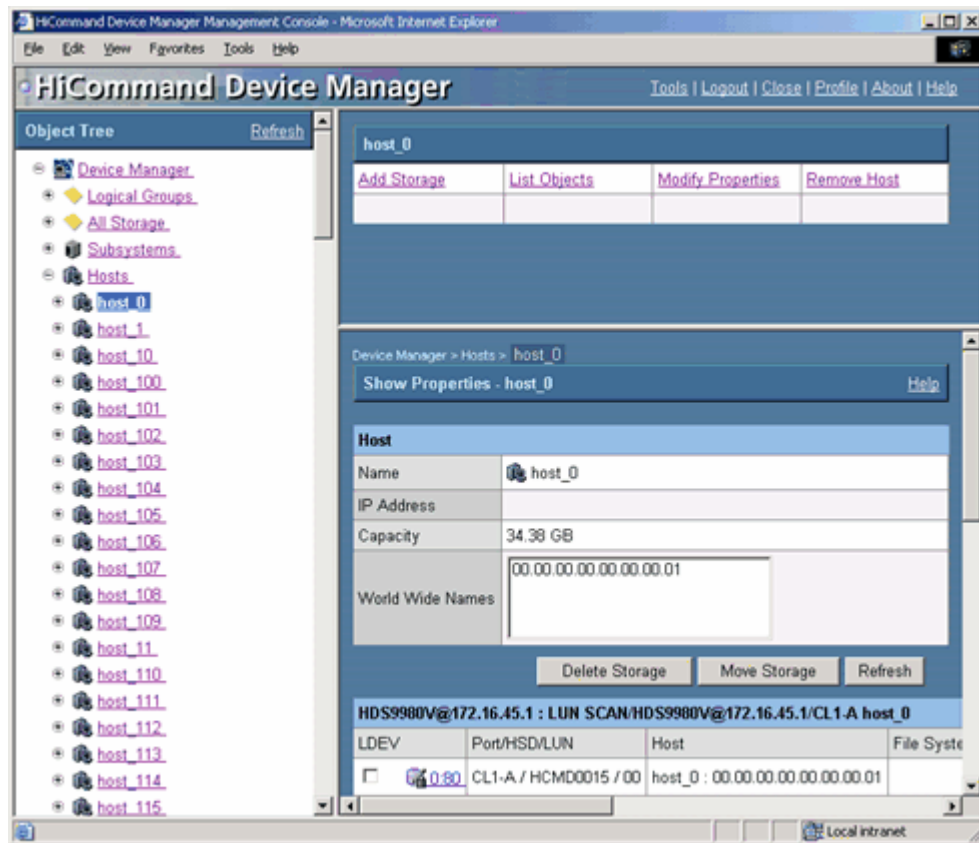


Figure 4.9 Displaying the Host View on the HiCommand™ Device Manager Web Client

4.3.3 Exiting the HDLM Web GUI

This section explains how to close a HDLM Web GUI window. The two ways to close a HDLM Web GUI window are by logging out and quitting all programs, and by quitting only the HDLM Web GUI without logging out.

To log out and quit all programs:

In the menu-bar frame, click **Log Out**. The HDLM Web GUI quits. All other programs that have been started from the Device Manager main console also quit.

To quit without logging out:

In the menu-bar frame, click **Close**. Or, close the browser window. The HDLM Web GUI quits. Any other programs that have been started from the Device Manager main console remain active.

4.3.4 Executable Operations in the HDLM Web GUI

When HDLM is linked with Device Manager and you operate the HDLM Web GUI from a Device Manager client, executable operations differ depending on the Device Manager login privileges shown in Table 4.10. For details on the login privileges, see the *HiCommand™ Device Manager Server Installation and Configuration Guide*, MK-91HC002.

Table 4.10 Executable Operations

Device Manager Login Privileges	Executable Operation(s) in the HDLM Web GUI
System Administrator Storage Administrator Local System Administrator Local Storage Administrator	Refreshing the display Changing the HDLM operating environment Starting the Help window Performing <i>online</i> operations Performing <i>offline</i> operations Clearing data Outputting information to a CSV file
Guest Local Guest	Refreshing the display Starting the Help window Outputting information to a CSV file

The operations that can be executed in the HDLM Web GUI differ depending on which permissions have been specified for operating the HDLM Web GUI. For details on how to set HDLM Web GUI operating permissions, see section 3.13.5.

When the HDLM Web GUI starts, which icon is selected in the tree frame differs depending on the LDEV selected in the Host View. Table 4.11 describes the icons selected in the tree frame when the HDLM Web GUI starts.

Table 4.11 Icons Selected in Tree Frame

LDEV Selection from the Host Level of the Host View (Device Manager Main Window)	Icon Selected in the Tree Frame when the HDLM Web GUI Starts
No LDEV is selected Multiple LDEVs are selected	The storage subsystem that is one level lower than the host level
One LDEV is selected	The LU corresponding to the selected LDEV

4.3.4.1 Specifying a host

To specify a host:

1. Click on a host name in the navigation frame of the Device Manager main window. In the information frame, the Device Manager's Show Properties subwindow appears.
2. Click the **Dynamic Link Manager** button.

The HDLM Web GUI window opens; the host that you selected on the Device Manager's Show Properties subwindow is selected.

4.3.4.2 Specifying an LDEV

To specify an LDEV:

1. Click on a host name in the navigation frame of the Device Manager main window. The Device Manager's Show Properties subwindow appears in the information frame.
2. On the Device Manager's Show Properties subwindow, select the LDEV checkbox in the storage subsystem information list.
3. Click the **Dynamic Link Manager** button. An HDLM Web GUI window opens. The LUs corresponding to the LDEV that you clicked on the Device Manager's Show Properties subwindow are selected.

However, in the following cases the window opens with the host selected (as when you specify a host):

- When two or more LDEVs (**Note**) are selected
- When an LDEV that is not an HDLM management target is selected
- When there is no LU corresponding to the selected LDEV (**Note**)
- When the version of Device Manager is 3.0 and an LDEV of the Thunder 9500V Series is selected

To display the paths corresponding to the particular LDEV of the Thunder 9500V Series, select the corresponding LU from the HDLM Web GUI navigation frame.

Note: When the Dynamic Link Manager button is clicked, a warning message is displayed.

4.3.5 Viewing HDLM Web GUI Version Information

You can view HDLM version information from the **About** subwindow of the HDLM Web GUI.

To display HDLM Web GUI version information:

1. Start the HDLM Web GUI.
2. In the navigation frame, click Dynamic Link Manager. The Dynamic Link Manager subwindow appears in the method frame. This subwindow displays the operations that can be selected for HDLM.

On the Dynamic Link Manager subwindow (method frame), click About. The About subwindow appears in the information frame. This subwindow displays HDLM Web GUI version information.

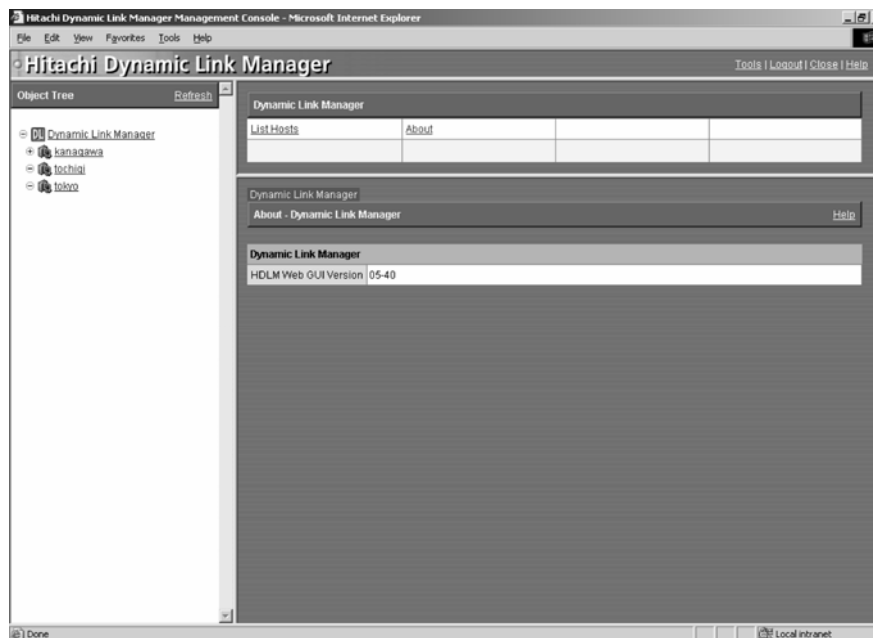


Figure 4.10 HDLM Version Information

4.3.6 Operating the HDLM Web GUI Windows

The HDLM Web GUI uses subwindows to manipulate paths and set up an operation environment. Subwindows are displayed in the method frame and the information frame, as shown in the following example.

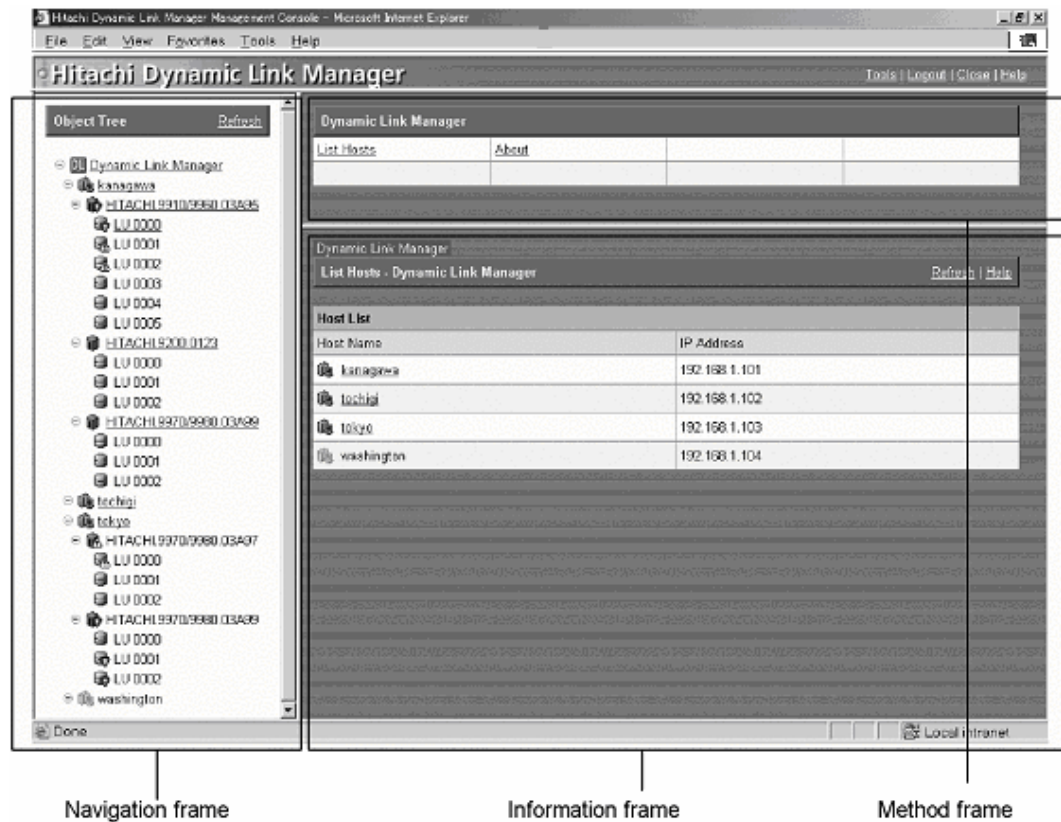


Figure 4.11 HDLM Web GUI Displaying the Navigation, Information, and Method Frames

The subwindow to be displayed depends on the object selected in the navigation frame. Figure 4.12 shows the relationships between the objects in the navigation frame and the subwindows to be displayed. The name of a subwindow is the same as the title of the subwindow.

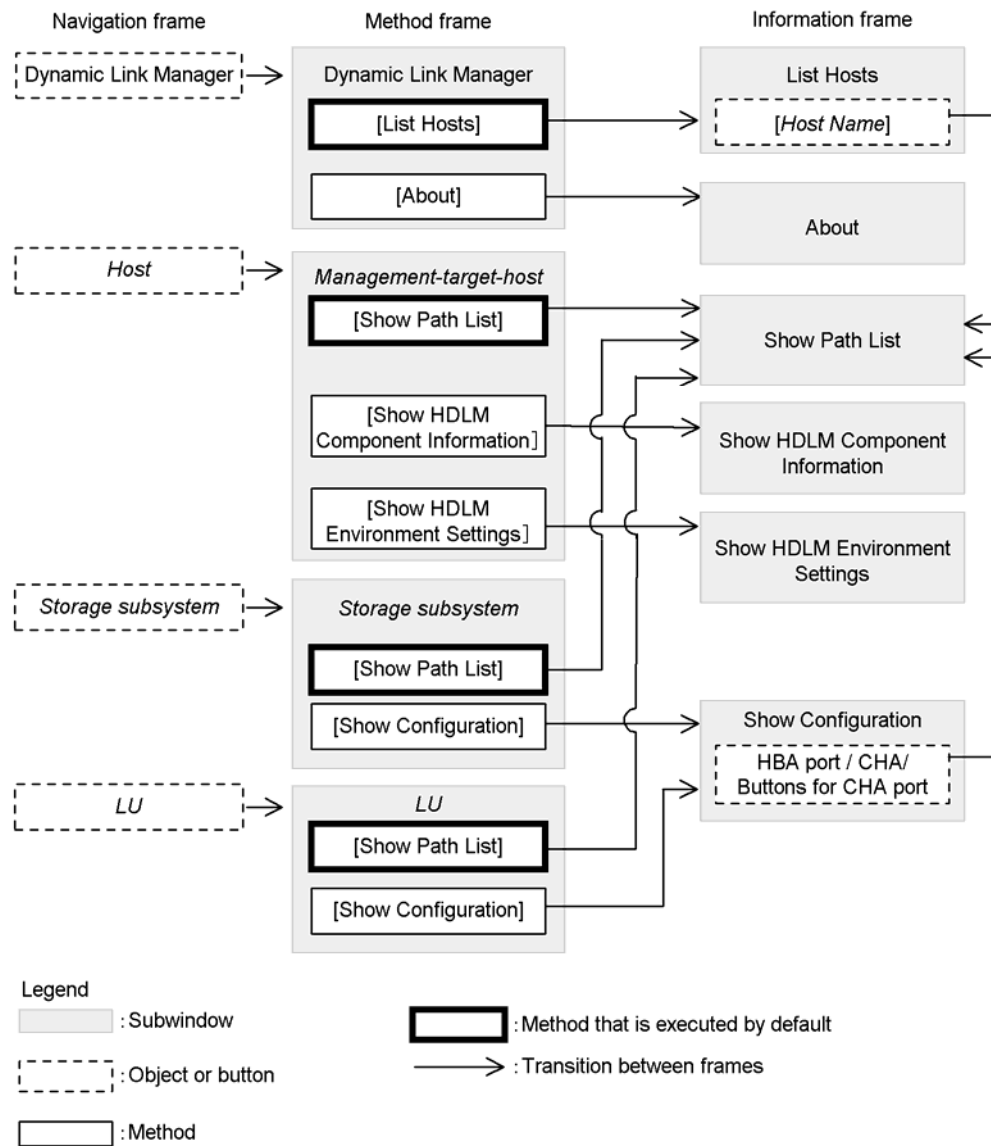


Figure 4.12 Subwindows that are Displayed According to the Object in the Navigation Frame

4.3.7 About the Subwindows that are Displayed

The following subsections describe the following subwindows of the HDLM Web GUI. Note that certain features and functions operate the same as in the HDLM GUI—references to those items are provided in each subsection:

- List Hosts subwindow
- Show Path List subwindow
- Show HDLM Component Information subwindow
- Show HDLM Environment Settings subwindow
- Show Configuration subwindow

4.3.7.1 Viewing the List Hosts Subwindow

The List Hosts subwindow (Figure 4.13) is displayed in the information frame when List Hosts is selected from the method frame. The List Hosts subwindow displays a list of management-target hosts.

To display host information:

Start the HDLM GUI. For details on how to start the HDLM GUI and the HDLM Web GUI, see sections 4.2.2 and 4.3.2.

In the navigation frame, click Dynamic Link Manager. The Dynamic Link Manager subwindow appears in the method frame. This subwindow displays the operations that can be selected for HDLM.

On the Dynamic Link Manager subwindow, click List Hosts. The List Hosts subwindow appears in the information frame. This subwindow displays the management-target hosts.

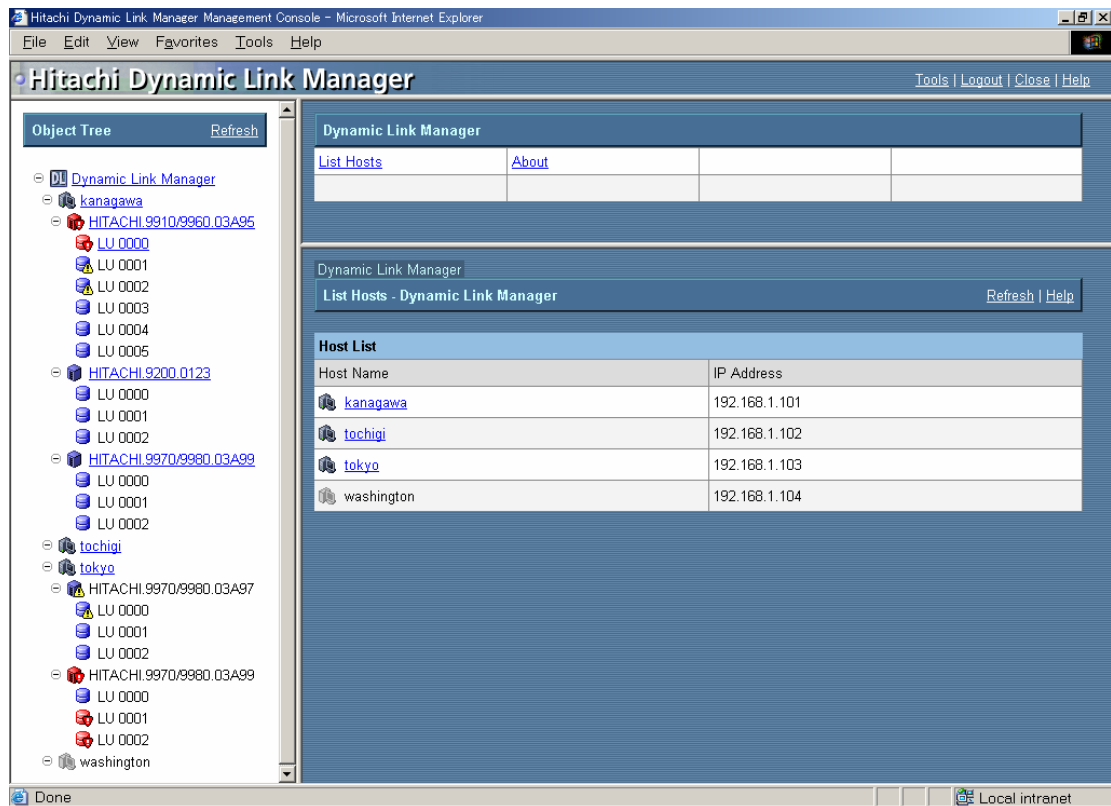


Figure 4.13 The List Hosts Subwindow

Table 4.12 describes the items that are displayed on the List Hosts subwindow.



Note: If Device Manager 3.0 is installed, and the host name of the management-target host is changed, the HDLM Web GUI Navigation frame and the List Hosts subwindow display the old host name and the new host name. Use the new host name to perform operations for that host.

Table 4.12 Contents of the List Hosts Subwindow

Item	Details
Refresh	See section 4.2.4.1.
Help	See section 4.2.4.1.
Host List	Displays a list of the paths for the management-target host selected in the navigation frame: Host Name Displays the names of the management-target hosts. The lines are sorted in ascending order of the host names. IP Address Displays the IP address of each management-target host. The displayed IP addresses are obtained from the URLs that are reported from Device Manager - Agent to Device Manager.

Table 4.13 describes the icons that are displayed in the Host List field.

Table 4.13 Icons that may be Displayed in the Host List Field

Icon	Name	Description
	Host	A management-target host
	Inactive Host	A management-target host on which an HDLM (driver) has not been installed

4.3.7.2 Viewing the Show Path List Subwindow

The Show Path List subwindow (Figure 4.14) is displayed when Show Path List is selected from the method frame. You can display this subwindow by selecting management-target host, Storage subsystem, or LU in the navigation frame. The Show Path List subwindow displays the list of paths for the selected management-target host, storage subsystem or logical unit. Following is a list of items that are displayed in the Show Path List Subwindow:

- Refresh
- Help
- Filtering (Type checkboxes)
- Path List
- Online button, Offline button
- Clear Data button
- Export CSV button

For details about these items, see sections 4.2.4.1 and 4.2.4.3.

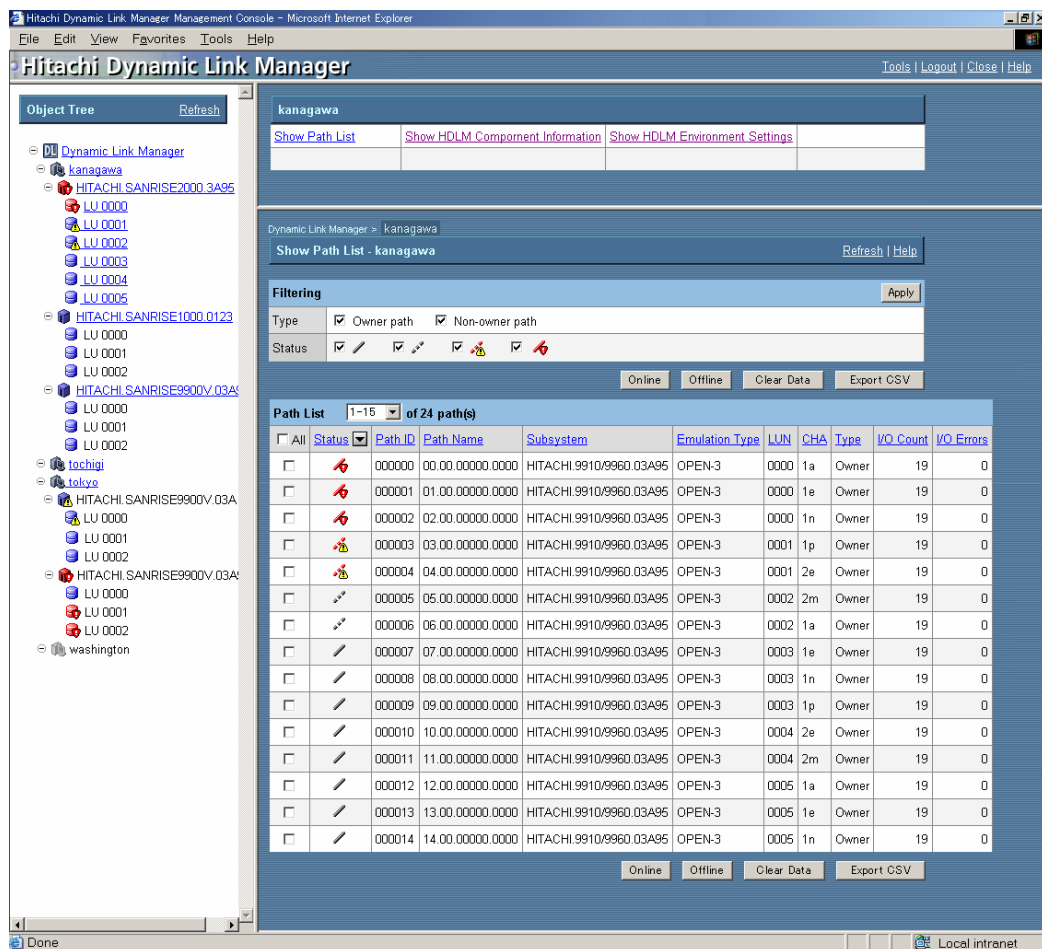


Figure 4.14 The Show Path List Subwindow

4.3.7.3 Viewing the Show HDLM Component Information Subwindow

The Show HDLM Component Information subwindow (Figure 4.15) is displayed when Show HDLM Component Information is chosen in the method frame. This subwindow displays information about the HDLM components that have been installed on the management-target host, and contains the following items:

- Refresh
See section 4.2.4.1.
- Help
See section 4.2.4.1.
- Component Information
Component information is comprised of the component name, version number, status (Alive, for an active HDLM manager, or Dead, for an inactive HDLM manager), and wakeup time (time the component was started).

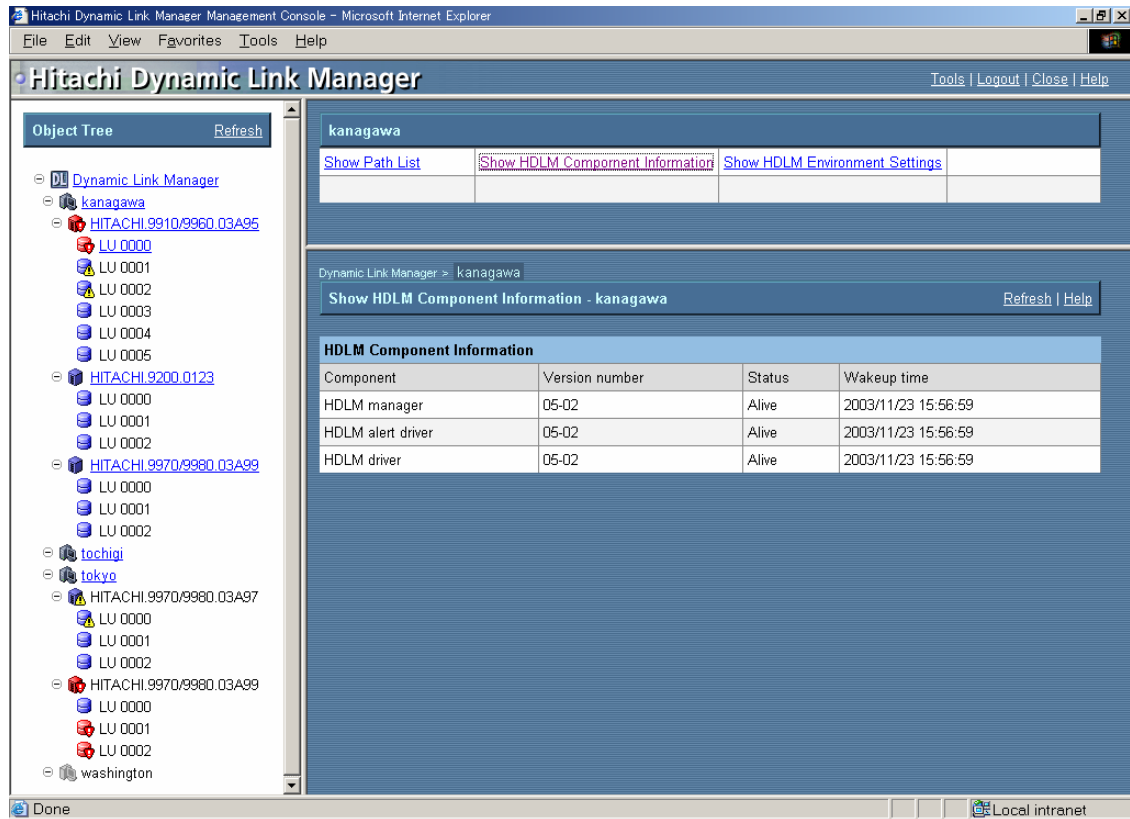


Figure 4.15 The Show HDLM Component Information Subwindow

4.3.7.4 Viewing the Show HDLM Environment Settings Subwindow

The Show HDLM Environment Settings subwindow (Figure 4.16) is displayed when Show HDLM Environment Settings is chosen in the method frame. The Show HDLM Environment Settings subwindow lets you do the following:

- View the operating environment of HDLM.
- Make changes to the HDLM operating environment.

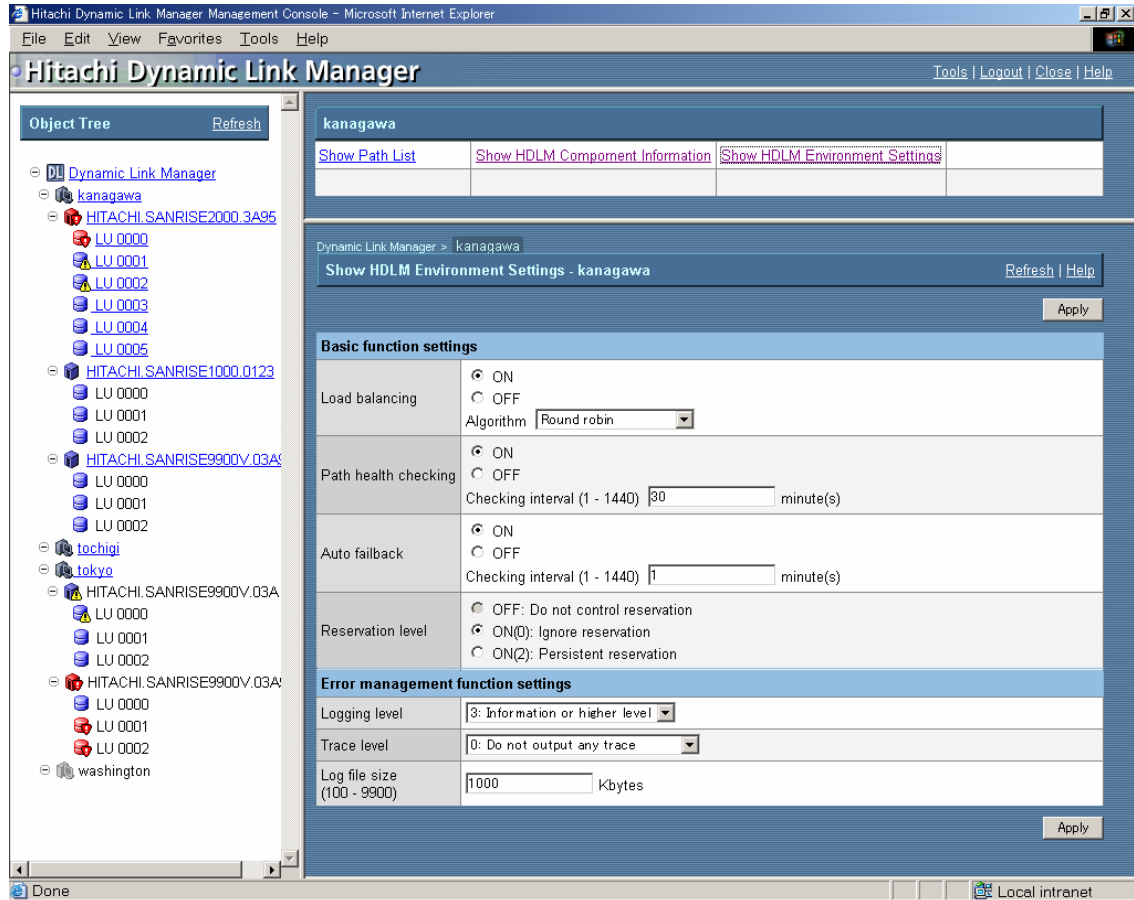


Figure 4.16 The Show HDLM Environment Settings Subwindow

You can specify the following HDLM operating environment setup facilities on the Show HDLM Environment Settings subwindow:

- Basic HDLM facilities
 - Load balancing
 - Path health checking
 - Auto failback
 - Intermittent Error Monitor
 - Reservation level
- Error management function settings
 - Logging level
 - Trace level
 - Log file size

For information about these items, see section 4.2.4.6.

4.3.7.5 Viewing the Show Configuration Subwindow

You can display this subwindow by selecting Storage subsystem or LU in the navigation frame. The Show Configuration subwindow (Figure 4.17) displays the configuration of the path information for the object selected in the navigation frame. Following are the items that are contained in the subwindow:

- Refresh, Help, Filtering (Type checkboxes)
See sections 4.2.4.1 and 4.2.4.3.
- Configuration
See section 4.2.4.4.

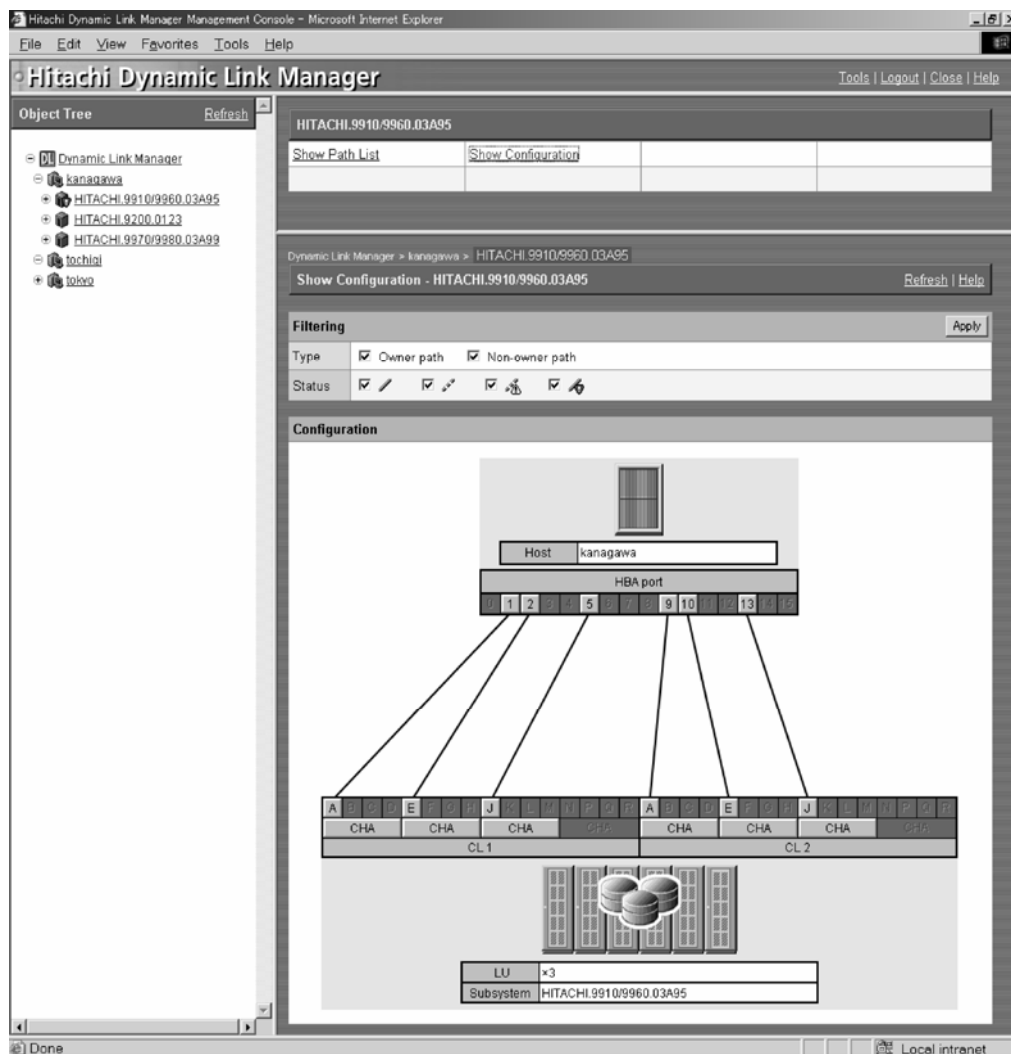


Figure 4.17 Show Configuration Subwindow

4.3.7.6 Viewing the About Subwindow

The About subwindow is displayed when About is selected from the method frame. The About subwindow (Figure 4.18) displays the HDLM Web GUI version information, and it contains the Help button.

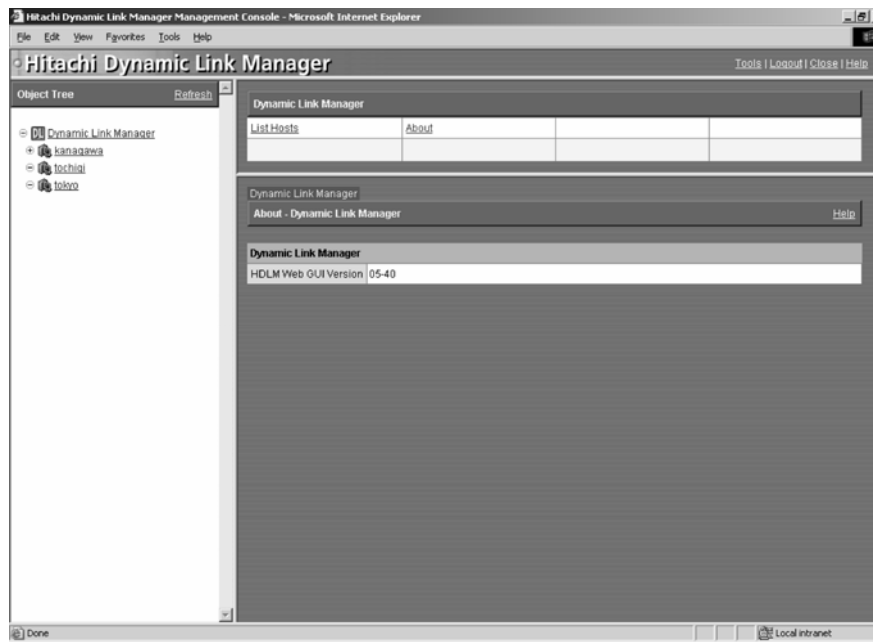


Figure 4.18 About Subwindow

4.3.7.7 Closing the HDLM Web GUI Window

This section explains how to close an HDLM Web GUI window. The two ways to close an HDLM Web GUI window are by logging out and quitting all programs, and by quitting only the HDLM Web GUI without logging out.

Logging out and quitting all programs

1. In the menu-bar frame, click Log Out. This action quits the HDLM Web GUI.
2. This action also quits all other programs that have been started from the Device Manager main window.

Quitting without logging out

To quit only the HDLM Web GUI:

1. In the menu-bar frame, click Close. Or, close the browser window. This action quits the HDLM Web GUI.
2. It does not, however, quit any other programs that have been started from the Device Manager main window.

Chapter 5 Operating HDLM

This chapter describes the procedures for operating the HDLM software, including:

- Usage precautions (see section 5.1)
- Starting and stopping the HDLM manager (see section 5.2)
 - Starting the HDLM Manager (see section 5.2.1)
 - Stopping the HDLM Manager (see section 5.2.2)
- Operating the HDLM GUI remotely (see section 5.3)
- Checking path information (see section 5.5)
 - Checking path information by using the **dlnkmgr view** command (see section 5.5.1.1)
 - Checking path information by using the HDLM GUI (see section 5.5.1.2)
 - Checking path information by using the HDLM Web GUI (see section 5.5.1.3)
- Configuring path health checking (see section 5.5.2)
- Using the error management functions (see section 5.7)
 - Setting up the logging functions (see section 5.7.1)
 - Excluding disks from HDLM management (see section 5.7.2)

5.1 HDLM Usage Precautions

Before you begin working with HDLM, please review the items that are listed in Table 5.1 for important information about environment settings, general procedures, and GUI updates.

Note: Please refer to the Release Notes for the latest HDLM Usage Precautions.

Table 5.1 HDLM Usage Precautions

Area	Item	Notes/Instructions
Environment Settings	Reducing the Host's Start-up Time	<p>If your site has hosts that are connected by a fibre channel switch, and those hosts are started at the same time, the disks change to 'Defined' and the host may require additional time to start. By modifying the code for the shutdown file, you can reduce the amount of time that is required for the host to start.</p> <p>To reduce the host's start-up time:</p> <p>Log in as an Administrative user (a user with root permission).</p> <p>Add the following code before exit 0 in the <code>/etc/rc.shutdown</code> file:</p> <pre>if [-x/etc/rc.HDLM_shutdown] then sh /etc/rc.HDLM_shutdown fi</pre> <p>Note: To cancel this setting, complete the following steps, then uninstall HDLM:</p> <p>Log in as an Administrative user.</p> <p>Execute the following command to recover ODM:</p> <pre># /usr/DynamicLinkManager/bin/dlmodmrecover</pre> <p>Delete the code section in the <code>/etc/rc.shutdown</code>.</p>
General Procedures	Reconfiguring HDLM management-target disks, deleting or adding a disk.	<p>If you reconfigure the HDLM management-target disks or delete (rmdev) or add (cfgmgr) a disk, the disk (hdiskn) and the HDLM driver name (dlmfdrv) may change. To change the disk configuration, use the following procedure:</p> <p>If needed, change the disk configuration and execute the cfgmgr command. (Note: If the HDLM driver is on the disk to delete, you cannot delete the disk. Delete the HDLM driver, then the disk.</p> <p>Modify the dlmfdrv.conf and dlmfdrv.unconf file.</p> <p>To get the output results, compare the status before and after the reconfiguration, then reset dlmfdrv.conf and dlmfdrv.unconf:</p> <ul style="list-style-type: none">▪ If pvid exists, execute the following commands and specify the relevant LU from pvid: <pre># lsdev -Cc disk # lspv</pre>▪ If pvid does not exist, execute the following commands and specify the relevant LU from pvid, scsi_id, or lun_id: <pre># lsattr -El hdiskn</pre> <p>Note: Even when you are using a raw disk, you must specify the relevant LU from pvid, scsi_id, or lun_id, then review the settings for the application where the raw disk is being used.</p> <p>Delete the unnecessary HDLM driver (rmdev or dlrmdev).</p> <p>Configure the HDLM driver (dlmcfmgr).</p>

Area	Item	Notes/Instructions
General Procedures (continued)	Excluding a disk from HDLM management	To exclude a disk from HDLM management, do the following: Delete the HDLM drivers: <code>#rmdev -dl dlmfdrvn</code> Add disk names in <code>dlmfdrv.unconf</code> .
	Changing the disk status (Defined)	A 'Defined' device state means that specific information about the device is recorded in the customized database, but is unavailable to the system. Before placing the status of a disk to Defined, do one of the following: Delete the corresponding HDLM driver Place the driver's status to Defined When the status of the disk is Defined, you can change the status of the HDLM driver to Available: When the disk and HDLM driver are "Defined", execute the <code>#cfgmgr</code> command. When the HDLM driver is "Defined", execute the following command: <code># /usr/DynamicLinkManager/bin/dlmcfgmgr</code>
	Using Primary and Secondary volumes	Execute the following commands when referring to primary and secondary volumes on the same server, such as the ShadowImage: Pair the primary and secondary volumes (<code>paircreate</code>). Separate the primary and secondary volumes (<code>pairsplit</code>). Make the secondary volume a volume group (<code>dlimrecreatevg</code>). When this command is executed, volume group attributes are initialized. Access the primary and secondary volumes. Export the volume group to delete the volume information (<code>dlimexportvg</code>). The secondary volume will be recognized as part of the volume group. Proceed to step 2.
	Executing the diag command	To execute the <code>diag</code> command in AIX 4.3.3, disable the volume group (change the volume group's state to inactive), then execute the command.
	Executing the chdev and rmdev commands	When executing the <code>chdev</code> command (when the HDLM driver is "Available") or when executing the <code>rmdev</code> command, do not specify the disk (<code>hdiskn</code>) that configured the HDLM driver (<code>dlmfdrvn</code>) in the parameter.
	Configuring HDLM after creating a VG	When HDLM is configured after a VG is created on an <code>hdisk</code> that does not have a <code>pvid</code> , the relationship between the VG and <code>dlmfdrvn</code> may become unobservable. To correct, execute the following command and make a <code>pvid</code> in <code>dlmfdrvn</code> . <code>chdev -l dlmfdrvn -a pv=yes</code>

Area	Item	Notes/Instructions
GUI Updates	SMIT menu changes	<p>The following SMIT menus cannot be executed for HACMP 4.5: Communications Applications and Services, HACMP for AIX, Cluster System Management, Cluster Logical Volume Manager, Shared Logical Volumes, Set Characteristics of a Shared Volume Group, Add a Volume to a Shared Volume Group.</p> <p>And</p> <p>Communications Applications and Services, HACMP for AIX, Cluster System Management, Cluster Concurrent Logical Volume Manager, Concurrent Volume Groups, Set Characteristics of a Concurrent Volume Group, Add a Volume to a Concurrent Volume Group</p> <p>Instead, specify the HDLM driver as a physical volume name, and execute from a command line, as shown in the following example: # /usr/es/sbin/cluster/sbin/cl_extendvg -cspoc -n'nodeA,nodeB' -R nodeA -f hdlmlv dlmfdrv6</p>
Managing "Operation Status" messages	<p>While refresh, online, offline and data clear operations are being processed in the HDLM Web GUI, a message titled "Operation Status" may appear. The contents of the message read: The Offline operation is executing.</p> <p>If this message appears, do not close it. If you do close it, another Operation Status message appears. After the process completes, click OK to close the message.</p>	Managing "Operation Status" messages

5.2 Starting and Stopping the HDLM Manager

To use HDLM, you need to start the HDLM manager. This section describes how to start and stop the HDLM manager.

5.2.1 Starting the HDLM Manager

The HDLM manager is started using the startup script that was set up when HDLM was installed. This means that when AIX® starts, the HDLM manager also starts automatically.

If, for some reason, the HDLM manager has not started or has stopped, log in to AIX® as a user with root privileges, and then execute the following command. You can use lower-case characters (**d**l**m**anager):

```
# startsrc -s DLMManager
```

This starts the startup script that was set up when HDLM was installed.

5.2.2 Stopping the HDLM Manager

When you uninstall HDLM, the HDLM manager automatically stops.

If, for some reason, the HDLM manager does not automatically stop, log in to AIX® as a user with root privileges, and then execute the following command. You can use lower-case characters (**d**l**m**anager):

```
# stopsrc -s DLMManager
```

This starts the stop script that was set up when HDLM was installed.

5.3 Operating the HDLM GUI Remotely (from a Device Manager Client)

HiCommand™ Device Manager provides a link-and-launch function which enables you to launch and use the HDLM GUI from any Device Manager Web Client system.

To operate the HDLM GUI remotely from the Device Manager Web Client, you need to perform the setup procedures on the Device Manager Web Client system that are described in section 3.5. You do not need to do anything on the HDLM management-target host.

The HDLM GUI is accessed from the Host level of the **Host View** displayed by the Device Manager Web Client. For details on displaying the HDLM GUI from the Device Manager Client, see section 4.2.4.

For details on the installation and operation of the HiCommand™ Device Manager Web Client, see the *HiCommand™ Device Manager Web Client User's Guide* (MK-91HC001).

Note: The information that you can view and the operations that you can perform depend on the Device Manager login authority. Administrative users can view, modify, and delete data, whereas Guest users can only view data and export CSV files.

5.4 Operating the HDLM Web GUI Remotely (from a Device Manager Client)

Figure 5.1 shows an example system configuration for linking to the Device Manager and using an HDLM Web GUI to operate HDLM remotely.

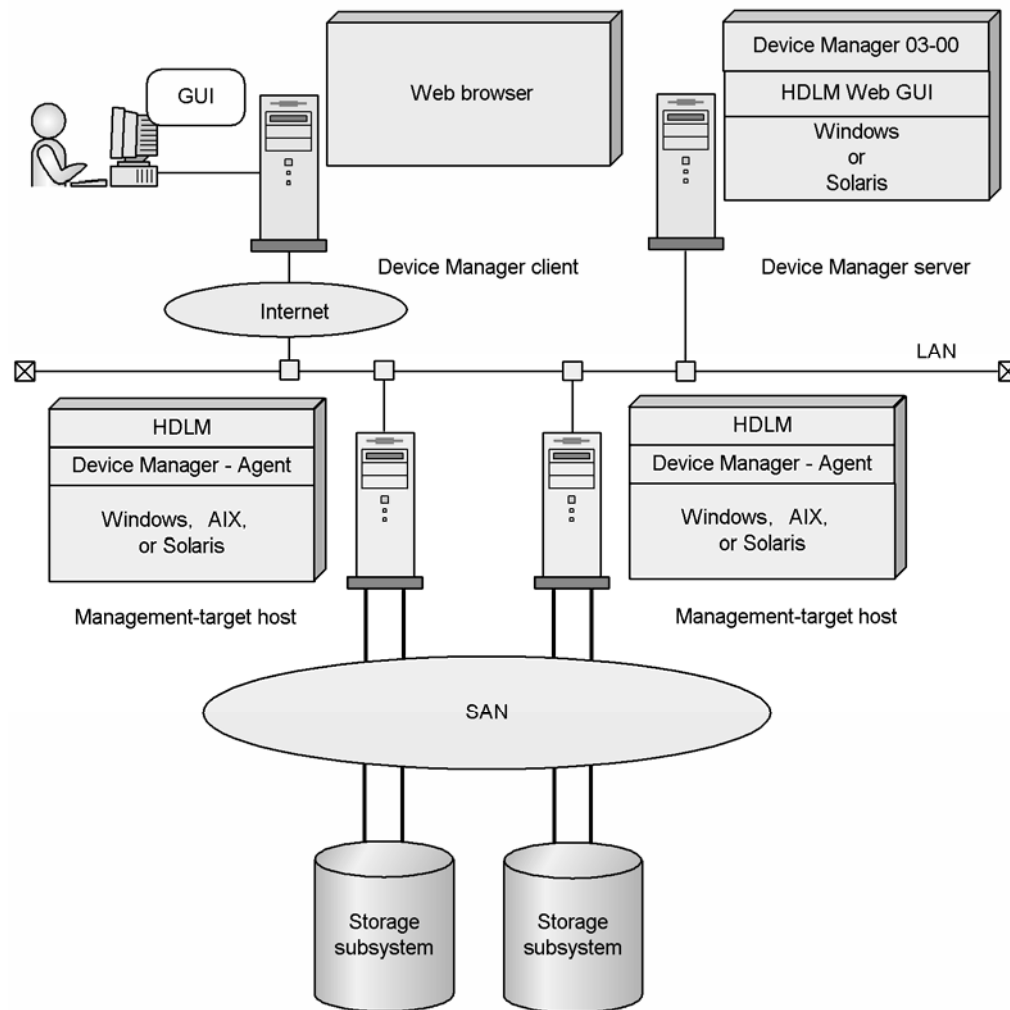


Figure 5.1 Example System Configuration for linking with Device Manager

For details on launching HDLM Web GUI from a Device Manager client, see section 4.3.2.

For details on the installation and uninstallation, of the Device Manager, see the *HiCommand™ Device Manager Server Installation and Configuration Guide* (MK-91HC002).

For details on the installation and uninstallation, of the Device Manager—Agent, see the *HiCommand™ Device Manager Agent Installation Guide* (MK-91HC019).

For details on the installation and uninstallation, of the Device Manager—Web Client, see the *HiCommand™ Device Manager Web Client User's Guide* (MK-91HC001).

5.5 Checking and Configuring Paths

5.5.1 Checking Path Information

Some HDLM functions, such as load balancing and failover, are available only when a device has multiple online paths. You need to check the path information including the path configuration and status after installing HDLM or after changing the hardware configuration.

Note: HDLM reads the hardware configuration that AIX® recognized during startup. If you changed the hardware configuration of the system, make sure to restart the management-target host. This enables HDLM to recognize the changes to the hardware configuration.

Note: Make sure to start the storage subsystem before starting the management-target host. This enables AIX® to detect the storage subsystem.

To check the path information, you can use any of the following:

- The **dlnkmgr view** command (see section 5.5.1.1)
- The **Path List** view in the Path Management window of the HDLM GUI (see section 5.5.1.2)
- The **Show Path List** subwindow in the information frame of the HDLM Web GUI (see section 5.5.1.3)

5.5.1.1 Checking Path Information by Using the `dlnkmgr view` Command

To check the path information by using the `dlnkmgr` command together with the `view` operation:

1. Execute the `dlnkmgr view` command to display the path information.

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path >pathinfo.txt
```

where `pathinfo.txt` is the redirection-output file name. Use a file name that matches your environment. Executing this command displays information about all the paths.
2. Open the redirection-output file (`pathinfo.txt` in step 1), and then check the following:
 - **Logical unit (LU) that the path accesses:**
You can identify the path by the `PathName` display. The combination of the `DskName` and `iLU` display identifies the LU that the path accesses.
 - **Whether the paths are accessing the same LU via different HBAs:**
In the `PathName` displays for the paths accessing the same LU, make sure that the numbers to the left of the second period (i.e., *HBA-adapter-number.path-number*) are different.
Make sure that the number of *HBA-adapter-number.path-number* combinations is the same as the number of physical HBAs.
 - **Whether the paths are accessing the same LU use different channel adapters:**
Make sure that multiple channel adapters are physically mounted.
Make sure that the `ChaPort` number for each path accessing the same LU is different.
 - **Path status:**
Make sure that the `Status` display contains `Online` only.

For details on the items displayed by the `dlnkmgr view` command, see section 6.7.

5.5.1.2 Checking Path Information by Using the HDLM GUI

To check the path information by using the **Path List** view in the Path Management window:

1. Display the Path Management window. For details on displaying the Path Management window, see sections 4.2.2 and 4.2.4.1.
2. Select the **Path List** tab. The **Path List** view appears.
3. In the **Path List** view, check the following:
 - **Logical unit (LU) that the path accesses:**
You can identify the path by the **Path Name** display. The combination of the **Subsystem** and **LUN** display identifies the LU that the path accesses.
 - **Whether the paths are accessing the same LU via different HBAs:**
In the **Path Name** display for the paths accessing the same LU, make sure that the numbers to the left of the second period (i.e., *HBA-adapter-number.path-number*) are different.

Make sure that the number of *HBA-adapter-number.path-number* combinations is the same as the number of physical HBAs.
 - **Whether the paths are accessing the same LU via different channel adapters:**
Make sure that multiple channel adapters are physically mounted.
Make sure that the **CHA** number for each path accessing the same LU is different.
 - **Path status:**
Make sure that the **Status** display contains (**Online**) only.

For details on the **Path List** view in the Path Management window, see section 4.2.4.5.

5.5.1.3 Checking Path Information by Using the HDLM Web GUI

You can use the HDLM Web GUI to display path information in list form or configuration diagram form, as shown in the following examples.

Displaying path information in list form

The screenshot displays the Hitachi Dynamic Link Manager Web GUI in a Microsoft Internet Explorer browser window. The interface includes a navigation pane on the left with an 'Object Tree' showing a hierarchy of nodes: 'Dynamic Link Manager', 'kanagawa', 'HITACHI.9200.0123', 'HITACHI.99709980.03A99', 'Ishiai', and 'Ishio'. The main content area is titled 'Hitachi Dynamic Link Manager' and shows the 'Show Path List' for the selected node 'HITACHI.9200.0123'. Below the title bar, there are tabs for 'Show Path List' and 'Show Configuration'. A 'Filtering' section allows users to select 'Owner path' or 'Non-owner path' and 'Status' (Online, Offline, Clear Data, Export CSV). The 'Path List' table displays 15 paths with columns for Path ID, Path Name, Subsystem, Emulation Type, LUN, CHS, Type, IO Count, IO Errors, and Intermittent Error Path. The table is currently filtered to show 15 paths, all of which are 'Owner' paths with a status of 'Online'.

Path ID	Path Name	Subsystem	Emulation Type	LUN	CHS	Type	IO Count	IO Errors	Intermittent Error Path
000000	0000.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0000	1A	Owner	19	0	-
000001	0001.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0000	1E	Owner	19	0	-
000002	0002.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0000	1N	Owner	19	0	-
000003	0003.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0001	1P	Owner	19	0	-
000004	0004.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0001	2E	Owner	19	0	-
000005	0005.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0002	2M	Owner	19	0	-
000006	0006.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0001	1A	Owner	19	0	-
000007	0007.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0002	1E	Owner	19	0	-
000008	0008.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0003	1N	Owner	19	0	-
000009	0009.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0003	1P	Owner	19	0	-
000010	0010.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0004	2E	Owner	19	0	-
000011	0011.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0004	2M	Owner	19	0	-
000012	0012.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0005	1A	Owner	19	0	-
000013	0013.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0005	1E	Owner	19	0	-
000014	0014.0000.0000000000000000.0000	HITACHI.9200.0123	OPEN-8	0005	1N	Owner	19	0	-

Figure 5.2 Displaying Path Information in Path List Form

Displaying path information in configuration diagram form

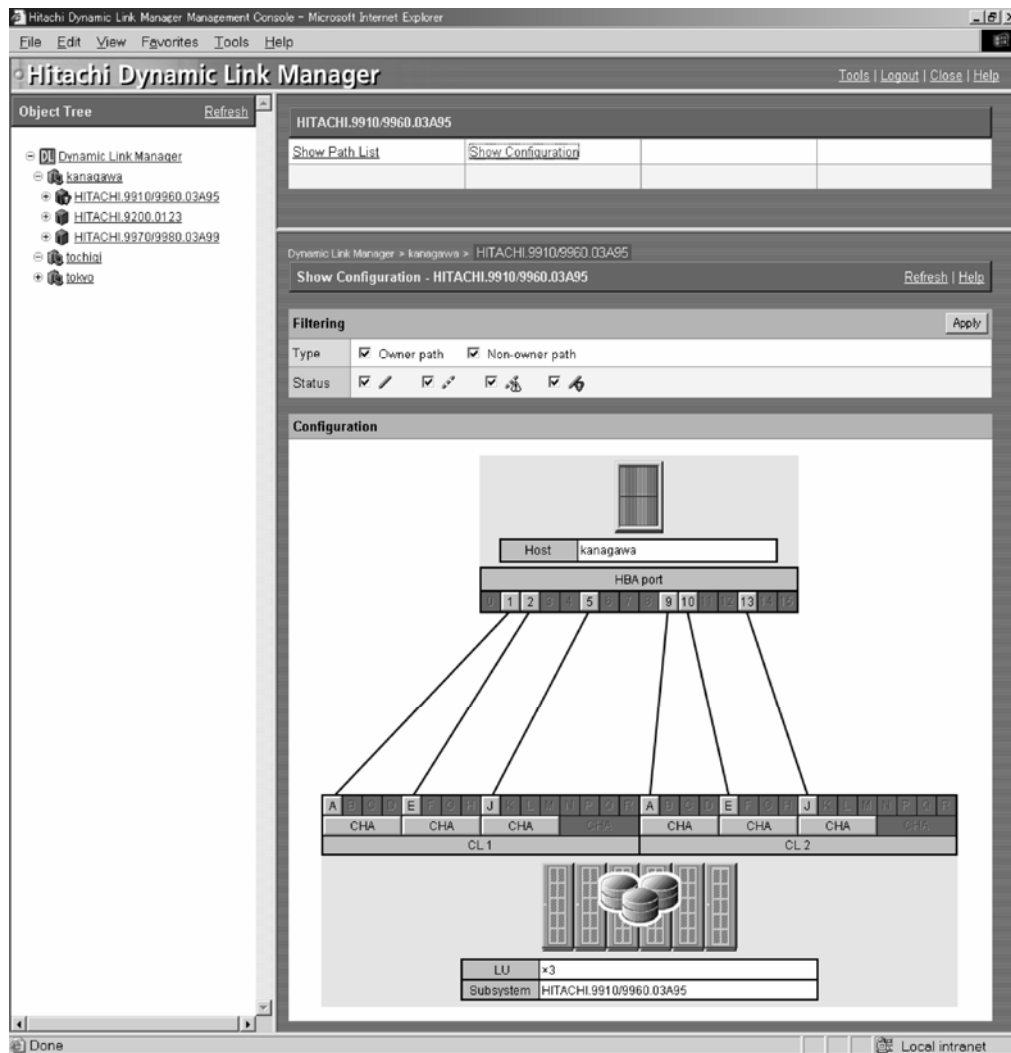


Figure 5.3 Displaying Path Information in Configuration Diagram Form

Note: The GUI cannot be used to display the correspondence between HDLM driver instances and disk devices. If you require this information, you must use the `dlnkmgr` command's `view` operation.

To check the path information by using the **Show Path List** subwindow:

1. Display the HDLM Web GUI window. For details on displaying the HDLM Web GUI window, see section 4.3.2.
2. In the navigation frame, select a management-target host, storage subsystem, or LU that is connected to the paths whose information you wish to display. The item you selected displays in the **method** frame.

Note: Only a storage subsystem or LU can be selected for viewing information in a configuration diagram.

3. Choose one of the following display options:
 - To view path information in **list** form, select **Show Path List** on the management-target host, storage subsystem, or LU subwindow in the method frame.
 - To view path information in **configuration diagram** form, select **Show Configuration** on the storage subsystem or LU subwindow in the method frame

The selected subwindow displays in the **information** frame.

4. To further limit the paths that are displayed in the subwindow, select the **Type** and **Status** checkboxes in **Filtering**.

5.5.2 Configuring Path Health Checking

HDLM provides the path health checking functionality for checking the path status at regular intervals. Path health checking checks paths that have the **Online** status. When an error occurs in a path that is in the **Online** status, the path health checking places the path in the **Offline(E)** or **Online(E)** status.

Path health checking is ON by default in HDLM for AIX® version 5.0 and later. If path health checking is disabled, HDLM does not detect errors in paths in which no I/O occurs. The path health checking functionality enables the system to detect errors in paths in which no I/O occurs, such as non-owner paths and paths in the standby host in a cluster configuration (i.e., passive node paths).

You can set up the path health checking functionality by using the Options window (see section 4.2.4.6) or by executing the `dlnkmgr set` command (see section 6.6).

Caution: In previous versions of HDLM, path health checking was performed by executing a batch file that defined the **online** operation. Do not execute this batch file. With the current version, executing the **set** operation performs path health checking.

Notes for the USP, 9900V, 9900, and 7700E subsystems:

- If load balancing is ON, all paths send I/O signals, so HDLM can detect all online and offline events immediately. Path health checking is therefore not needed.
- For cluster configurations: passive node paths do not send I/O signals. In this case, it is advantageous to enable the path health checking function, so HDLM can immediately detect any problem on those paths. In addition, if the automatic failback function is also enabled, HDLM will change the path status to **Online** automatically.
- If load balancing is ON and automatic failback is also ON, the total number of working paths will not change after a path fails. If automatic failback is ON, a failed path is automatically set to **ONLINE**, and total number of working paths increases. The interval time set will depend upon your individual system configuration and your current storage workload.

Notes for the 9500V, 9200, 5800, and 5700E subsystems:

- When path health checking is ON, HDLM can detect non-owner path errors.
- When automatic failback is ON, I/O signals are sent through a non-owner path when an error occurs on an owner path. Once the owner path recovers from the error, the I/O signals are sent back to an owner path automatically.

5.5.3 Exporting the Path Information

The **Export CSV** button on the function bar of the Path Management window allows you to export the path information displayed on the **Path List** view. You can export path information only while displaying the **Path List** view. HDLM exports the information in comma-separated-value (CSV) format to a text file.

5.5.3.1 About the CSV Output Dialog Box

When the path management window is started from the Device Manager client, the CSV output dialog box displays (as shown in Figure 5.4) when path information is output to the CSV file.

Note: This dialog appears slightly different on the management-target host.

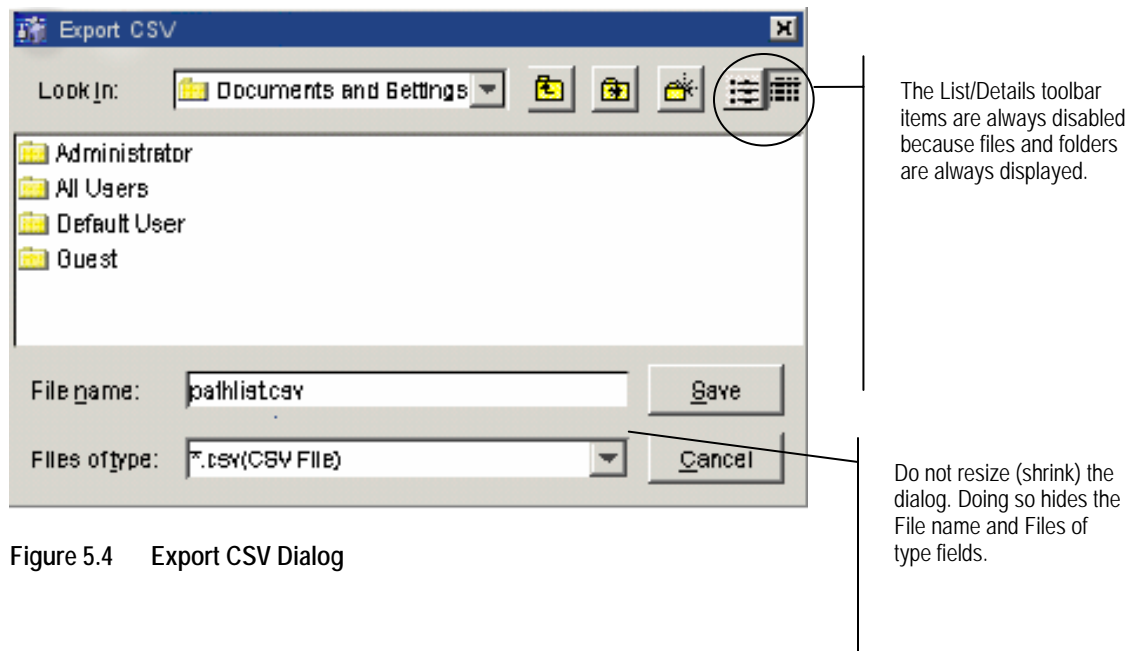


Figure 5.4 Export CSV Dialog

Table 5.2 summarizes the tasks you can perform when working with the Export CSV dialog box.

Table 5.2 Export CSV Dialog Tasks

Task	Details
Delete files and folders contained in the list box	Use the command line, not the Delete key.
Open a displayed folder	Double-click the folder.
Locate a new folder	New folders that are created using the Create New Folder toolbar item are added to the bottom of the list box. If needed, use the scrollbar to locate new folders.
Rename a folder	Right-click on the folder, type the new name, then press Enter.
Look in a network or removable disk drive folder	Use the Look in list. In the Export CSV dialog that is displayed from the Device Manager client, you can display disconnected drives by reallocating those drives, then displaying the Export CSV dialog. To view files that are contained on a floppy disk or CD-ROM, ensure that the removable media is inserted before using the Look in list.

Note: Please refer to the HDLM Release Notes for additional information about the Export CSV dialog.

To export the path information to a CSV text file:

Note: This operation applies to the paths displayed on the **Path List** view.

1. Open the Path Management window (see sections 4.2.2 and 4.2.4.1 for instructions), and select the **Path List** tab.
2. Select the desired range of paths to be displayed using the host tree frame as follows:
To display all paths that are connected to the current host, select the host in the host tree frame.
To display all paths connected to a storage subsystem, select the desired subsystem in the host tree frame.
To display all paths connected to an LU, select the desired LU in the host tree frame.
3. Select the desired **Type** and **Status** of the paths to be displayed in the view frame. For example, to display only online owner paths in the view frame, select the **Owner** and **Online** checkboxes, and clear the **Non-owner**, **Offline(C)**, **Offline(E)**, and **Online(E)** checkboxes.
4. When the **Path List** view displays the desired path(s), select the **Export CSV** button.
5. When HDLM displays the panel for specifying the name for the export file, enter the desired file name (default = pathlist.csv), and select the **Save** button (or select **Cancel** to cancel your request to export the path information). The dialog box for specifying the file name closes and the information displayed in the Path List view will be exported to the CSV file.

5.6 Changing the Path Configuration

This section describes the procedures for changing the path configuration, such as by replacing hardware (host bus adapter, fiber cable, fibre-channel switch) that constitutes a path or changing a management-target disk that is accessed by paths.

The following sections contain information on:

- Replacing a host bus adapter
- Replacing a fiber cable
- Replacing a fibre-channel switch
- Changing the configuration of HDLM management-target disks
- Changing the configuration of an HDLM driver instance

5.6.1 Replacing a Host Bus Adapter

If there are multiple active paths for a device in a logical unit, you can replace a desired host bus adapter while running your applications by placing offline only the path that goes through the host bus adapter to be replaced and using other paths to continue accesses.

To replace a host bus adapter:

1. Place in Offline (C) status the path that goes through the host bus adapter to be replaced. To place the path that goes through the host bus adapter with adapter number 01 and bus number 01 in Offline (C) status, execute the following command:

```
# /usr/DynamicLinkManager/bin/dlnkmgr offline -hba 01.01
```
2. Execute the following command to delete the path that is associated with the host bus adapter to be replaced:

```
# /usr/DynamicLinkManager/bin/dlmHBAdel fscsin
```

To delete the path, specify the device name of the host bus adapter to be replaced (*fscsi* device); *n* indicates the instance number of the *fscsi* device.
3. If LUN security has been set up for the storage subsystem, add the world wide name (WWN) of the new host bus adapter to the LUN security.
4. Execute the following command:

```
# diag
```
5. From the displayed menu, choose **Task Selection**.
6. Choose **Hot Plug Task**.
7. Choose **PCI Hot Plug Manager**.

8. Select **List PCI Hot Plug Slots** to check the PCI to be replaced (Figure 5.5):

# Slot	Description	Device(s)
P1-I3	PCI 64 bit, 66MHz, 3.3 volt slot	Empty
P1-I4	PCI 64 bit, 66MHz, 3.3 volt slot	Empty
P1-I5	PCI 64 bit, 66MHz, 3.3 volt slot	fcs0
P1-I6	PCI 64 bit, 50MHz, 5 volt slot	Empty
P1-I7	PCI 64 bit, 50MHz, 5 volt slot	mg20
P1-I8	PCI 64 bit, 66MHz, 3.3 volt slot	fcs1
P1-I9	PCI 64 bit, 66MHz, 3.3 volt slot	scsi2 scsi3
P1-I10	PCI 64 bit, 66MHz, 3.3 volt slot	Empty
P1-I11	PCI 64 bit, 50MHz, 5 volt slot	pci12 ent1 ent2 ent3 ent4
P1-I12	PCI 64 bit, 50MHz, 5 volt slot	Empty

Figure 5.5 Host Bus Adapter Replacement

The shading indicates the host bus adapter to be replaced.

9. Choose **Unconfigure a Device** and enter in **Device name** the device to be replaced:

* Device Name	[fcs0]	+
Unconfigure any Child Devices	yes	+
KEEP definition in database	yes	+

Figure 5.6 Unconfigure a Device

10. Choose **Replace/Remove a PCI Hot Plug Adapter**. Select the host bus adapter to be replaced.

11. When the following message is displayed, replace the host bus adapter (Figure 5.7):

```
The visual indicator for the specified PCI slot has
been set to the identify state. Press Enter to continue
or enter x to exit.

The visual indicator for the specified PCI slot has
been set to the action state. Replace the PCI card
in the identified slot and press Enter to continue.
Enter x to exit. Exiting now leaves the PCI slot
in the removed state.
```

Figure 5.7 Replacing the Host Bus Adapter

When you finish replacing the host bus adapter, connect the cable and press Enter.

12. Execute the following command to reconfigure the device:

```
# cfgmgr -l fcsn
```

To reconfigure the device, specify the device name of the PCI slot where the host bus adapter was replaced (`fcs` device); *n* indicates the instance number of the `fcs` device.

13. Execute the `dlnmcfmgr` utility to configure the HDLM device:

```
# /usr/DynamicLinkManager/bin/dlnmcfmgr
```

14. If LUN security has been set up for the storage subsystem, delete the world wide name (WWN) of the previous host bus adapter from the LUN security.

15. Execute the following command to check the path information:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path
```

For details about path information, see section 5.5.

5.6.2 Settings for an OS Upgrade and Changing Kernel Mode

This section explain the procedures when upgrading an OS or changing the kernel mode.

5.6.2.1 Settings for an OS Upgrade

The following shows the procedure when upgrading the OS.

If you execute the `dlmrmdev -A` utility as follows, you can omit step 3 through step 6:
`/usr/DynamicLinkManager/bin/dlmrmdev -A`

To upgrade the OS:

1. Log in to AIX® as a user with root privileges.
2. Stop all the processes and services using the HDLM management-target paths.
Also stop any process or service for an application such as DBMS that is using the HDLM management-target paths.
3. Execute the following command to unmount the file system used in HDLM.
`umount file-system-mount-point`
4. Execute the following command to display all the activated volume groups.
`lsvg -o`
5. Among the displayed volume groups, deactivate the volume group used in HDLM.
`/usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name`
6. Execute the following command to remove the HDLM device and the logical device file for the HDLM alert driver from the running kernel, and then stop the HDLM manager:
`/usr/DynamicLinkManager/bin/dlmrmdev`

If the KAPL09012-I message is displayed, there is no problem.

If the KAPL09012-I message is not displayed, the logical device file for the HDLM alert driver or the HDLM device has not been deleted or the HDLM manager has not stopped. Make sure that no processes, services, file systems, and volume groups are using any HDLM management-target path, and then re-execute the above command.

7. Execute the following command to adjust HDLM to the environment for the OS version you want to change.
`/usr/DynamicLinkManager/bin/dlmchenv -v OS-mode`

Table 5.3 lists the available OS modes, and their corresponding OS versions and kernel modes.

Table 5.3 OS Modes

OS modes	OS versions and kernel modes
2	AIX 5L V5.1 (32-bit version)
3	AIX 5L V5.1 (64-bit version)
4	AIX 5L V5.2 (32-bit version)
5	AIX 5L V5.2 (64-bit version)
6	AIX 5L V5.3 (32-bit version)
7	AIX 5L V5.3 (64-bit version)

In the following example, the command upgrades the 64-bit version of AIX 5L V5.1 to the 64-bit version of AIX 5L V5.3:

```
# /usr/DynamicLinkManager/bin/dlmchenv -s -l -v 7
```

8. Upgrade the OS. The host restarts and the HDLM driver is configured.

5.6.2.2 Settings when the Kernel Mode is Changed

The following shows the procedure when changing the kernel mode.

If you execute the `dlmrmdv -A` utility as follows, you can omit step 3 through step 6:

```
# /usr/DynamicLinkManager/bin/dlmrmdv -A
```

To change the kernel mode and set up HDLM when the kernel mode is changed:

1. Log in to AIX as a user with root privileges.
2. Stop all the processes and services using the HDLM management-target paths.
Also stop any process or service for an application such as DBMS that is using the HDLM management-target paths.
3. Execute the following command to unmount the file system used in HDLM.
`# umount file-system-mount-point`
4. Execute the following command to display all the activated volume groups:
`# lsvg -o`
5. Among the displayed volume groups, deactivate the volume group used in HDLM:
`# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name`
6. Execute the following command to remove the HDLM device and the logical device file for the HDLM alert driver from the running kernel, and then stop the HDLM manager:
`# /usr/DynamicLinkManager/bin/dlmrmdv`

If the KAPL09012-I message is displayed, there is no problem.

If the KAPL09012-I message is not displayed, the HDLM device or the logical device file for the HDLM alert driver has not been deleted or the HDLM manager has not stopped. Make sure that no processes, services, file systems, and volume groups are using any HDLM management-target path, and then re-execute the above command.

7. Execute the following command to adjust HDLM to the environment for the kernel mode you want to change:

```
# /usr/DynamicLinkManager/bin/dlmchenv -l -v OS-mode
```

Table 5.4 lists the available OS modes, and their corresponding OS versions and kernel modes.

Table 5.4 OS modes

OS modes	OS versions and kernel modes
2	AIX 5L V5.1 (32-bit version)
3	AIX 5L V5.1 (64-bit version)
4	AIX 5L V5.2 (32-bit version)
5	AIX 5L V5.2 (64-bit version)
6	AIX 5L V5.3 (32-bit version)
7	AIX 5L V5.3 (64-bit version)

The following shows an example of changing AIX® 5.2 32-bit version to AIX® 5L V5.2 64-bit version:

```
# /usr/DynamicLinkManager/bin/dlmchenv -l -v 5
```

8. Change the kernel mode.
9. Restart the host.

The HDLM driver is configured.

5.6.3 Replacing a Fiber Cable

If there are multiple active paths for a device in a logical unit, you can replace a desired cable while running your applications by placing offline only the path that goes through the cable to be replaced and using other paths to continue accesses.

The following procedure is only for replacing a fiber cable.

To replace a fiber cable:

1. Place the path that goes through the cable to be replaced in the Offline (C) status:

```
# /usr/DynamicLinkManager/bin/dlnkmgr offline -hba 01.01
```

2. Replace the cable.

Note: If you change the port on the switch or on the storage subsystem, the path configuration changes. Delete the device associated with the cable to be replaced and then reconfigure the device.

If you are using the `dlnmfdrv.conf` or the `dlnmfdrv.unconf` file, reconfigure the device according to the procedure described in section 5.6.6.

3. Place the path that goes through the replaced cable in the Online status.
4. Place the path that goes through the host bus adapter to which the replaced cable is connected in the Online status:

```
# /usr/DynamicLinkManager/bin/dlnkmgr online -hba 01.01
```

5. Execute the following command to check the path information:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path
```

For details about path information, see Chapter 6.

5.6.4 Replacing a Fibre-Channel Switch

If there are multiple active paths for a device in a logical unit, you can replace a desired switch while running your applications by placing offline only the path that goes through the switch to be replaced and using other paths to continue accesses.

The following procedure is only for replacing a fibre-channel switch.

To replace a fibre-channel switch:

1. Place in Offline (C) status the path that goes through the switch to be replaced (path that goes through the host bus adapter to which the switch is connected). To place the path with the host bus adapter number 01 and bus number 01 in the Offline (C) status, execute the following command:

```
# /usr/DynamicLinkManager/bin/dlnkmgr offline -hba 01.01
```

2. Execute the following command to delete the path that goes through the switch to be replaced:

```
# /usr/DynamicLinkManager/bin/dlmHBAde1 fcsin
```

To delete the path, specify the device name of the host bus adapter that is connected by the switch to be replaced (*fcsin* device); *n* indicates the instance number of the *fcsin* device.

3. Execute the following command to acquire the name of the parent device:

```
# lsdev -C -l fcsin -F parent
```

4. Delete the HBA device associated with the switch to be replaced:

```
# rmdev -dl fcsin -R
```

5. Replace the switch.

6. Execute the following command to reconfigure the device:

```
# cfgmgr -l fcsn
```

fcsn indicates the instance number of the device; *n* indicates the instance number of the *fcs* device.

Note: If you are using the *dlnmfdrv.conf* or *dlnmfdrv.unconf* file, reconfigure the device according to the procedure described in section 5.6.6.

7. Execute the following command to check the path information:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path
```

For details about path information, see Chapter 6.

5.6.5 Changing the Configuration of HDLM Management-Target Disks

To change the configuration of the HDLM management-target disks, register any physical volumes (`hdisk`) that you wish to remove in the `dlnmdrv.unconf` file, so that they are no longer managed by HDLM. Then reconfigure the HDLM driver.

This section describes the procedures for removing a disk from the HDLM management and for changing the disk configuration.

5.6.5.1 Removing a Disk from HDLM Management

This section explains the procedure for removing a disk from the HDLM management target.

1. Check and make note of the `hdisk` entries corresponding to `dlnmdrvn` for the disk that is to be removed from the management target. Following is an example command execution:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -drv | grep -w
dlnmdrv6
000024 dlnmdrv6 hdisk10 9200.0010.0007
000025 dlnmdrv6 hdisk49 9200.0010.0007
000026 dlnmdrv6 hdisk80 9200.0010.0007
000027 dlnmdrv6 hdisk111 9200.0010.0007
```

2. Delete `dlnmdrvn` for the disk that is to be removed from the management target:

```
# rmdev -dl dlnmdrv6
```
3. Add the physical volume (`hdisk`) entries to `dlnmdrv.unconf` for the deleted `dlnmdrvn`. Continuing the environment in steps 1 and 2 above, add `hdisk10`, `hdisk49`, `hdisk80`, and `hdisk111` to `dlnmdrv.unconf`.
4. Make sure that the paths connected to the disk that was removed from the management target have been deleted:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path | grep -w dlnmdrv6
```

In this example, there will be no problem if there are no path displays for `AutoPATH_ID`, `000024`, `000025`, `000026`, and `000027`.

5.6.5.2 Changing the Configuration of HDLM Management-Target Disks

This section explains the procedure for changing the configuration of management-target disks for a purpose such as disk deletion (`rmdev`) or disk addition (`cfgmgr`):

1. Change the configuration of the disks.

Note: You cannot delete a physical volume for which an HDLM device has been configured. Use the procedure described below to execute the command to delete the HDLM device, delete the corresponding physical volume, and then delete the applicable logical unit from the storage subsystem configuration.

To add a physical volume, add the applicable logical unit to the storage subsystem configuration.

Check and make note of the `hdisk` entries corresponding to `dlnmfdrvn` for the disk that is to be removed from the management target. Following is an example command execution:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -drv | grep -w
dlnmfdrv6
000024 dlnmfdrv6 hdisk10 9200.0010.0007
000025 dlnmfdrv6 hdisk49 9200.0010.0007
000026 dlnmfdrv6 hdisk80 9200.0010.0007
000027 dlnmfdrv6 hdisk111 9200.0010.0007
```

- Delete the HDLM driver:
`rmdev -dl dlnmfdrv6`
- Delete the physical volume:
`rmdev -dl hdisk10`
`rmdev -dl hdisk49`
`rmdev -dl hdisk80`
`rmdev -dl hdisk111`
- Execute `cfgmgr` to reconfigure the physical volume (`hdiskn`).

2. Edit the `dlnmfdrv.conf` or `dlnmfdrv.unconf` file.

Obtain the output result of the command shown below before and after the configuration change, compare the results, and then reset `dlnmfdrv.conf` and `dlnmfdrv.unconf`.

Execute the following command to determine the applicable logical unit from `scsi_id` and `lun_id`:

```
# lsattr -El hdiskn
```

If you are using a character device, determine the applicable logical unit from `scsi_id` and `lun_id` in the same manner as above, and then check, and if necessary, revise the settings of the applications that use the character device.

3. Stop all the processes and services that are using the HDLM management-target path.

When the processes and services of any other applications such as DBMS are using the HDLM management-target path, stop all those processes and services.

4. Execute the following command to unmount the file system used in HDLM:

```
# umount file-system-mount-point
```

5. Execute the following command to display all the activated volume groups:

```
# lsvg -o
```

6. Among the displayed volume groups, deactivate the volume group used in HDLM:
/usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
7. Execute the following command to delete any redundant HDLM devices:
 - To delete all HDLM devices from the active kernel:
/usr/DynamicLinkManager/bin/dlrmdev
 - To delete a specific HDLM device:
rmdev -dl dlmfdrvn
8. Execute the dlmcfgmgr utility to configure the HDLM device:
/usr/DynamicLinkManager/bin/dlmcfgmgr

5.6.6 Changing the Configuration of an HDLM Driver Instance

This section describes the procedure for using `dlnmfdrv.conf` or `dlnmfdrv.unconf` to reconfigure an HDLM driver instance when the configuration of host bus adapters or switches is changed. This section explains the procedure for both when the `dlnmfdrv.conf` file is being used, and when it is not.

5.6.6.1 Changing Configuration Using the `dlnmfdrv.conf` File

1. Make a backup copy of the `dlnmfdrv.conf` file and then delete it. This file should be deleted to prevent an HDLM driver instance from being created when an `hdisk` is added.
2. Execute the following commands:

```
# mv /usr/DynamicLinkManager/drv/dlnmfdrv.conf  
/usr/DynamicLinkManager/drv/dlnmfdrv.conf.bak  
  
# cp /dev/null /usr/DynamicLinkManager/drv/dlnmfdrv.conf
```
3. Execute the following command to reconfigure the new `hdisk`:

```
# cfgmgr
```
4. Execute the following command to restore `dlnmfdrv.conf` from its backup copy:

```
# mv /usr/DynamicLinkManager/drv/dlnmfdrv.conf.bak  
/usr/DynamicLinkManager/drv/dlnmfdrv.conf
```
5. Check the reconfigured physical volume `hdisk` and `dlnmfdrv.conf` or `dlnmfdrv.unconf`, and then change the contents of `dlnmfdrv.conf` or `dlnmfdrv.unconf` to match the reconfigured environment.
6. Execute the following command to start the HDLM configuration manager and configure the HDLM driver:

```
# /usr/DynamicLinkManager/bin/dlnmcfmgr
```
7. Execute the following command to check the path information:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path
```

For details about path information, see Chapter 6.

5.6.6.2 Changing Configuration Without the dlmfdrv.conf File

To reconfigure an HDLM driver instance:

1. To create an empty **dlmfdrv.conf** file to prevent an HDLM driver instance from being created when an hdisk is added, execute the following commands:

```
# cp /dev/null /usr/DynamicLinkManager/drv/dlmfdrv.conf
```
2. Execute the following command to reconfigure the new hdisk:

```
# cfgmgr
```
3. Execute the following command to delete the dlmfdrv.conf file:

```
# rm /usr/DynamicLinkManager/drv/dlmfdrv.conf
```
4. Check the reconfigured hdisk and dlmfdrv.unconf, and then change the contents of dlmfdrv.unconf to match the reconfigured environment.
5. Execute the following command to start the HDLM configuration manager and configure the HDLM driver:

```
# /usr/DynamicLinkManager/bin/dlmcfgmgr
```
6. Execute the following command to check the path information:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path
```

For details about path information, see Chapter 6.

5.6.7 Changing the Path Status

The **Online** and **Offline** buttons on the function bar of the Path Management window allow you to change the status of paths from offline to online and from online to offline(C). You can change the path status while displaying the **Configuration** view or the **Path List** view.

However, when you select **Guest** only for HDLM Web GUI operating privileges, you cannot change the path status. For details on operations executable on a Device Manager client, see section 2.13.

To change the path status:

1. Open the Path Management window (see sections 4.2.2 and 4.2.4.1 for instructions).

Note: If you are operating HDLM remotely from the HiCommand™ Device Manager client, you must log in to Device Manager as a local or system user to perform HDLM functions. If you are logged in as a guest, you will only be able to view the HDLM path information.

2. Select the desired range of paths to be displayed using the host tree frame as follows:

To display all paths that are connected to the current host, select the **Path List** tab, and then select the host in the host tree frame.

To display all paths connected to a storage subsystem, select either the **Configuration** tab or the **Path List** tab, and then select the desired subsystem in the host tree frame.

To display all paths connected to an LU, select either the **Configuration** tab or the **Path List** tab, and then select the desired LU in the host tree frame.

3. Select the desired **Type** and **Status** of the paths to be displayed in the view frame. For example, to display only offline paths in the view frame, select **Owner** and **Non-owner**; select **Offline(C)**, **Offline(E)**, and **Online(E)**; and clear the **Online** checkbox.

4. Select the desired path(s) in the view frame as follows:

If you want to change the status of all offline paths displayed in the view frame to online, do not select any paths.

If you want to change the status of one or more specific paths, select the desired path(s). To select path(s) in the **Path List** view, you can use the **Shift** and **Ctrl** keys to select multiple items. To select path(s) in the **Configuration** view, you can:

- Select the line representing the path.
- Select a channel adapter port button (e.g., port **A** on **CHAO**) to select all paths connected to that channel adapter port.
- Select a channel adapter button (e.g., **CHAO**) to select all paths connected to all ports of that channel adapter.
- Select an HBA port button (e.g., port **3**) to select all paths connected to that port.

5. If you want to change the path(s) from offline to online, select the **Online** button. If you want to change the path(s) from online to offline(C), select the **Offline** button.
6. When the confirmation panel appears, select **OK** to change the path status as specified, or select **Cancel** to cancel your request to change path status.

Note: If you attempt to change the status of multiple paths but the status of one of those paths cannot be changed, HDLM displays the KAPL02022-W or KAPL02023-W message. To ignore that path and continue processing, select **OK**. To stop processing, select **Cancel**.

5.6.8 Setting the Path Statistics to the Initial Value

The **Clear Data** button on the function bar of the Path Management window allows you to reset the HDLM path statistics (I/O count and I/O errors) to their initial value (zero). You can clear the path statistics only while displaying the **Path List** view. This operation is useful when you want to find out how many I/Os and/or I/O errors occur during a specific time period, starting from the time when you reset the I/O count and I/O error values to the initial values (0).

However, when you select **Guest** only for HDLM Web GUI operating privileges, you cannot change the path status. For details on operations executable on a Device Manager client, see section 2.13.

Note: This operation applies to all paths managed by HDLM.

To set the HDLM path statistics to their initial values:

1. Open the Path Management window and select the **Path List** tab.

Note: If you are operating HDLM remotely from the HiCommand™ Device Manager client, you must log in to Device Manager as a local or system user to perform HDLM functions. If you are logged in as a guest, you will only be able to view the HDLM path information.

2. Select the **Clear Data** button. The values displayed in the **I/O Count** and **I/O Errors** columns of the **Path List** view are set to the initial values for all paths that HDLM manages.

5.7 Using the Error Management Functions

HDLM provides error management functions for error logging and trace file output. This section describes setting up the logging functions (see section 5.7.1) and changing the trace file settings (refer to Table 3.14).

5.7.1 Setting Up the Logging Functions

The *error logging level* refers to the level of error information to collect for the error log. Likewise, the *trace level* refers to the output level of the trace. The *log file size* refers to the size of the error log file. For further information on the log files, see section 2.10.1.

To view the settings for the error logging level, trace level, and log file size, you can either launch the HDLM GUI and open the Options window, or execute the **dlnkmgr view** command.

To change the settings for the error logging level, trace level, and log file size, you can either use the Options window of the HDLM GUI or the **dlnkmgr set** command.

(1) Using the Options window to set the error management functions:

To set up the error management functionality:

1. Display the Path Management window. For details on displaying the Path Management window, see sections 4.2.2 and 4.2.4.1.
2. Select the **Options** button to open the Options window (see section 4.2.4.6).
3. In the **Logging level** list box, specify the level for collecting error log data: 0, 1, 2, or 3 (default = 3).
4. In the **Trace level** list box, specify the trace output level: 0, 1, 2, 3, or 4 (default = 0).
The larger the trace level value, the larger the amount of log information that is output. When a large amount of log information is output, the time taken for the file-writing to wrap around and delete old log data is reduced.
5. In the **Log file size** box, enter the log file size in kilobytes (100 to 9900, default = 9900). We recommend that you increase the log file size to 9900 for maximum utility.

The log files are **dlnmgrn.log** (*n* = log file number 1, 2) and **dlnmguin.log** (*n* = log file number 1, 2). If the sizes of both files in a log file group reach the specified value, the oldest file in the group is wrapped around and is overwritten by the new log information.

Note: HDLM displays the log file size when the GUI was started, and the size of the GUI log files (**dlnmguin.log**) is fixed until the HDLM GUI is terminated. To change the file size of the GUI log files, exit and restart the HDLM GUI after you set the file size.

6. Select the **OK** button to save your settings and close the Options window.

(2) Using the *dlnkmgr set* command to set the error management functions:

- **Setting the error logging level.** To set the error logging level, execute the **dlnkmgr** command with the **set** operation. The following example sets the logging level to 2:

```
# /usr/DynamicLinkManager/bin/dlnkmgr set -ellv 2
```

Refer to Table 2.10 for a description of the error logging levels.

- **Setting the trace level.** To set the trace level, execute the **dlnkmgr** command with the **set** operation. The following example sets the trace level to 1:

```
# /usr/DynamicLinkManager/bin/dlnkmgr set -systflv 1
```

Refer to Table 2.11 for a description of the trace levels.

The trace file used is a Hitachi Network Objectplaza Trace Library (HNTRLib2) file, which is common to all Hitachi products.

Setting a higher value increases the quantity of log data that is output, which reduces the period it takes for file-writing to wrap around and overwrite existing log data. As a result, setting a higher value reduces the period during which old log data is retained.

For information and instructions on changing the trace file size, see 3.5.1.9.

Note that the history and results of user-issued commands are output to the trace files regardless of the trace level.

- **Setting the log file size.** To set the log file size, execute the **dlnkmgr** command with the **set** operation. The range is 100 KB to 9900 KB, and the default size is 9900 KB.

```
# /usr/DynamicLinkManager/bin/dlnkmgr set -elfs 9900
```

The log files are **dlnmgrn.log** (*n* = log file number 1, 2) and **dlngruin.log** (*n* = log file number 1, 2). If the sizes of both log files in a log file group reach the specified value, the oldest file in the group is wrapped around and is overwritten by the new log information.

5.7.2 Excluding Disks from HDLM Management

You need to exclude disks from HDLM management under the following circumstances:

- **CCI command devices:** HDLM does not support load balancing or failover for Command Control Interface (CCI) command devices. These disks must be excluded from HDLM management.
- **Boot disk:** When you install AIX® onto the management-target disk, and then create the boot disk in the management-target disk, and then install HDLM onto the boot disk, you must exclude the boot disk from HDLM management.
- **Damp devices:** HDLM cannot manage damp devices in the storage subsystem. When creating damp devices in the storage subsystem, you must exclude damp devices from HDLM management.

To exclude specific disks from HDLM management:

1. Check and make note of the physical volume (hdisk) entries corresponding to the HDLM device (dlmfdrv6) that is to be removed as a management target.

The following is an example of executing the command:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -drv | grep -w dlmfdrv6
000024 dlmfdrv6 hdisk10 9200.0010.0007
000025 dlmfdrv6 hdisk49 9200.0010.0007
000026 dlmfdrv6 hdisk80 9200.0010.0007
000027 dlmfdrv6 hdisk111 9200.0010.0007
```

2. Delete the HDLM device (dlmfdrv6) that is to be removed as a management target.

The following is an example of the command:

```
# rmdev -dl dlmfdrv6
```

3. Add the physical volume (hdisk) entries for the deleted HDLM device to the **dlmfdrv.unconf** file.

Continuing the environment in steps 1 and 2 above, add **hdisk10**, **hdisk49**, **hdisk80**, and **hdisk111** to **dlmfdrv.unconf**.

4. Make sure that the paths connected to the device that was removed as a management target have been deleted.

The following is an example of the command:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path | grep -w dlmfdrv6
```

In this example, there will be no problem if there are no path displays for **AutoPATH_ID**, **000024**, **000025**, **000026**, and **000027**.

5.7.3 Messages to be Output in a Monitoring Interval

This section explains how to adjust the number of messages output to fit a particular monitoring interval. For information on adjusting the trace file settings, please see section 3.5.1.9.

To adjust the number of messages to be output per monitoring interval:

1. In the Hitachi Network Objectplaza Trace Library setup menu, type **6** and then press the **Enter** key. A screen to set the monitoring interval for the amount of messages output to the trace file will appear. The current value is displayed in **Current Span (sec)** (Figure 5.8).

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility  Rel 2.0

Type the number of lookout span [1-3600 or 0]      (Type '!' to return)

Current Span(sec):    0
New Span(sec):
```

Figure 5.8 Current Value Display

2. Enter a desired interval in **New Span**. The specifiable range is between **0** and **3600** seconds, with a default of **0**. A value of **0** is recommended.

To leave the monitoring interval as is, leave **New Span** blank, type **!** and press the **Enter** key. You will be returned to the Hitachi Network Objectplaza Trace Library setup menu.

Note: When you specify a monitoring interval of **0**, even if you specify the maximum number of messages in **7: Max messages per span**, the amount of trace information to be output will not be adjusted.

3. Press the **Enter** key. The new setting is applied and the Hitachi Network Objectplaza Trace Library setup menu appears again.
4. In the Hitachi Network Objectplaza Trace Library setup menu, type **7** and press the **Enter** key. A screen to set the maximum number of messages output to the trace file based on the monitoring interval specified in **6: Lookout span** will appear. The current value is displayed in **Current Max** (Figure 5.9).

```
Hitachi Network Objectplaza Trace Library 2 - Configuration Utility  Rel 2.0

Type the number of max messages [0-500]      (Type '!' to return)

Current Max:    0
New Max:
```

Figure 5.9 Displaying Current Max

5. Adjust the maximum number of messages output to the trace files in **New Max**. The specifiable range is between **0** messages and **500** messages, with a default of **0**. A value of **0** is recommended.

When you specify a monitoring interval of **0** in **6: Lookout span**, the value set in **New Max** will be disregarded. **Note:** when you specify a value of **0** for **New Max**, even if you specify the monitoring interval in **6: Lookout span**, the maximum number of messages output will not be adjusted.

To leave the maximum number of messages output as is, leave **New Max** blank, enter **!** and press the **Enter** key. You will be returned to the Hitachi Network Objectplaza Trace Library setup menu.

6. Press the **Enter** key. The new setting is applied and the **HNTRLib** setup menu appears again.

Chapter 6 Using the HDLM dlnkmgr Command

This chapter describes the HDLM **dlnkmgr** command and its options, which are called *operations* in HDLM. Note that the term *HDLM command* can refer to the **dlnkmgr** command together with an operation (e.g., the **dlnkmgr set** command).

- Overview of the **dlnkmgr** command (see section 6.1)
 - **dlnkmgr** command format (see section 6.1.1)
 - Operations of the **dlnkmgr** command (see section 6.1.2)
- Clear operation (see section 6.2)
- Help operation (see section 6.3)
- Offline operation (see section 6.4)
- Online operation (see section 6.5)
- Set operation (see section 6.6)
- View operation (see section 6.7)

6.1 Overview of the dlnkmgr Command

6.1.1 dlnkmgr Command Format

When you are using HDLM for AIX® systems, execute the command as a user with root permissions. Enter the **dlnkmgr** command using the following format:

```
dlnkmgr operation-name [parameter[parameter-value]]
```

dlnkmgr: The command name

operation-name: The type of HDLM operation to be performed (see Table 6.1)

parameter: The value/setting required for an operation

parameter-value: The value/setting required for a parameter

Note: To specify a value which contains a space, enclose the entire value in double quotes (").

6.1.2 Operations of the dlnkmgr Command

Table 6.1 shows the operations of the HDLM **dlnkmgr** command and their functions.

Table 6.1 HDLM Command Operations and Functions

Operation	Function	Section
clear	Clears the statistics (I/O counts and I/O errors) of all paths managed by the HDLM system to the initial value (0).	6.2
help	Displays the format of the operation used for HDLM.	6.3
offline	Places an online path offline.	6.4
online	Places one or all offline paths online.	6.5
set	Sets the HDLM operating environment.	6.6
view	Displays HDLM program information, path information, and information about the correspondence between an HDLM driver and a disk device.	6.7

6.2 clear Operation

- **Format**

`usr/DynamicLinkManager/bin/dlnkmgr clear -pdst [-s]`

- **Description**

The **clear** operation together with the **dlnkmgr** command clears the statistics (I/O count and I/O errors) of all paths that are managed by HDLM to the initial value (0).

- **Parameters**

-pdst: Clears statistics (such as the path error count) to the initial value (0).

-s: Executes the command without displaying user confirmation message. Specify this parameter if you want to skip the user confirmation message for a shell script or batch file.

- **Examples**

Figure 6.1 shows how to clear the statistics to the initial value (0) after asking for confirmation of command execution from the user. Figure 6.2 shows how to clear the statistics to the initial value (0) without asking for confirmation of command execution from the user. Figure 6.3 shows how to display the format of the **clear** operation.

```
# /usr/DynamicLinkManager/bin/dlnkmgr clear -pdst
KAPL01049-I Would you like to execute the operation?
Operation name = clear [y/n]:y          ← Enter y to execute the command.
KAPL01001-I The HDLM command completed successfully. Operation name = clear, completion
time = 2005/06/01 12:00:00
#
```

Figure 6.1 Example of the Clear Command with User Confirmation

```
# /usr/DynamicLinkManager/bin/dlnkmgr clear -pdst -s
KAPL01001-I The HDLM command completed successfully. Operation name = clear, completion
time = 2005/06/01 12:00:00
#
```

Figure 6.2 Example of the Clear Command with no User Confirmation

```
# /usr/DynamicLinkManager/bin/dlnkmgr clear -help
clear:
  Format
    dlnkmgr clear -pdst [-s]
KAPL01001-I The HDLM command completed normally. Operation name = clear, completion time =
2005/06/01 12:00:0
#
```

Figure 6.3 Example of the Clear Operation Format

6.3 help Operation

- **Format**

`/usr/DynamicLinkManager/bin/dlnkmgr help [operation-name] [operation-name]`

- **Description**

The **help** operation together with the **dlnkmgr** command displays the list of operations available for the HDLM command, or the format of individual operations.

- **Parameter**

operation-name: Specify the name of the HDLM operation. You can check the format of multiple operations at one time by entering multiple operation names. When you enter multiple operation names, the operations are displayed in the order that you entered them. If you do not specify an operation name, HDLM displays all operations.

- **Examples**

Figure 6.4 shows how to display the names of all operations available in HDLM. Figure 6.5 shows how to display the format of the **online** and **offline** operations.

Note: Typing **-help** following the operation name will display the format of that operation (see Figure 6.6).

```
# /usr/DynamicLinkManager/bin/dlnkmgr help
dlnkmgr:
  Format
    dlnkmgr { clear | help | offline | online | set | view }
KAPL01001-I The HDLM command completed successfully. Operation name = help, completion time
= 2005/06/01 12:00:00
#
```

Figure 6.4 Example of the Help Command for all Operations

```
# /usr/DynamicLinkManager/bin/dlnkmgr help online offline
online:
  Format
    dlnkmgr online [-path] [-pathid AutoPATH_ID] [-s]
    dlnkmgr online [-path] -cha -pathid AutoPATH_ID [-s]
    dlnkmgr online [-path] [-pathid AutoPATH_ID] [-s]
  Valid value
    AutoPATH_ID {000000 - 999999} (Decimal)
offline:
  Format:
    dlnkmgr offline [-path] -hba HBAPortNumber.BusNumber [-s]
    dlnkmgr offline [-path] -cha -pathid AutoPATH_ID [-s]
    dlnkmgr offline [-path] -pathid AutoPATH_ID [-s]
  Valid value
    AutoPATH_ID {000000 - 999999} (Decimal)
KAPL01001-I The HDLM command completed successfully. Operation name = help, completion time
= 2005/06/01 12:00:00
#
```

Figure 6.5 Example of the Help Command for an Operation


```
# /usr/DynamicLinkManager/bin/dlnkmgr clear -help
clear:
  Format
    dlnkmgr clear -pdst [-s]
KAPL01001-I The HDLM command completed successfully. Operation name = help, completion time
= 2005/06/01 12:00:00
#
```

Figure 6.6 Example of the *-help* Option for an Operation

6.4 offline Operation

■ Format

```
/usr/DynamicLinkManager/bin/dlnkmgr offline  
[-path]  
{ -hba HBA-adapter-number.bus-number  
|-cha -pathid AutoPATH_ID  
|-pathid AutoPATH_ID}  
[-s]
```

■ Description

The **offline** operation together with the **dlnkmgr** command places online paths offline. You can specify the path(s) you want to place offline by specifying an HBA port or channel adapter port to which the path(s) are connected, or by specifying the path using the **-pathid** parameter. The last path accessing each device cannot be placed offline.

Note: Placing too many paths offline may prevent path switching if an error occurs. Before placing a path offline, use the **view** operation to check how many online paths remain.

■ Parameters

-path: Specifies that the target of the operation is a path managed by HDLM. This parameter is optional because the offline operation is only effective on paths. Make sure, however, that you specify the target path in the subsequent parameter (**-hba**, **-cha**, or **-pathid**).

-hba HBA-adapter-number.bus-number: Use this parameter to place offline at one time all paths that pass through a specific HBA port. This command will place offline all paths connected to the HBA port that has the specified HBA adapter number and bus number.

The HBA adapter number and bus number of an HBA port are found in the **PathName** field displayed by using the **view** operation. Enter a period between these two values. The *HBA-adapter-number.bus-number* string is case-sensitive.

-cha -pathid AutoPATH_ID: Use this parameter to place offline at one time all paths that pass through a specific channel adapter port. This command will place offline all paths that pass through the channel adapter port to which the path with the specified *AutoPATH_ID* is connected.

Specify the current *AutoPATH_ID* of the target path, which is displayed by using the **view** operation. Leading zeros can be omitted; however, when the target *AutoPATH_ID* is 000000, enter 000000 or 0 for the parameter value.

Because the *AutoPATH_IDs* are reassigned every time the management-target host or the HDLM manager is rebooted, always make sure that you find the current *AutoPATH_ID* of the target path using the **view** operation, before executing the **offline** operation.

-pathid AutoPATH_ID: Use this parameter to place a single path offline. Specify the current *AutoPATH_ID* of the path, which is displayed using the **view** operation. Leading zeros can be omitted; however, when the target *AutoPATH_ID* is 000000, enter 000000 or 0 for the parameter value.

Because the *AutoPATH_IDs* are reassigned to each path of the LU when you execute the **dlnmcfgmgr** utility for managing the HDLM configuration, always make sure that you find the current *AutoPATH_ID* of the target path using the **view** operation, before executing the **offline** operation.

-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.

- **Examples**

Figure 6.7 shows how to place offline all paths connected to the HBA port whose adapter number is 01 and bus number is 01. Figure 6.8 shows how to place offline all paths connected to the channel adapter port to which path 1 is connected (AutoPATH_ID = 000001, leading zeros omitted). Figure 6.9 shows how to place path 1 (AutoPATH_ID = 000001) offline without user confirmation of command execution.

```
# /usr/DynamicLinkManager/bin/dlnkmgr offline -hba 01.01
KAPL01055-I All the paths which pass the specified HBA will be changed to the Offline(C)
status. Is this OK? [y/n]:y          ← Enter y to execute, n to cancel.
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
#
```

Figure 6.7 Example of the Offline Operation With the -hba Parameter

```
# /usr/DynamicLinkManager/bin/dlnkmgr 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          ← Enter y to execute, n to cancel.
KAPL01056-I If you are sure that there would be no problem when all the paths which pass
the specified CHA are placed in the Offline(C) status, enter y. Otherwise, enter n. [y/n]:y
← Enter y to execute, n to cancel.
KAPL01061-I 2 path(s) were successfully placed offline(C). 0 path(s) were not. Operation
name = offline
#
```

Figure 6.8 Example of the Offline Operation With the -cha Parameter

```
# /usr/DynamicLinkManager/bin/dlnkmgr offline -pathid 1 -s
KAPL01061-I 1 path(s) were successfully placed offline. 0 path(s) were not. Operation name
= offline
#
```

Figure 6.9 Example of the Offline Operation With the -pathid Parameter

```
# /usr/DynamicLinkManager/bin/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]
  Valid value
    AutoPATH_ID {000000 - 999999} (Decimal)
KAPL01001-I The HDLM command completed normally. Operation name = offline, completion time
= 2005/06/01 12:00:00
#
```

Figure 6.10 Example of the Format of the offline Operation

■ Reference

Using the **view** operation together with standard UNIX® commands enables you to filter the path information listed for a specific HBA port or channel adapter port. Before you execute the offline operation to place offline all paths connected to a specific HBA port or channel adapter port, we recommend that you use the following command and verify the information on the target paths.

Example 1: The following example shows how to filter and display the information on all paths that pass through the HBA port whose HBA adapter number is 04 and bus number is 01.

```
# dlnkmgr view -path | grep 04.01
```

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 0A of the Thunder 9500V Series (product identifier = DF600F).

The following commands differentiate upper and lower case:

```
# dlnkmgr view -path | grep DF600F | grep 0A
```

The following commands do not differentiate upper and lower case:

```
# dlnkmgr view -path | grep -i df600f | grep -i 0a
```

The above commands will display information pertaining to only those paths that pass through the specified channel adapter port.

6.5 online Operation

■ Format

```
/usr/DynamicLinkManager/bin/dlnkmgr online [-path]
                                             { -hba HBA-adapter-number.bus-number
                                             | -cha -pathid AutoPATH_ID
                                             | -pathid AutoPATH_ID }
                                             [-s]
```

■ Description

The **online** operation together with the **dlnkmgr** command places offline paths online. You can specify the path(s) you want to place online by specifying an HBA port or channel adapter port to which the path(s) are connected, or by specifying the path using the **-pathid** parameter.

Note: If an error exists in two or more paths or if path health checking or automatic failback is running, response to the **dlnkmgr online** command may be slow.

■ Parameters

-path: Specifies that the target of the operation is a path managed by HDLM. This parameter is optional because the **online** operation is only effective on paths. You can specify the target path in a subsequent parameter: **-hba**, **-cha**, or **-pathid**. If you do not specify any of these parameters, the command places 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 HBA-adapter-number.bus-number: Use this parameter to place online at one time all paths that pass through a specific HBA port. This command will place online all paths connected to the HBA port that has the specified HBA adapter number and bus number.

The HBA adapter number and bus number of an HBA port are found in the **PathName** field displayed by using the **view** operation. Enter a period between these two values. The *HBA-adapter-number.bus-number* string is case-sensitive.

-cha -pathid AutoPATH_ID: Use this parameter to place online at one time all paths that pass through a specific channel adapter port. This command will place online all paths that pass through the channel adapter port to which the path with the specified *AutoPATH_ID* is connected.

Specify the current *AutoPATH_ID* of the target path, which is displayed by using the **view** operation. Leading zeros can be omitted; however, when the target *AutoPATH_ID* is 000000, enter 000000 or 0 for the parameter value.

*AutoPATH_ID*s are re-assigned every time the management-target host is restarted. When you want to add a new LU without restarting the management-target, *AutoPATH_ID*s are re-assigned to each path of the LU when you execute the HDLM configuration manager (**dlnmcfmgr**). Always make sure that you use the **view** operation to find the current *AutoPATH_ID* of the target path, before executing the **online** operation.

-pathid *AutoPATH_ID*: Use this parameter to place a single path online. Specify the current *AutoPATH_ID* of the path, which is displayed using the **view** operation. Leading zeros can be omitted; however, when the target *AutoPATH_ID* is 000000, enter 000000 or 0 for the parameter value.

Because the *AutoPATH_IDs* are reassigned to each path of the LU when you execute the HDLM configuration manager (`dlmcfmgr`), always make sure that you find the current *AutoPATH_ID* of the target path using the **view** operation, before executing the **online** operation.

-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.

■ Examples

Figure 6.11 example shows how to place online all paths connected to an HBA port whose HBA adapter number is 01 and bus number is 01. Figure 6.12 shows how to place online the paths connected to the channel adapter port to which path 2 is connected (*AutoPATH_ID* = 000002, leading zeros omitted). Figure 6.13 shows how to place path 2 (*AutoPATH_ID* = 000002) online without asking for user confirmation of command execution.

```
# /usr/DynamicLinkManager/bin/dlnkmgr online -hba 01.01
KAPL01057-I All the paths which pass the specified HBA will be changed to the Online
status. Is this OK? [y/n]:y          ← Enter y to execute, n to cancel.
KAPL01061-I 3 path(s) were successfully placed online. 0 path(s) were not. Operation name =
online
#
```

Figure 6.11 Example of the Online Operation With the **-hba** Parameter

```
# /usr/DynamicLinkManager/bin/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          ← Enter y to execute, n to cancel.
KAPL01061-I 2 path(s) were successfully placed online. 0 path(s) were not. Operation name =
online
#
```

Figure 6.12 Example of the Online Operation With the **-cha** Parameter

```
# /usr/DynamicLinkManager/bin/dlnkmgr online -pathid 2 -s
KAPL01022-I 1 path(s) were processed. Operation name = online
KAPL01001-I The HDLM command completed successfully. Operation name = online
#
```

Figure 6.13 Example of the Online Operation With No User Confirmation

```
# /usr/DynamicLinkManager/bin/dlnkmgr online -help
online:
Format
  dlnkmgr online [-path] -hba HBAPortNumber.BusNumber [-s]
  dlnkmgr online [-path] -cha -pathid AutoPATH_ID [-s]
  dlnkmgr online [-path] [-pathid AutoPATH_ID] [-s]
Valid value
  AutoPATH_ID      {000000 - 999999} (Decimal)
KAPL01001-I The HDLM command completed normally. Operation name = online, completion time =
2005/06/01 12:00:00
#
```

Figure 6.14 Example of the online Operation Format

■ Reference

Using the **view** operation together with standard UNIX® commands enables you to filter the path information listed for a specific HBA port or channel adapter port. Before you execute the offline operation to place offline all paths connected to a specific HBA port or channel adapter port, we recommend that you use the following command and verify the information on the target paths.

Example 1: The following example shows how to filter and display the information on all paths that pass through the HBA port whose adapter number is 04 and bus number is 01:

```
# dlnkmgr view -path | grep 04.01
```

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 0A of the Thunder 9500V Series (product identifier = DF600F).

The following commands differentiate upper and lower case:

```
# dlnkmgr view -path | grep DF600F | grep 0A
```

The above commands will display information pertaining to only those paths that pass through the specified channel adapter port.

Note: Response may become slow when the **dlnkmgr online** command is executed. This can happen for the following reasons.

- An error exists in two or more paths.
- Path health checking and/or automatic failback is running.

6.6 set Operation

■ Format

```
/opt/DynamicLinkManager/bin/dlnkmgr set
{-lb {on [-lbtype {rr|exrr}]|off}
|-ellv error-log-collection-level
|-elfs error-log-file-size
|-elfn number-of-error-log-files
|-systflv trace-level
|-systfs trace-file-size
|-systfn number-of-trace-files
|-pchk {on [-intvl checking-interval]|off}
|-afb {on [-intvl checking-interval]|off}
|-iem { on [-intvl error-monitoring-interval]
      [-iemnum number-of-times-error-is-to-occur] | off }
|-lic
|-rsv on reservation-level}
[-s]
```

■ Description

The **set** operation together with the **dlnkmgr** command sets the HDLM operating environment.

■ Parameters

Table 6.2 lists the parameters for the **set** operation and their default values. If you change a parameter using the **set** operation, the new value takes effect immediately. You can install HDLM 5.6 over HDLM 4.0 or later.

Load balancing distributes load among paths and prevents the performance of the entire system from deteriorating. As such, we recommend that you set this parameter to **on**.

Table 6.2 Default Settings

Parameter	Description	Default
-lb	Load balancing function	on: Enabled
-ellv	Log level	3: Collect error information for Information or higher level (that is, all levels).
-elfs	Log size	9900 (Kbytes)
-systflv	Trace level	0: Do not output any trace.
-pchk	Path health checking function	on: Enabled, with an execution interval of 30 minutes
-afb	Automatic failback	off: Disabled
-rsv on	Reservation control	on 2: Enabled, with persistent reservation

-lb {on[-lbtype {rr|exrr}]|off}: Enables (on) or disables (off) load balancing. The default is on.

-lbtype {rr|exrr}: Specify the algorithm to be used for load balancing.

rr: Round robin: All I/Os will be distributed across multiple paths.

exrr: Extended round robin

The type of I/O determines how I/Os will be distributed among paths. For sequential access, after an I/O or a set number of I/Os are issued to a path, the system switches to the next path, in order. If the access method is changed to random access before the number of issued I/Os reaches the set number, the system switches to the next path. The storage subsystem cache can be used. For random access, after an I/O or a set number of I/Os are issued to a path, the system switches to the next path in turn.

When multiple applications that request sequential access are performed concurrently and all of those applications use the same HBA as the most preferred HBA, we recommend that you use the round robin algorithm in order to distribute I/Os across multiple paths.

When you execute only a single application that requests sequential access, such as a batch job running at night, we recommend that you use the extended round robin algorithm.

The type of algorithm specified by the **-lbtype** parameter remains stored in the system, even when you disable load balancing function by specifying **-lb off**. Therefore, when you re-enable load balancing without specifying an algorithm, load balancing will be executed according to the setting stored in the system.

-ellv error-log-collection-level: Specifies the level of error information you want to collect for an error log (refer to Table 2.10). The default and recommended value is 3.

The following shows the log files in which an error log collection level can be set:

HDL Manager logs:

`dlmmgrn.log` (*n* indicates a file number from 1 to 16)

HDL GUI logs:

`dlmguin.log` (*n* indicates a file number of 1 or 2)

-elfs error-log-file-size

Specify a value from 100 to 2000000 (in kilobytes) for the size of the error log files. The target log files for which a file size can be set are HDLM manager logs (`dldmmgrn.log` (*n* indicates a file number from 1 to 16)) and HDLM GUI logs (`dldmguin.log` (*n* indicates a file number of 1 or 2)). For HDLM GUI logs, the valid range of a file size is from 100 to 9900. If you specify a value of 9901 or more, 9900 is applied. The specified value is applied for HDLM manager logs. The default and recommended setting is 9900.

By specifying both the log file size and the number of log files, you can collect up to 32,000,000 kilobytes (approximately 30GB) of error logs in total.

The log files of which you can specify the file size are:

HDLM manager log:

`dldmmgrn.log` (*n* indicates a file number from 1 to 16)

HDLM GUI log:

`dldmguin.log` (*n* indicates a file number of 1 or 2)

If the sizes of all log files in a log file group reach the specified value, writing to the oldest file of the corresponding log file group wraps around and new log data overwrites the old log data.

-systflv trace-level: specify the trace output level (refer to Table 2.11). The default is 0.

The larger the trace level value, the larger the amount of log information that is output. When a large amount of log information is output, the time taken for the file-writing to wrap around and delete old log data is reduced.

The file used in this case is a Hitachi Network Objectplaza Trace Library (HNTRLib2) file, which is a trace file common to all Hitachi products.

Note that the history and results of user-issued commands are output to the trace files regardless of the trace level.

-systfs trace-file-size: Specify the size of the trace file in kilobytes. Specify a value of 100 to 16000. The default and recommended value is 1000.

When combined with the specification for the number of trace files, the maximum total size of the trace files that can be collected is 1024000 kilobytes.

If a value smaller than the setting value is specified, an execution confirmation message KAPL01097-W is displayed and the trace file is once deleted.

The trace files for which a file size can be set are `hldmtrn.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 fixed. When trace data is written to all trace files, the oldest trace file wraps around and new trace data overwrites the old trace data.

-systfn number-of-trace-files: Specify the number of trace files. Specify a value of 2 to 64. The default and recommended value is 4.

When combined with the specification for the trace file size, the maximum total size of the trace files that can be collected is 1024000 kilobytes.

If a value smaller than the setting value is specified, an execution confirmation message KAPL01097-W is displayed and the trace file is once deleted.

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 *execution-interval*] | off}: Enables (on) or disables (off) path health checking. The default is on with an execution interval of 30 minutes.

Path health checking checks the paths that have the Online status.

For a standby host, or a host connected to the Thunder 9500V Series, Thunder 9200, Freedom Storage 5800, or Freedom Storage 5700E storage subsystem, we recommend that you activate path health checking to enable detection of errors in paths where I/Os do not occur.

When you specify **on**, specify the execution 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 interval used in the last time

The explanation for the following sub-parameter describes how to specify the checking interval.

-intvl *execution-interval*: Specify the interval between path health checks (in minutes). Use a value between 1 and 1440. The default is 30.

When you change the checking interval, the new interval takes effect immediately. If you decrease the checking interval and the new interval has already elapsed (from the end of the previous path health check until the time you change the interval), the path health check will start immediately.

After you change the checking interval, the new interval remains in effect even if you turn path health checking OFF and then later turn it back ON. When the specified interval has elapsed (starting from the time you turn path health checking ON), the path health check will start.

Caution: In previous versions of HDLM, path health checking was performed by executing a batch file that defined the **online** operation. Do not execute this batch file. With the current version, executing the **set** operation performs path health checking.

-afb {on [-intvl *execution-interval*] | off}: Enables (on) or disables (off) automatic failback. The default is off.

Automatic failback is executed in the following paths:

Paths where an error occurred and the KAPL08022-E message was displayed, and
Paths where an error occurred at the startup of the HDLM manager.

To prevent an intermittent error from deteriorating I/O performance, we recommend that you also enable intermittent error monitoring when enabling automatic failback. You can specify intermittent error monitoring only when automatic failback is enabled. See Table 6.3 for the relationship between automatic failback and intermittent error monitoring.

When you specify **on**, specify the checking interval of path status by specifying the parameter immediately following **on**. If you do not specify a checking interval, path status is checked in the following interval:

When the checking interval has not been specified before: Every 60 minutes (default setting)

When the checking interval has been specified before: The interval used in the last time.

-intvl *execution-interval*: Specify the interval between path status checks (in minutes). Use a value between 1 and 1440. The default is 60.

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, a message (KAPL01080-W) is output and an error occurs. In such a case, 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.

When you change the checking interval, the new interval takes effect immediately. If you decrease the checking interval and the new interval has already elapsed (from the end of the previous path status check until the time you change the interval), the path status check will start immediately.

After you change the checking interval, the new interval remains in effect even if you turn auto failback OFF and then later turn it back ON. When the specified interval has elapsed (starting from the time you turn path status checking ON), the path status check will start.

-iem { on [-intvl *error-monitoring-interval*] [-iemnum *number-of-times-error-is-to-occur*] | off } : Enables (on) or disables (off) intermittent error monitoring. The default is off.

Intermittent error monitoring can be set 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, in the subsequent parameters 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 (from the time that the monitoring interval starts, until the specified interval ends). A path that is assumed to have an intermittent error is excluded from automatic failback. Intermittent error monitoring is performed on individual paths. Intermittent error monitoring starts when a path is recovered from the error by using 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 210 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 the last time are set.

When a value of 2 or more is specified in 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 is output and an error occurs. In such a case, 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 to specify the error monitoring interval and the number of times that the error is to occur (in order for the system to determine that an intermittent error is occurring):

-intvl *error-monitoring-interval*: Specify the monitoring interval for an intermittent error (in minutes). Use a value from 1 to 1440. The default is 30.

During intermittent error monitoring, 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 error count and the elapsed time measured since monitoring starts are set to 0, and monitoring starts by using the new settings.

Outside the duration of intermittent error monitoring, 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 take effect after the next time automatic fallback succeeds. Because the errors and elapsed time are not counted or measured while intermittent errors are not monitored, those values do 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 the monitoring interval is not specified, error monitoring will be executed for the stored monitoring interval.

-iemnum *number-of-times-error-is-to-occur*: Specify the number of times the error is to occur. Use a value 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 starts are reset to 0. Then, the changed setting takes effect and intermittent error monitoring starts.

Outside the duration of 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, from the next time automatic fallback finishes normally, the changed values takes effect. Outside the duration of intermittent error monitoring, the number of errors that determine an intermittent error is not counted and this value is not changed.

The number of times that the error is to occur specified in this parameter is stored even though specifying **-iem** off disables intermittent error monitoring. Therefore, when you re-enable intermittent error monitoring and the number of times is not specified, the error monitoring will be executed using the stored number of times.

When the **set -iem on** operation is executed during error monitoring, even though you do not change the conditions for intermittent error, the number of errors and the time that has passed since the error monitoring starts are reset to 0. Then, intermittent error monitoring resumes with the changed settings.

If you set automatic fallback to off while intermittent error monitoring is on, intermittent error monitoring becomes disabled. Note, however, that if you use the **view -sys** operation to display the HDLM functionality configuration, Intermittent Error Monitor shows on. When automatic fallback is returned to on, intermittent error monitoring becomes enabled.

The executable operations for automatic failback and intermittent error monitoring depend on the setting status for those functions. Table 6.3 shows the relationship between the setting status for automatic failback and intermittent error monitoring and the executable operations for those functions.

-rsv on *reservation-level*: Specify the reservation control method for the disk: 0 or 2. The default is 2 (persistent reservation).

-lic: Updates the license. Specify this option when a license key is installed. The HDLM license is provided by a license key or a license key file. A license key file is a file that stores an HDLM license key. When using the license key file:

Directly under **/var/tmp**, save the license key file as **hdlm_license**, and then execute the **set -lic** operation. A message appears depending on the type of the license key specified in the license key file, notifying you that the license has been registered. For a temporary or emergency license, the expiration date is also displayed (KAPL01071-I or KAPL01072-I).

When not using the license key file:

The **set -lic** operation displays a message (KAPL01068-I) prompting you to enter a license key. Enter the license key. A message appears depending on the type of the license key specified in the license key file, notifying you that the license has been registered. For a temporary or emergency license, the expiration date is also displayed (KAPL01071-I or KAPL01072-I).

-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.

■ Examples

Set the log level. Figure 6.15 shows how to set the log level after asking for confirmation of command execution from the user.

```
# /usr/DynamicLinkManager/bin/dlnkmgr set -ellv 1
dlnkmgr set -ellv 1
Execute command? [y/n]: y          ← Enter y to execute the command.
KAPL01001-I The HDLM command completed successfully. Operation name = set, completion time
= 2005/06/01 12:00:00
#
```

Figure 6.15 Example of Set Operation with User Confirmation

Update the license key (when the license key file exists). Figure 6.16 shows how to update the license key when the license key file exists.

```
# /usr/DynamicLinkManager/bin/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 = /var/tmp/hdlm_license
KAPL01068-I Enter a license key: *****
KAPL01071-I A permanent license was installed.
KAPL01001-I The HDLM command completed normally. Operation name = set, completion time =
2005/06/01 12:00:00
#
```

Figure 6.16 Example of Updating a License Key (When the License Key File Exists)

Update the license key (when the license key file does not exist). Figure 6.17 shows how to update the license key when the license key file does not exist.

```
# /usr/DynamicLinkManager/bin/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 = /var/tmp/hdlm_license
KAPL01068-I Enter a license key:*****
KAPL01071-I A permanent license was installed.
#
```

Figure 6.17 Example of Updating a License Key (When the license key file does not exist)

When the confirmation is displayed, enter **y** to continue or **n** to cancel the operation. When a message prompts you to enter a license key, enter the license key.

Set the intermittent error monitoring. Figure 6.18 shows how to set the intermittent error monitoring.

```
# /usr/DynamicLinkManager/bin/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 successfully. Operation name = set, completion time
= 2005/06/01 12:00:00
#
```

Figure 6.18 Example of Setting Intermittent Error Monitoring


```

# /usr/DynamicLinkManager/bin/dlnkmgr set -help
set:
Format
  dlnkmgr set { -lb on [ -lbtype { rr | exrr } ]
              | -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
              | -rsv on ReserveLevel
              }
  [-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)
TraceFileSize      { 100 - 16000 }(KB)  (Default Value 1000)
Number-Of-TraceFiles { 2 - 64 }(Files)   (Default Value 4)
Interval-Time      { 1 - 1440 }(Minute) (Default Value 30)
  (pchk)
Interval-Time      { 1 - 1440 }(Minute) (Default Value 60)
  (afb)
Error-Monitor-Interval { 1 - 1440 }(Minute) (Default Value 210)
Number-Of-Times      { 1 - 99 }(Times)   (Default Value 3)
ReserveLevel        { 0 | 2 }             (Default Value "on 2")
KAPL01001-I The HDLM command completed normally. Operation name = set, completion time =
2005/06/01 12:00:00
#

```

Figure 6.19 Example of set Operation Format

6.7 view Operation

■ Format

To display program information:

```
/usr/DynamicLinkManager/bin/dlnkmgr view -sys  
[-sfunc|-msrv|-adv|-pdrv | -lic]  
[-t ]
```

To display path information (without selecting display items):

```
/usr/DynamicLinkManager/bin/dlnkmgr view -path  
[-hdev host-device-name]  
[-stname]  
[-iem]  
[-srt {pn|lu|cp}]  
[-t]
```

To display path information (by abbreviating the list items):

```
/usr/DynamicLinkManager/bin/dlnkmgr view -path -c  
[-stname]  
[-srt {lu|cp}]  
[-t]
```

To display path information (by selecting a display item):

```
/usr/DynamicLinkManager/bin/dlnkmgr view -path -item  
[pn] [dn] [lu] [cp] [type] [ic] [ie] [dnu] [hd] [iep]  
[-hdev host-device-name]  
[-stname]  
[-srt {pn|lu|cp}]  
[-t]
```

To display Lu information (without selecting items to be displayed):

```
/usr/DynamicLinkManager/bin/dlnkmgr view -lu  
[-hdev host-device-name | -pathid AutoPATH_ID]  
[-t]
```

To display LU information (displaying a summary):

```
/usr/DynamicLinkManager/bin/dlnkmgr view -lu -c [-t]
```

To display LU information (by selecting items to be displayed):

```
/usr/DynamicLinkManager/bin/dlnkmgr view -lu -item  
[ [slpr] [pn] [cp] [clpr] [type] [ic] [ie] [dnu] [iep]  
[vg] | all ]  
[-hdev host-device-name | -pathid AutoPATH_ID]  
[-t]
```

To display the correspondence information about each instance of an HDLM driver to a physical volume:

```
/usr/DynamicLinkManager/bin/dlnkmgr view -drv [-t]
```

To display the format of the view operation:

```
/usr/DynamicLinkManager/bin/dlnkmgr view -help
```

■ Description

The **view** operation together with the **dlnkmgr** command displays HDLM program information, path information, LU information, and corresponding information about an HDLM device, physical volume, and LDEV.

- **Parameters to display program information**

-sys [-sfunc | -msrv | -adv | -pdrv | -lic]: Displays the HDLM program information. Use one of the subsequent parameters (following **-sys**) to specify the program information you want to display. If you do not specify the subsequent parameter, the command displays all program information.

Table 6.3 shows the parameters and the displayed information.

-t: Does not display the title for each information item.

Table 6.3 View -sys Operation Parameters and Displayed Information

Parameter	Displayed Information
-sfunc	Information about the HDLM function settings
-msrv	Information about the HDLM manager
-adv	Information about the HDLM alert driver
-pdrv	Information about the HDLM driver
-lic	Information about the HDLM license

- **Parameters to display path information without selecting display items**

-path: When you specify the **-path** parameter and do not specify either the **-c** or **-item** parameter, the command displays information about the paths without abbreviating or selecting items.

In the subsequent sub-parameters (following **-path**), you can filter the paths to be listed (**-hdev**) and sort the list (**-srt**). When you omit both parameters, the command displays information for all the paths in order of increasing AutoPATH_IDs.

For details on what is displayed in each item, see Table 6.12.

The sub-parameters for the **-path** parameter are:

-hdev *host-device-name*: Filters the information only for the paths accessing the specified host device. Specify the name of the logical device file for the HDLM device (**d1mfdrv*n***, where *n* indicates the instance number of the HDLM driver), to indicate the desired host device.

-stname: Use this parameter to display the model name of the storage subsystem in the product ID part of the **DskName** field. When this parameter is omitted, the command displays the product identifier or emulation type of the subsystem instead.

-iem: Use this parameter to add IEP to path information and display information about intermittent errors. For more information pertaining to IEP, see Table 6.14.

-srt {pn | lu | cp}: Use this parameter to sort the list of 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 subsystem (**DskName**), the second sorting key is the value that you specify with the **-srt** parameter, and the third sorting key is the AutoPATH_ID.

The values that you can specify for the second sorting key are:

pn: Path name

lu: LU number of the storage subsystem

cp: Port number of the channel adapter

When the **-srt** parameter is omitted, the path information is listed in order of ascending AutoPATH_IDs.

-t: Does not display the title for each information item

■ **Parameters to display path information by abbreviating the list items**

-path -c: When you specify the **-path** parameter together with the **-c** parameter, the command selects certain items to be displayed, and shortens the contents of each item so that the information about each path fits into a single line on the screen.

The items that are displayed are **PathID**, **DskName**, **iLU**, **CP**, **Status**, and **Type**.

For details on what is displayed in each item, see Table 6.12.

When you use the **-c** parameter, the number of characters that can be displayed in the product ID part of the **DskName** field is limited to 10. Therefore, when there are 11 or more characters in the product ID, the 8th and following characters are abbreviated to ellipses (...).

The subsequent sub-parameters (following **-path -c**) are:

-stname: Use this parameter to display the model name of the storage subsystem in the product ID part of the **DskName** field. When this parameter is omitted, the command displays the product identifier or emulation type of the subsystem instead.

-srt {lu|cp}: Use this parameter to sort the list of 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 subsystem (**DskName**), the second sorting key is the value that you specify with the **-srt** parameter, and the third sorting key is the **AutoPATH_ID**.

The values that you can specify for the second sorting key are:

lu: LU number of the storage subsystem

cp: Port number of the channel adapter

When the **-srt** parameter is omitted, the path information is listed in order of ascending AutoPATH_IDs.

-t: Does not display the title for each information item

- **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.

When the value of the **-item** parameter is omitted, only the **PathID** and the **Status** fields are displayed.

Table 6.4 shows the correspondence between the items that can be displayed by the **dlnkmgr view -path -item** command and the parameter values for displaying each item.

In the subsequent sub-parameters (following **-path -item**), you can filter the paths to be listed (**-hdev**) and sort the list (**-srt**). When you omit both parameters, the command displays information for all the paths in order of increasing **AutoPATH_IDs**.

The subsequent sub-parameters (following **-path -item**) are:

-hdev *host-device-name*: Filters the information only for the paths accessing the specified host device.

Specify the HDLM driver's special file name, **dlnmfdrvn** (where **n** indicates the instance number of the driver), to indicate the desired host device. The *host-device-name* string is case-sensitive.

When you specify this parameter, **HDevName** is displayed by default. Therefore, it is not necessary to specify **hd** for the **-item** parameter.

-stname: Use this parameter to display the model name of the storage subsystem in the product ID part of the **DskName** field. When this parameter is omitted, the command displays the product identifier or emulation type of the subsystem instead.

When you use the **-stname** parameter, **DskName** is displayed by default. Therefore, it is not necessary to specify **dn** for the **-item** parameter.

-srt {pn|lu|cp}: Use this parameter to sort the list of 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 subsystem (**DskName**), the second sorting key is the value that you specify with the **-srt** parameter, and the third sorting key is the **AutoPATH_ID**.

The values that you can specify for the second sorting key are:

pn: Path name

lu: LU number of the storage subsystem

cp: Port number of the channel adapter

When the **-srt** parameter is omitted, the path information is listed in order of ascending **AutoPATH_IDs**.

When you use the **-srt** 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.

-t: Does not display the title for each information item

Table 6.4 Values of the `-item` Parameter for the `dlkmgr view -path -item` Command

Value of the <code>-item</code> Parameter	Description
<i>None</i>	PathID*
<i>None</i>	Status*
pn	PathName
dn	DskName
lu	iLU
cp	ChaPort
type	Type
ic	IO-Counts
ie	IO-Errors
dnu	DNum
hd	HDevName
iep	IEP

* Because both **PathID** and **Status** are always displayed, they do not require any parameters to be specified.

■ **Parameters to display LU information (without selecting items to be displayed)**

-lu: When neither the `-c` nor `-item` parameter is specified with the `-lu` parameter, the information about the LU recognized by HDLM is displayed without selecting items to be displayed or displaying a summary. The sorting key is iLU and its configuration information is displayed for each LU.

By using the subsequent parameter (`-hdev` or `-pathid`), you can filter the LU information to be displayed. If you do not specify `-hdev` or `-pathid`, the information about all LUs recognized by HDLM is displayed.

For details on the contents of each display item, see Table 6.15.

The subsequent parameters are:

-hdev *host-device-name*: Displays only the information about the LU corresponding to the specified host device name.

Specify the HDLM driver's special file name, `dlnmfdrvn` (where *n* indicates the instance number of the driver), to indicate the desired host device. The host-device-name string is case-sensitive.

-pathid *AutoPATH_ID*: Use this parameter to display only the information about the LU to which the path with the specified *AutoPATH_ID* is connected.

-t: Does not display the title for each information item.

- **Parameters to display LU information (displaying a summary)**

-lu -c: When the **-c** parameter is specified with the **-lu** parameter, a summary of LU configuration information is displayed on a line. The total number of paths recognized by HDLM and the number of online paths are displayed for each LU.

Note: You cannot specify the **-c** parameter together with the **-hdev** or **-pathid** parameter.

For details on the contents of each display item, see Table 6.16.

-t: Does not display the title for each information item.

- **Parameters to display LU information (selecting items to be displayed)**

-lu -item: The items specified with the **-item** option are added to the items to be displayed by the **-lu** option and displayed.

Note: When the value of the **-item** parameter is omitted or all is specified, all the items that can be displayed are displayed.

Table 6.5 shows the correspondence between the items that can be displayed by the **dlnkmgr view -lu -item** command and the parameter values for displaying each item.

Table 6.5 Items Displayed by the **dlnkmgr view -lu -item** Command and the Values of the **-item** Parameter

Items Displayed by the dlnkmgr view -lu -item Command	Values Specified after the -item
SLPR	slpr
PathName	pn
ChaPort	cp
CLPR	clpr
Type	type
IO-Count	ic
IO-Errors	ie
DNum	dnu
IEP	iep
VG	vg
All items are displayed	all

In the subsequent sub-parameters (**-hdev** or **-pathid**), you can filter the LU information to be displayed. When you omit both parameters, the command displays the information about all the LUs recognized by HDLM.

For details on the contents of each displayed item, see Table 6.16.

The subsequent sub-parameters are:

-hdev *host-device-name*: Displays only the information about the LU corresponding to the specified host device name.

Specify the HDLM driver's special file name, **dlnmfdrv*n*** (where *n* indicates the instance number of the driver), to indicate the desired host device. The *host-device-name* string is case-sensitive.

-pathid *AutoPATH_ID*: Use this parameter to display only the information about the LU to which the path with the specified **AutoPATH_ID** is connected.

-t: Does not display the title for each information item.

■ **Parameters to display a summary of LU information (without selecting items to be displayed)**

-lu -c: When the **-c** parameter is specified with the **-lu** parameter, a summary of LU configuration information is displayed on a line. The total number of paths recognized by HDLM and the number of online paths are displayed for each LU.

You cannot specify the **-c** parameter together with the **-hdev** or **-pathid** parameter.

For details on the contents of each display item, see Table 6.5.

-t: Does not display the title for each information item.

■ **Parameters to display a summary of LU information (by selecting items to be displayed)**

-lu -c -item: The items specified with the **-item** option are added to the items to be displayed by the **-lu -c** option and displayed.

If no value is specified or **all** is specified for the **-item** parameter, the command displays all of the items that can be displayed.

Table 6.6 shows the correspondence between the items that can be displayed by the **dlnkmgr view -lu -c -item** command and the value specified after the **-item** parameter.

Table 6.6 Correspondence Between the Item Displayed by the **dlnkmgr view -lu -c -item** Command and the Value of the **-item** Parameter

Item Displayed by the dlnkmgr view -lu -c -item Command	Value Specified after the -item Parameter
SLPR	slpr
VG	vg
All items	all

The subsequent sub-parameter is:

-t: Does not display the title for each information item.

- **Parameters to display relationships between HDLM drivers and physical volumes**
 - drv: Displays the correspondence between the PathID, HDLM driver, physical volume corresponding to the HDLM driver, and the LDEV information (storage subsystem model name, serial number, and character string, where LU numbers are delimited by periods).
 - t: Does not display the title for each information item.
- **Examples**
 - HDLM function settings.** Figure 6.20 shows how to display information about the HDLM function settings. Table 6.7 describes the displayed items.
 - HDLM manager.** Figure 6.21 shows how to display information about the HDLM manager. Table 6.8 describes the displayed items.
 - HDLM alert driver.** Figure 6.22 shows how to display information about the HDLM alert driver. Table 6.9 describes the displayed items.
 - HDLM driver.** Figure 6.23 shows how to display information about the HDLM driver. Table 6.10 describes the displayed items.
 - Paths that access a host device.** Figure 6.24 shows how to display information about the paths that access the host device whose name is `d1mfdrv1`. Table 6.12 describes the displayed items.
 - Abbreviated path information.** Figure 6.26 shows how to abbreviate the display of path information, ordered by iLU. For details on the displayed items, refer to Table 6.12.
 - Specifying path info.** Figure 6.27 shows how to specify the items to display in an execution result. In this example, the user specified PathName, ChaPort, IO-Counts, and IO-Errors (Path ID and Status are always displayed). For details on the displayed items, refer to Table 6.12.
 - LU information.** Figure 6.28 shows how to display LU information. Table 6.15 describes the displayed items.
 - Abbreviated LU information.** Figure 6.29 shows how to abbreviate the display of the LU information. Table 6.15 describes the displayed items.
 - Specifying device information.** Figure 6.30 shows how to specify the items to display in an execution result ordered by iLU. In this example, the user specified PathName, ChaPort, Type, IO-Counts, IO-Errors, DskName, IEP, and VG. For details on the displayed items, refer to Table 6.16.

Displaying LU Information:

Without Selecting Items to be Displayed. Figure 6.31 shows how to display LU information without selecting specific items to be displayed.

Using iLUs as a Sorting Key, and Selecting the Items to be Displayed. Figure 6.32 shows how to display LU information using iLUs as a sorting key.

Display a Summary of the LU Information (Without Selecting Items to be Displayed): Figure 6.33 shows how to display a summary of LU information without selecting specific items to be displayed.

Displaying a Summary of the LU Information by Selecting Items to be Displayed. Figure 6.34 shows how to display a summary of LU information by selecting specific items to be displayed.

HDLM driver instances and disk devices. shows how to display information about the correspondence between each instance of an HDLM driver and a physical volume.

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -sys -sfunc
HDLM Version           : 05-40
Load Balance           : on
Support Cluster         :
Elog Level              : 3
Elog File Size(KB)      : 9900
Trace Level             : 1
Path Health Checking    : on(30)
Auto Failback           : on(1)
Reservation Status      : on(2)
Intermittent Error Monitor : on(3/30)
KAPL01001-I The HDLM command completed successfully. Operation name = view
#
```

Figure 6.20 Displaying Information on the HDLM Function Settings

Note: The HDLM version is shown in screen captures as 05-40. This is equivalent to version 5.4.

Table 6.7 Description of HDLM Function Settings

Function Setting	Description
HDLM Version	HDLM version number
Service Pack Version	HDLM service pack version number. This item is blank if a service pack is not installed.
Load Balance	Setting for load balancing: on: Enabled off: Disabled
Support Cluster	The dlkmgr view -sys command displays nothing in this field. However, HDLM operates normally in both cluster and non-cluster configurations.
Elog Level	Error Logging level: 0: Do not collect an error log. 1: Collect error information for the Error or higher level. 2: Collect error information for the Warning or higher level. 3: Collect error information for the Information or higher level (that is, all levels). 4: Collects error information at the Information or higher level (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	Trace output level: 0: Do not output any trace. 1: Only output error information. 2: Output a summary of program operation. 3: Output details of program operation. 4: Output all information.
Trace File Size (KB)	Trace file size in kilobytes
Number of Trace Files	Number of trace files
Path Health Checking	Setting for path health checking: on: Enabled off: Disabled When path health checking is on , the execution interval (in minutes) of path health checking is displayed in parentheses (refer to Figure 6.20).
Auto Failback	Setting for automatic failback: on: Enabled off: Disabled When automatic failback is on , the execution interval (in minutes) of automatic failback is displayed in parentheses (refer to Figure 6.20).
Reservation Status	Setting for disk reservation control: on: Enabled Reservation level: displayed within the parentheses, (), after on. 0: Ignore reservation 2: Persistent reservation

Function Setting	Description
Intermittent Error Monitor	<p>Setting for intermittent error monitoring</p> <p>on: Enabled off: Disabled</p> <p>When automatic fallback is off, intermittent error monitoring is disabled although Intermittent Error Monitor shows on. When automatic fallback becomes on, intermittent error monitoring becomes enabled.</p> <p>Intermittent error monitoring interval and number of times that the error is to occur:</p> <p>When intermittent error monitoring is set to on, the specified intermittent error monitoring interval and number of times that the error is to occur are displayed in parentheses, (), following on. The format is number-of-times-error-is-to-occur/monitoring-interval. The time is in minutes.</p>

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -sys -msrv
HDL Manager Ver      WakeupTime
Alive      05-60      2005/06/01 11:37:56
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
```

Figure 6.21 Displaying Information on the HDLM Manager

Note: The HDLM version is shown in screen captures as 05-40. This is equivalent to version 5.4.

Table 6.8 Description of HDLM Manager Information

Item	Description
HDL Manager	Status of the HDLM manager: Alive: Normal Dead: Stopped
Ver	Version number of the HDLM manager
WakeupTime	Startup time of the HDLM manager

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -sys -adrv
HDL Alert Driver Ver      WakeupTime      ElogMem Size
Alive      05-60      2005/06/01 10:33:03 1000
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
#
```

Figure 6.22 Displaying Information on the HDLM Alert Driver

Note: The HDLM version is shown in screen captures as 05-40. This is equivalent to version 5.4.

Table 6.9 Description of the HDLM Alert Driver Information

Item	Description
HDLM Alert Driver	Status of the HDLM alert driver: Alive: Normal Dead: Stopped
Ver	Version number of the HDLM alert driver
WakeupTime	Startup time of the HDLM alert driver
Elog Mem Size	Size of error log memory for the HDLM alert driver

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -sys -pdrv
HDLM Driver Ver      WakeupTime
Alive      05-60      2005/06/01 11:28:34
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
#
```

Figure 6.23 Displaying Information on the HDLM Driver

Note: The HDLM version is shown in screen captures as 05-40. This is equivalent to version 5.4.

Table 6.10 Description of the HDLM Driver Information

Item	Description
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

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path -hdev dlmfdrv1
Paths:000001 OnlinePaths:000001
PathStatus  IO-Count  IO-Errors
Online      0          0

PathID PathName                               DskName
iLU      ChaPort Status      Type IO-Count  IO-Errors  DNum
HDevName
000006 08.14.00000000000000E2.0001      HITACHI .OPEN-3      .15001
0005      2H      Online      Own      0          0      0
dlmfdrv1
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
#
```

Note: The column headings in this figure have been modified for improved readability: bold has been applied, spacing has been adjusted, and the headings are repeated for each path. The actual display is different than this figure.

Figure 6.24 Displaying Information on the Host Device Path

Figure 6.25 shows how to display information about the HDLM license.

```
#/ usr/DynamicLinkManager/bin/dlnkmgr view -sys -lic
LicenseType  Expiration
Permanent    -
KAPL01001-The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
#
```

Figure 6.25 Displaying Information about the HDLM License

Table 6.11 Description of the HDLM License Information

Item	Description
LicenseType	License types are one of the following: Permanent Temporary Emergency
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: YYYY/MM/DD(ndays after). When the view -sys -lic operation is executed, (ndays after) appears if there are n days left until the license period expires. When there are 100 days left until the license period (2005/08/21) expires 2005/08/21(100days after)

Table 6.12 Description of the Path Information

Item	Description
Paths	Total number of displayed paths, indicated by a decimal number.
OnlinePaths	Number of available paths in the displayed paths, indicated by a decimal number. When the value of Paths equals the value of OnlinePaths, all 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 take appropriate action for any paths that have an error status.
PathStatus	Status of the displayed paths: Online: All paths are available. Reduced: Some paths are not available. Reduced means that some paths might have an error status, in which case you should check the status of individual paths and take appropriate action for any paths that have an error status.
IO-Count	Total I/O count for the displayed paths, indicated by a decimal number. The maximum value 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.
IO-Errors	Total I/O error count for the displayed paths, indicated by a decimal number. The maximum value 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.
PathID	AutoPATH_ID , indicated by a decimal number. AutoPATH_ID is assigned when the management target host is restarted or when a path configuration is changed. When a new LU was added and the management-target host has not been restarted, AutoPATH_ID is assigned to each path of the LU when you execute the HDLM config manager (dlmcfmgr).
PathName	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 path that will be affected by the change Path name that consists of the following four items, separated by periods: HBA adapter number (character string) Bus number (character string) Target ID (hexadecimal number) Host LU number (hexadecimal number) Table 4.6 contains details on path name components. Note: Whenever you modify the system configuration or replace a hardware item, you should check the path names to determine if any of the physical paths are affected by the configuration or hardware change.
DskName	Storage subsystem name, which identifies the storage subsystem that is accessed by a path. A storage subsystem name consists of the following three elements, separated by periods: <ul style="list-style-type: none"> Vendor ID: The name of the storage subsystem vendor (for example, HITACHI). Product ID: Indicates the storage subsystem product ID, emulation type, or model name (for example, OPEN-3OPEN-3). Serial number: The serial number of the storage subsystem (for example, 15001). You can identify an actual storage subsystem by referencing the above information from the storage subsystem management program. <ul style="list-style-type: none"> When the -sname parameter is not specified: The product ID element shows the product ID or emulation type of the storage subsystem. When the -sname parameter is specified: The product ID element shows the model name of the storage subsystem.

Item	Description
iLU	<p>LU number within the storage subsystem (e.g., two-digit CU and two-digit LDEV) (hexadecimal number)</p> <p>This number combined with the storage subsystem name (shown in DskName) identifies the LU that is accessed by a path.</p> <p>For TagmaStore USP, Lightning 9900V Series, Lightning 9900 Series, and Freedom Storage 7700E, the first two characters of iLU are the CU number, and the last two characters are the internal LU number within the CU. For the Thunder 9500V Series, Thunder 9200 Series, Freedom Storage 5800, and Freedom Storage 5700E, the entire value of iLU is the internal LU number within the storage subsystem. You can identify an actual LU by referencing iLU from the storage subsystem management program.</p>
ChaPort	<p>Port number of the channel adapter, which identifies the CHA that is mounted on the storage subsystem. You can identify an actual CHA by referencing this number from the storage subsystem management program.</p> <p>For the Lightning 9900V Series, the port number of the channel adapter is the same as the number shown by the SVP.</p>
Status	<p>Status of the path:</p> <p>Online: Online</p> <p>Offline(C): Offline by a command, using the Path Management window of the HDLM GUI, or using the Show Path List subwindow of the HDLM Web GUI.</p> <p>Offline(E): Offline due to an error</p> <p>Online(E): Failure has occurred (If none of the paths accessing a device is in the Online status, one of the paths is changed to the Online(E) status.)</p> <p>Paths that are Offline(E) or Online(E) require corrective action.</p>
Type	Attribute of the path: Own (Owner path), or Non (Non-owner path)
IO-Count	<p>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 is reset, and the count is re-started from 0.</p> <p>To reset the IO-Count value to zero, execute the dlnkmgr command's clear operation. Executing the clear operation also resets the number of I/O errors (IO-Errors) to zero.</p>
IO-Errors	<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 is reset, and the count is re-started from 0.</p> <p>To reset the IO-Errors value to zero, execute the dlnkmgr command's clear operation. Executing the clear operation also clears the number of I/O operations (IO-Count) to zero.</p>
DNum	<p>Dev number, indicated by a decimal number.</p> <p>This item pertains to a logical volume number.</p> <p>There is one Dev in an LU, so the number is fixed to 0.</p>
HDevName	Host device name. The logical device file name of the HDLM device (dlnmfdrvn , where n is the driver's instance number) is displayed.
IEP	<p>Information about the intermittent error. This item is displayed only when you specify -iem with the -path parameter.</p> <p>-: Indicates that intermittent error monitoring is disabled or the monitoring time for an intermittent error is out of range.</p> <p>Numerical value larger than 0: Indicates the number of errors that occurred during intermittent error monitoring.</p> <p>*: Indicates that an intermittent error occurred (automatic fallback does not check the path).</p>

Table 6.13 shows the path status and contents displayed in IEP when intermittent error monitoring is enabled.

Table 6.13 Path Status and Contents Displayed in IEP When Intermittent Error Monitoring is Enabled

Contents Displayed in IEP	Status of the Intermittent Error Monitoring	Path status
*	The path is assumed to be an intermittent error and is removed from items subject to automatic failback.	Online(E) Offline(E)
Numerical value 0 or more	Inside the period of intermittent error monitoring	Online(E) Offline(E) Online
Not applicable.	Outside the period of intermittent error monitoring	Online(E) Offline(E) Online Offline(C)

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path -c -srt lu
Paths:000012 OnlinePaths:000012
PathStatus   IO-Counts  IO-Errors
Online       1616        0

PathID DskName          iLU          CP Status    Type
000000 HITACHI .DF600F .0051        0005        0A Online    Own
000003 HITACHI .DF600F .0051        0005        1A Online    Non
000001 HITACHI .DF600F .0051        0014        0A Online    Non
000004 HITACHI .DF600F .0051        0014        1A Online    Own
000002 HITACHI .DF600F .0051        0015        0A Online    Non
000005 HITACHI .DF600F .0051        0015        1A Online    Own
000006 HITACHI .OPEN-3 .15001      0005        1H Online    Own
000009 HITACHI .OPEN-3 .15001      0005        2H Online    Own
000007 HITACHI .OPEN-3 .15001      0015        1H Online    Own
000010 HITACHI .OPEN-3 .15001      0015        2H Online    Own
000008 HITACHI .OPEN-3 .15001      0020        1H Online    Own
000011 HITACHI .OPEN-3 .15001      0020        2H Online    Own
KAPL01001-I The HDLM command completed successfully. Operation name = view
#
```

Figure 6.26 Displaying Abbreviated Path Information

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path -item pn cp ic ie
Paths:000006 OnlinePaths:000006
PathStatus   IO-Counts   IO-Errors
Online       190           0

PathID PathName                               ChaPort  Status   IO-Counts  IO-Errors
000000 08.14.000000000000000E2.000C          1H      Online      95         0
000001 08.14.000000000000000E2.000D          2H      Online       0         0
000002 08.14.000000000000000E2.000E          1H      Online       0         0
000003 08.14.000000000000000E2.000C          2H      Online       0         0
000004 08.14.000000000000000E2.000D          1H      Online      95         0
000005 08.14.000000000000000E2.000E          2H      Online       0         0
KAPL01001-I The HDLM command completed successfully. Operation name = view
#
```

Figure 6.27 Displaying Specific Items of Path Information

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -lu
Product      : USP
SerialNumber : 0014010
LUs          : 10

iLU  HDevName Device PathID Status
003A dlmfdrv0 hdisk12 000000 Online
      hdisk2  000001 Online
003B dlmfdrv1 hdisk13 000002 Online
      hdisk3  000003 Online
003C dlmfdrv2 hdisk14 000004 Online
      hdisk4  000005 Online
003D dlmfdrv3 hdisk15 000006 Online
      hdisk5  000007 Online
003E dlmfdrv4 hdisk16 000008 Online
      hdisk6  000009 Online
003F dlmfdrv5 hdisk17 000010 Online
      hdisk7  000011 Online
0040 dlmfdrv6 hdisk18 000012 Online
      hdisk8  000013 Online
0041 dlmfdrv7 hdisk19 000014 Online
      hdisk9  000015 Online
0042 dlmfdrv8 hdisk20 000016 Online
      hdisk10 000017 Online
0043 dlmfdrv9 hdisk21 000018 Online
      hdisk11 000019 Online
KAPL01001-I The HDLM command completed normally. Operation name = view
#
```

Figure 6.28 Displaying LU Information

Table 6.14 Device Information Using Host LUs as a Sorting Key

Item	Description
Product	Model name of the storage subsystem
Serial number	Serial number of the storage subsystem
LUs	Total number of LUs managed by HDLM among the LUs in the storage subsystem
iLU	LU number in the storage subsystem
HDevName	In AIX, the logical device file name of the HDLM device (dlmfdvsn , where n is the driver's instance number) is displayed.
Device	Physical volume name that corresponds to each instance of an HDLM driver
PathID	AutoPATH_ID indicated by a decimal number
Status	<p>Status of the path</p> <p>Online: Online</p> <p>Offline(C): Placed offline by using the Path Management window of the HDLM GUI, by using the Show Path List subwindow of the HDLM Web GUI, or by a command</p> <p>Offline(E): Offline due to an error</p> <p>Online(E): Failure has occurred (If none of the paths accessing a device is in the Online status, one of the paths is changed to the Online(E) status.)</p>

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path -c -srt lu
Paths:000012 OnlinePaths:000012
PathStatus   IO-Count   IO-Errors
Online       1616         0

PathID DskName                               iLU          CP Status    Type
000000 HITACHI .DF600F .0051          0005         0A Online    Own
000003 HITACHI .DF600F .0051          0005         1A Online    Non
000001 HITACHI .DF600F .0051          0014         0A Online    Non
000004 HITACHI .DF600F .0051          0014         1A Online    Own
000002 HITACHI .DF600F .0051          0015         0A Online    Non
000005 HITACHI .DF600F .0051          0015         1A Online    Own
000006 HITACHI .OPEN-3 .15001        0005         1H Online    Own
000009 HITACHI .OPEN-3 .15001        0005         2H Online    Own
000007 HITACHI .OPEN-3 .15001        0015         1H Online    Own
000010 HITACHI .OPEN-3 .15001        0015         2H Online    Own
000008 HITACHI .OPEN-3 .15001        0020         1H Online    Own
000011 HITACHI .OPEN-3 .15001        0020         2H Online    Own
KAPL01001-I The HDLM command completed normally. Operation name = view,
completion time = 2005/06/01 12:00:00
#
```

Figure 6.29 Displaying Abbreviated LU Information

Table 6.15 Device Information using Host LUs as a Sorting Key and Displaying a Summary

Item	Description
Product	Model name of the storage subsystem
S/N	Serial number of the storage subsystem
VG	Volume group name
LUs	Total number of LUs managed by HDLM among the LUs in the storage subsystem
iLU	LU number in the storage subsystem
HDevName	In AIX, the logical device file name of the HDLM device (dlmfdrv <i>n</i> , where <i>n</i> is the driver's instance number) is displayed.
Paths	Total number of the paths recognized by HDLM for the LU to be displayed, indicated by a decimal number
OnlinePaths	Number of available paths among the paths recognized by HDLM for the LU to be displayed, indicated by a decimal number

```

# /usr/DynamicLinkManager/bin/dlnkmgr view -lu -item pn cp type ic ie dnu iep vg
Product      : USP
SerialNumber  : 0014010
LUs          : 10

iLU  HDevName VG      Device  PathID PathName                      ChaPort Status
Type IO-Count  IO-Errors DNum IEP
003A dlmfdrv0 -        hdisk12 000000 08.1f.0000000000610813.003A    6A      Online
Own      0          0      0 -
        hdisk2  000001 08.1c.0000000000610813.003A    6A      Online
Own      0          0      0 -
003B dlmfdrv1 samplevg001 hdisk13 000002 08.1f.0000000000610813.003B    6A      Online
Own     2723          0      0 -
        hdisk3  000003 08.1c.0000000000610813.003B    6A      Online
Own     2714          0      0 -
003C dlmfdrv2 samplevg002 hdisk14 000004 08.1f.0000000000610813.003C    6A      Online
Own      42          0      0 -
        hdisk4  000005 08.1c.0000000000610813.003C    6A      Online
Own      31          0      0 -
003D dlmfdrv3 -        hdisk15 000006 08.1f.0000000000610813.003D    6A      Online
Own      0          0      0 -
        hdisk5  000007 08.1c.0000000000610813.003D    6A      Online
Own      0          0      0 -
003E dlmfdrv4 -        hdisk16 000008 08.1f.0000000000610813.003E    6A      Online
Own      0          0      0 -
        hdisk6  000009 08.1c.0000000000610813.003E    6A      Online
Own      0          0      0 -
003F dlmfdrv5 -        hdisk17 000010 08.1f.0000000000610813.003F    6A      Online
Own      0          0      0 -
        hdisk7  000011 08.1c.0000000000610813.003F    6A      Online
Own      0          0      0 -
0040 dlmfdrv6 -        hdisk18 000012 08.1f.0000000000610813.0040    6A      Online
Own      0          0      0 -
        hdisk8  000013 08.1c.0000000000610813.0040    6A      Online
Own      0          0      0 -
0041 dlmfdrv7 -        hdisk19 000014 08.1f.0000000000610813.0041    6A      Online
Own      0          0      0 -
        hdisk9  000015 08.1c.0000000000610813.0041    6A      Online
Own      0          0      0 -
0042 dlmfdrv8 -        hdisk20 000016 08.1f.0000000000610813.0042    6A      Online
Own      0          0      0 -
        hdisk10 000017 08.1c.0000000000610813.0042    6A      Online
Own      0          0      0 -
0043 dlmfdrv9 -        hdisk21 000018 08.1f.0000000000610813.0043    6A      Online
Own      0          0      0 -
        hdisk11 000019 08.1c.0000000000610813.0043    6A      Online
Own      0          0      0 -
KAPL01001-I The HDLM command completed normally. Operation name = view
#

```

Figure 6.30 Displaying Specific Items of LU Information

Table 6.16 Items That Can Be Selected with the -item Parameter

Item	Description
PathName	Path name that consists of the following four elements, separated by periods: <ul style="list-style-type: none"> ▪ Host port number (hexadecimal number) ▪ Bus number (hexadecimal number) ▪ Target ID (hexadecimal number) ▪ Host LU number (hexadecimal number)
ChaPort	Port number of the channel adapter. For the Lightning 9900V Series, the port number of the channel adapter is the same as the number shown by the SVP.
Type	Attribute of the path Own: Owner path Non: Non-owner path
IO-Count	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 is reset, and the count is re-started from 0.
IO-Errors	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 is reset, and the count is re-started from 0.
DNum	A device number, which is equivalent to a logical volume number in AIX. A device number beginning from 0 is assigned to the device in the LU. In AIX, this value is fixed to 0 because one LU contains one device.
IEP	The displayed paths are assumed to be in an intermittent error status and checked whether those paths are to be operated for automatic failback. -: Indicates that intermittent error monitoring is disabled or the monitoring time for an intermittent error is out of range. Numerical value larger than 0: Indicates the number of errors that occurred during intermittent error monitoring. *: Indicates that an intermittent error occurred (automatic failback does not check the path).
VG	Volume group name

```

# /usr/DynamicLinkManager/bin/dlnkmgr view -lu
Product      : USP
SerialNumber  : 0014010
LUs          : 10

iLU  HDevName Device  PathID Status
003A dlmfdrv0  hdisk12 000000 Online
      hdisk2  000001 Online
003B dlmfdrv1  hdisk13 000002 Online
      hdisk3  000003 Online
003C dlmfdrv2  hdisk14 000004 Online
      hdisk4  000005 Online
003D dlmfdrv3  hdisk15 000006 Online
      hdisk5  000007 Online
003E dlmfdrv4  hdisk16 000008 Online
      hdisk6  000009 Online
003F dlmfdrv5  hdisk17 000010 Online
      hdisk7  000011 Online
0040 dlmfdrv6  hdisk18 000012 Online
      hdisk8  000013 Online
0041 dlmfdrv7  hdisk19 000014 Online
      hdisk9  000015 Online
0042 dlmfdrv8  hdisk20 000016 Online
      hdisk10 000017 Online
0043 dlmfdrv9  hdisk21 000018 Online
      hdisk11 000019 Online
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
#

```

Figure 6.31 Example of Displaying the LU Information Without Selecting Items to be Displayed

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -lu -item
Product      : USP
SerialNumber  : 0014050
LUs          : 10
```

iLU	SLPR	HDevName	VG	Device	PathID	PathName	ChaPort	CLPR
Status	Type	IO-Count	IO-Errors	DNum	IEP			
0150	12	d1mfdrv0 -		hdisk3	000000	08.11.0000000000660B00.0000	3B	1
Online	Own	0	0	0	-			
				hdisk33	000001	08.1D.0000000000660B00.0000	3B	1
Online	Own	0	0	0	-			
0151	12	d1mfdrv1 samplevg001		hdisk4	000002	08.11.0000000000660B00.0001	3B	1
Online	Own	0	0	0	-			
				hdisk34	000003	08.1D.0000000000660B00.0001	3B	1
Online	Own	0	0	0	-			
0152	12	d1mfdrv2 samplevg002		hdisk5	000004	08.11.0000000000660B00.0002	3B	1
Online	Own	0	0	0	-			
				hdisk35	000005	08.1D.0000000000660B00.0002	3B	1
Online	Own	0	0	0	-			
0153	12	d1mfdrv3 -		hdisk6	000006	08.11.0000000000660B00.0003	3B	1
Online	Own	0	0	0	-			
				hdisk36	000007	08.1D.0000000000660B00.0003	3B	1
Online	Own	0	0	0	-			
0154	12	d1mfdrv4 -		hdisk7	000008	08.11.0000000000660B00.0004	3B	1
Online	Own	0	0	0	-			
				hdisk37	000009	08.1D.0000000000660B00.0004	3B	1
Online	Own	0	0	0	-			
0155	12	d1mfdrv5 -		hdisk8	000010	08.11.0000000000660B00.0005	3B	1
Online	Own	0	0	0	-			
				hdisk38	000011	08.1D.0000000000660B00.0005	3B	1
Online	Own	0	0	0	-			
0156	12	d1mfdrv6 -		hdisk9	000012	08.11.0000000000660B00.0006	3B	1
Online	Own	0	0	0	-			
				hdisk39	000013	08.1D.0000000000660B00.0006	3B	1
Online	Own	0	0	0	-			
0157	12	d1mfdrv7 -		hdisk10	000014	08.11.0000000000660B00.0007	3B	1
Online	Own	0	0	0	-			
				hdisk40	000015	08.1D.0000000000660B00.0007	3B	1
Online	Own	0	0	0	-			
0158	12	d1mfdrv8 -		hdisk11	000016	08.11.0000000000660B00.0008	3B	1
Online	Own	0	0	0	-			
				hdisk41	000017	08.1D.0000000000660B00.0008	3B	1
Online	Own	0	0	0	-			
0159	12	d1mfdrv9 -		hdisk12	000018	08.11.0000000000660B00.0009	3B	1
Online	Own	0	0	0	-			
				hdisk42	000019	08.1D.0000000000660B00.0009	3B	1
Online	Own	0	0	0	-			

```
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
#
```

Figure 6.32 Example Showing How to Display LU Information Using iLUs as a Sorting Key, and Selecting the Items to be Displayed.


```
# /usr/DynamicLinkManager/bin/dlnkmgr view -lu -c
Product      S/N      LUs iLU  HDevName  Paths  OnlinePaths
USP          0014010  10 003A dlmfdrv0    2      2
              003B dlmfdrv1    2      2
              003C dlmfdrv2    2      2
              003D dlmfdrv3    2      2
              003E dlmfdrv4    2      2
              003F dlmfdrv5    2      2
              0040 dlmfdrv6    2      2
              0041 dlmfdrv7    2      2
              0042 dlmfdrv8    2      2
              0043 dlmfdrv9    2      2
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
#
```

Figure 6.33 Example Showing How to Display a Summary of the LU Information (Without Selecting Items to be Displayed)

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -lu -c -item
Product S/N      LUs iLU  SLPR HDevName  VG      Paths  OnlinePaths
USP      0014050  10 0150  12 dlmfdrv0  -        2      2
              0151  12 dlmfdrv1  samplevg001  2      2
              0152  12 dlmfdrv2  samplevg002  2      2
              0153  12 dlmfdrv3  -          2      2
              0154  12 dlmfdrv4  -          2      2
              0155  12 dlmfdrv5  -          2      2
              0156  12 dlmfdrv6  -          2      2
              0157  12 dlmfdrv7  -          2      2
              0158  12 dlmfdrv8  -          2      2
              0159  12 dlmfdrv9  -          2      2
KAPL01001-I The HDLM command completed normally. Operation name = view,
completion time = 2005/06/01 12:00:00
#
```

Figure 6.34 Example Showing How to Display a Summary of the LU Information by Selecting Items to be Displayed.

Table 6.17 describes the items that can be selected by using the `-lu -c -item` parameter.

Table 6.17 Items that can be selected with the `-lu -c -item` parameter

Item	Description
SLPR	The number of the SLPR to which the LU belongs, indicated by a decimal number from 0 to 31. A hyphen (-) is displayed if the storage logical partition functionality for the storage subsystem for the target LU is not supported.
VG	The name of a volume group to which an LU is registered. A hyphen (-) is displayed if no LU is registered to the volume group.

Table 6.18 Correspondence between HDLM Driver Instances and Disk Devices

Item	Description
PathID	AutoPATH_ID indicated by a decimal number
HDevName	Special file name of an HDLM driver
Device	Physical volume name that corresponds to each instance of an HDLM driver
LDEV	LDEV that consists of the model name of the subsystem, serial number, and iLU number, separated by periods

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -drv
PathID   HDevName  Device    LDEV
000000   dlmfdrv0  hdisk1    9500V.0051.0005
000001   dlmfdrv1  hdisk2    9500V.0051.0015
000002   dlmfdrv2  hdisk3    9500V.0051.0020
000003   dlmfdrv0  hdisk4    9500V.0051.0005
000004   dlmfdrv1  hdisk5    9500V.0051.0015
000005   dlmfdrv2  hdisk6    9500V.0051.0020
KAPL01001-I The HDLM command completed normally. Operation name = view, completion time =
2005/06/01 12:00:00
#
```

Figure 6.35 Displaying Correspondence between HDLM Driver Instances and Disk Devices

Chapter 7 Using the HDLM Utilities

This chapter describes the HDLM for AIX® utilities. Users who have root privileges can execute the HDLM utilities:

- HDLM error information collection utility (**DLMgetras**) (see section 7.1)
- HDLM volume group operation utility (see section 7.2)
- Utility for setting the HDLM execution environment (see section 7.3)
- Utility for Setting the HDLM Execution Environment (**dlmodmset**) (see section 7.4)
- Utility for modifying the HDLM Execution Environment (see section 7.5)
- Utility for changing the HDLM HBA (see section 7.6)
- Utility for Changing the HDLM HBA (**dImHBAdel**) (see section 7.7)
- Utility for clearing HDLM persistent reservation (see section 7.8)
- Utility for removing HDLM devices (see section 7.9)
- Utility for HDLM installation configuration support (**dImsetup**) (see section 7.10)

7.1 HDLM Error Information Collection Utility (DLMgetras)

Important: Execute DLMgetras immediately after an error occurs, since restarting the machine may delete information collected by DLMgetras.

- **Format**

```
# /usr/DynamicLinkManager/bin/DLMgetras {destination-directory-for-collected-information [-f file-for-defining-the-information-to-be-collected] | -h}
```

Note: You can also use lower-case characters (**dlmgetras**).

- **Description**

The error information collection utility collects information, such as trace files, definition files, core files, and libraries, required for analyzing errors that occur in HDLM. Table 7.1 lists and describes the information automatically collected by the error information collection utility, if you do not specify the information to be collected. If desired, you can specify the files to be collected by defining them in a special file (see section 7.1.1).

The following files are output:

- *Name-of-the-directory-containing-a-system-crash-dump-file/system-crash-dump-file*

This file contains a symbolic link to the system crash dump file.

- *getras.tar.Z*

This file contains compressed HDLM information and system information.

Note: When HDLM is launched from HiCommand™ Device Manager, error information is output to the Device Manager Client (location defined using Java™ Web Start). This error information at the Device Manager Client is not collected by DLMgetras. In case of error, collect the error information at the Device Manager Client in addition to using DLMgetras.

When you want to collect information other than that in List of collected error information, define the information to collect in the *information- collection- definition* file. Information defined in *information- collection- definition* file is compressed into *getras.tar.Z*.

- **Parameters**

destination-directory-for-collected-information: Specify the directory to which the collected information is output. The directories to be output are created in the specified directory, and error information is collected in the created directories.

-f file-for-defining-the-information-to-be-collected: Specify this parameter when you want to specify the directories or the files to be collected. Specify the directories or the files in the file for defining the information to be collected, and then specify this parameter. Use an absolute path to specify the *file-for-defining-the-information-to-be-collected*. For details on this file, see section 7.1.1.

-h: Displays the format of the issued command

Note: DLMgetras compresses files other than the OS crash dump and directories and saves them to the **getras.tar.Z** file in the specified directory.

Note: If the specified output directory already exists, a message confirming the overwrite of the directories and files is displayed. If you enter **y**, the file is overwritten. If you enter **n**, the utility is terminated without being executed.

Note: If you create an archive for the system crash dump collected by the DLMgetras utility, execute the following:

```
# cd directory-to-which-collected-information-is-output
# tar cvfh archive-file-name ./var
```

Table 7.1 Error Information Collected by the DLMgetras Utility

Directory	File	Description
Directly under the directory to which collected information is output	getras.log	Log file generated when DLMgetras is executed
/usr/DynamicLinkManager/drv	dlnmdrv.conf	conf file of the HDLM filter driver
/opt/Hitachi/Hamon/etc	sysdef	File to define HA monitor environment
	servers	File to define HA monitor server
/var/DynamicLinkManager/log	dlnmgr*.log (* = 1, 2) (dlnmgr1.log, dlnmgr2.log, dlnmgr[1-16].log)	HDLM manager log file (driver logs are included)
	dlnmcfmgr1.log	Error information pertaining to dlnmcfmgr utility execution
	dlnmcfmgr2.log	
	dlnmgui*.log (* = 1, 2) (dlnmgui1.log, dlnmgui2.log)	Log files of HDLM GUI When more than one Path Management window is open, only the log for the first Path Management window opened is output to dlnmguin.log . See the HNTRLlib2 trace files (/var/opt/hitachi/HNTRLlib2/spool/hntr2n.log) for the log of the other windows.
	dlnmwebagent [1-M].log	HDLM Web GUI log (Note 3)
	dlnminquiry1.log dlnminquiry2.log	Inquiry logs
	hnlmtr[1-64].log	Trace file
var/DynamicLinkManager/log/mmap	hnlmtr.mm	Trace management file
/opt/hitachi/HNTRLlib2/mmap	hntr2mmap.mm	Memory mapped file
integrated-trace-file-output-directory-specified-in-the-Hitachi-Network-Objectplaza-Trace-Library-utility (Default: var/opt/hitachi/HNTRLlib2/spool)	integrated-trace-file-prefix-specified-in-the-Hitachi-Network-Objectplaza-Trace-Library-utility2[1-16].log (Note 3) (default prefix: hntr)	

Directory	File	Description
/var/opt/hitachi/HNTRLib2/spool	hntr2*.log (* = 1-16) (e.g., hntr21.log, hntr22.log, hntr23.log, hntr24.log, etc.)	Trace files (<i>Note 2</i>)
usr/DynamicLinkManager/config	dlimmgr.xml	dlimmgr setting file
	dlimwebagent.properties	HDLM agent add-in component setting file
/usr/DynamicLinkManager/drv	dlimdrv.unconf	File that defines non-HDLM-managed disks
/etc	syslog.conf	File for defining the directory for the output destination of syslog
	filesystems	Mount information of the file system
	inittab	inittab file
	rc.shutdown	shutdown script
error-log-file	error-log-file	Error log file obtained by /usr/lib/errdemon -1
/OS-crash-file-directory (The directory that is output as the copy directory value when the sysdumpdev -l command is executed)	OS-crash-file-name	Outputs the OS crash dump file to the copy directory whose value is returned by the sysdumpdev -l command. (<i>Note 1</i>)
/directory-for-the-output-destination-of-syslog	syslog-name	syslog and backup files defined in /etc/syslog.conf file
directory-to-which-the-collected-information-is-output/getrasinfo	(Not applicable)	Directory for collecting the command execution results
	disk.txt	List of disks that are treated as block devices
	rdisk.txt	List of disks that are treated as character devices
	env.txt	Environment variable file
	lsvg.txt	Information of volume groups
	lscfg.txt	Firmware version of FC6227 Fibre HBA
	mount.txt	Mount information
	pagesize.txt	Memory page size
	oslevel.txt	OS level information, output when the oslevel or oslevel -g command was executed
	ulimit-a.txt	Limit value of the system resources (data segment, stack segment, and file descriptor) available for the processes
	lspp.txt	List of installed packages
	bootinfo-r.txt	Physical memory size
	lsdev-proc.txt	CPU information
	lsdev-C.txt	Kernel parameter value

Directory	File	Description
	lsps-a.txt	Swap area, usage of swap
	genkex.txt	Information of loaded drivers
	alog.txt	System diagnosis message
	dlmmgr-lu.txt	HDLM LU information
	dlmmgr-lu-all.txt	HDLM LU information (including the number of times an intermittent error occurred)
	dlmmgr-path.txt	Path information of HDLM
	dlmmgr-path-iem.txt	HDLM path information (including the number of times an intermittent error occurred)
	dlmmgr-sys.txt	System setting information of HDLM
	dlmpr-k.txt	Persistent reservation key information
	Maintenance-Level.txt	Maintenance level of information, displayed when instfix -i grep ML was executed
	Config_Rules.txt	Information of Object Database Manager
	PdAt.txt	Information of Object Database Manager
	PdDv.txt	Information of Object Database Manager
	CuAt.txt	Information of Object Database Manager
	CuDv.txt	Information of Object Database Manager
	CuDvDr.txt	Information of Object Database Manager
	CuVPD.txt	Information of Object Database Manager
	unix	UNIX® file
	HDLMDrvConf.txt	ODM for defining HDLM operations
	iotool.txt	Driver information
	uname-a.txt	Information on the AIX® version
	bootinfo.txt	Information on the operation mode of the kernel (32/64 bit) and multi-CPU support
	ps-ef.txt	Information on the executing process
	lspv.txt	Physical volume information
	lsfs.txt	File system information
	hacmp.txt	Information on the HACMP configuration
	errpt-a.txt	Error log edit file
	dlmls-la.txt	HDLM directory information file
	dlmmgr-driv.txt	HDLM device information
	whatlist.txt	Information output by the what command

Directory	File	Description
	dlngetomtrace.dmp	HDLM function trace
etc/VRTSvcs/conf/config	main.cf	VCS configuration definition file
opt/VRTSvcs/bin/triggers	preonline	VCS trigger file
var/VRTSvcs/log	All files under VCS-log- file	VCS log file
<i>hacmp.out-output-directory</i>	hacmp.out	HACMP execution log
etc/vsd	oemdisktypes.lst	RVSD setting file
var/adm/csd	vsd.log	RVSD execution log

Note 1: An output directory is created in the specified directory when you open the `getras.tar.Z` file.

Note 2: In the actual file name, a file number is appended to *Trace-file-prefix-specified-in-the-Hitachi-Network-Objectplaza-Trace-Library-utility2*. For example, the default will be `hntr21.log` to `hntr216.log`. The number 2 that follows the trace file prefix does not represent a file number.

Note 3: In the actual file name, a file number is appended to *Trace-file-prefix specified-in-the-Hitachi-Network-Objectplaza-Trace-Library-utility2*. For example, the default will be `hntr21.log` to `hntr216.log`. Note that the number 2 following the integrated trace file prefix does not represent a file number.

7.1.1 File for Defining the Information to be Collected

Figure 7.1 shows an example of a file that defines the information to be collected by the error information collection utility (DLMgetras). If you do not specify the information to be collected, refer to Table 7.1 for details on the information that is collected.

```
# DLM manager core file
/opt/DynamicLinkManager/bin/core          ← Collects the core file of HDLM.
#
# Oracle initial parameter
/u01/app/oracle/admin/sandb/pfile/init.ora ← Collects the initial parameter file
#                                           for the database (Oracle).
# Oracle Alert Directory
/u01/app/oracle/rdbms/log                  ← Collects the alert information directory
#                                           for the database (Oracle).
```

Figure 7.1 Example of File for Defining the Information to be Collected

The coding rules and notes for the file that defines the information to be collected are:

- Use absolute paths to specify the directories or files. If you use relative paths to specify the directories or the files, the specified directories and files are searched in the directory where the error information collection utility was executed, and then the found directories and files are collected.
- Do not specify directories that contain the directory to which the collected information is output. If you do specify a directory containing such a directory, the error information collection utility will never complete.
- If there is a pound sign or sharp character (#) at the beginning of a line, the line is considered to be a comment.
- If there is a pound sign or sharp character (#) somewhere other than at the beginning of a line, the sharp character is considered to be part of a file path.
- Specify one file or one directory in one line.
- Do not specify the root directory (/).
- If you specify a directory, all files in the specified directory are collected. The files in the subdirectories in the specified directory are also collected. If the specified directory does not contain any files, no files in the specified directory are collected. The specified directory is not created in the directory to which the collected information is output.

7.2 HDLM Volume Group Operation Utility

■ Format

Table 7.2 lists and describes the HDLM volume group operation utility commands. The format of each command is the same as the format of the corresponding AIX® command. For details on the format of each command, see the AIX® documentation.

These utility commands are under the `/usr/DynamicLinkManager/bin` directory.

Table 7.2 HDLM Volume Group Operation Utility Commands and Corresponding AIX® Commands

HDLM Command	Parameter Values	Corresponding AIX® Command	Function
d1mchvg	(Do not specify.)	chvg	Changes a volume group
d1mexportvg	(Do not specify.)	exportvg	Exports a volume group
d1mextendvg	d1mfdrv _n (n indicates the instance number of the drive)	extendvg	Adds an HDLM driver to a volume group See <i>Note</i> .
d1mimportvg	d1mfdrv _n	importvg	Imports a volume group See <i>Note</i> .
d1mlsvg	(Do not specify.)	lsvg	Lists all volume groups
d1mmirrorvg	d1mfdrv _n	mirrorvg	Mirrors all volume groups See <i>Note</i> .
d1mmkvg	d1mfdrv _n	mkvg	Creates a volume group See <i>Note</i> .
d1mrecreatevg (for AIX® 5L only)	d1mfdrv _n	recreatevg	Reorganizes a volume group that includes an HDLM driver See <i>Note</i> .
d1mreducevg	d1mfdrv _n	reducevg	Removes an HDLM driver from a volume group See <i>Note</i> .
d1mreorgvg	(Do not specify.)	reorgvg	Reorganizes a volume group
d1mrestvg	d1mfdrv _n	restvg	Restores a volume group See <i>Note</i> .
d1msavevg	(Do not specify.)	savevg	Backs up a volume group
d1msyncvg	d1mfdrv _n	syncvg	Synchronizes for each volume group (synchronizes mirrored logical volumes) See <i>Note</i> .
d1munmirrorvg	d1mfdrv _n	unmirrorvg	Releases mirroring of volume groups See <i>Note</i> .
d1mvaroffvg	(Do not specify.)	varoffvg	Deactivates a volume group
d1mvaronvg	(Do not specify.)	varonvg	Activates a volume group
d1mlistvgbackup	(Do not specify.)	listvgbackup	Lists the backup files of a volume group

HDLM Command	Parameter Values	Corresponding AIX® Command	Function
dlmrestorevgfiles	(Do not specify.)	restorevgfiles	Restores from the backup files of a volume group

Note: When executing this AIX command, do not specify the disk (**hdiskn**) that configured the HDLM driver (**dlmfdrv**) in the parameter.

About Corresponding Cluster-Single-Point of Control (C-SPOC) Commands

When executing the C-SPOC command that corresponds to the utilities for operating HDLM volume groups, set the physical volume group parameter to the HDLM driver. Table 7.3 shows the relationship between the utilities for operating HDLM volume groups, the AIX command, and the C-SPOC command.

Table 7.3 Relationships among HDLM, AIX, and C-SPOC Commands

HDLM Command	Corresponding AIX® Command	Corresponding C-SPOC Command
dlmchvg	chvg	cl_chvg
dlmlsvg	lsvg	cl_lsvg
dlmmkvg	mkvg	cl_mkvg
dlmextendvg	extendvg	cl_extendvg
dlmimportvg	importvg	cl_importvg
dlmmirrorvg	mirrorvg	cl_mirrorvg
dlmreducevg	reducevg	cl_reducevg
dlmsyncvg	syncvg	cl_syncvg
dlmunmirrorvg	unmirrorvg	cl_unmirrorvg

■ Description

Even if the AIX® system recognizes a device, HDLM cannot use such a device as is. To enable HDLM for AIX® to recognize a disk, HDLM provides a set of special commands for performing operations on volume groups. The volume groups created with these commands are for the exclusive use of HDLM. Table 7.2 describes each command of the HDLM volume group operation utility.

To execute an HDLM volume group command, you can use the SMIT window (provided by HDLM) for each command, or you can execute the command from the command line. We recommend that you use the SMIT window, because the SMIT window makes it easy to select a physical disk. The SMIT window displays only the physical disk that was first registered in the Object Data Manager, instead of all physical disks allocated to one LU.

■ Parameters

Table 7.2 lists the parameters for each command of the HDLM volume group operation utility. These parameters are the same as the corresponding IBM® AIX® system command parameters. For details on each command parameter, see the IBM® AIX® system documentation.

- **Command-response messages**

The messages output are KAPL10501-W from HDLM, and the messages from the AIX® commands that correspond to the HDLM commands.

- **SMIT window**

HDLM for AIX® provides a SMIT window for use with the HDLM volume group operation utility. SMIT is an interactive, menu-driven user interface that allows you perform routine system management tasks and manage and maintain the OS configuration. For details on SMIT window operations, see the AIX® documentation or the results of executing the **man** command.

In the SMIT window for the HDLM volume group operation utility, you can perform the same operations as executing the HDLM commands from the command line. We recommend that you use the SMIT window instead of the command line, because the SMIT window makes it easy to select a physical disk. The SMIT window displays only the physical disk that was first registered in the Object Data Manager, instead of all physical disks allocated to one LU.

Note: The exception to using the SMIT window instead of a command line is when specifying an HDLM driver. You cannot specify an HDLM driver in the following SMIT menu: **System Storage Management (Physical & Logical Storage), Logical Volume Manager, Logical Volumes, Set Characteristic of a Logical Volume, Remove a Copy from a Logical Volume**. Instead, specify the HDLM driver as a physical volume name using the command line. For example: `#rmlvccopy hdlmlv 1 dlmfdrv6`

To display the SMIT window for the volume group operation utility, select **System Storage Management (Physical & Logical Storage), Logical Volume Manager**, and then **HDLM Volume Groups**. Figure 7.2 shows the SMIT window for the HDLM volume group operation utility.

Executing the `dlmrecreatevg` command: The `dlmrecreatevg` command is not shown in the SMIT window for the HDLM volume group operation utility. If you want to execute the `dlmrecreatevg` command from the SMIT window, use the SMIT **fast path** and execute the following command:

```
# smit dlmrecreatevg
```

When you execute this command, in the displayed SMIT window specify the physical volumes that you want to target when a volume group is recreated.

As with the other commands for the HDLM volume group operation utility, you can also execute the `dlmrecreatevg` command from the command line.



Figure 7.2 SMIT Window

Notes:

The HDLM volume group commands output the same error messages as the corresponding AIX® commands. For details on the commands and/or messages, see the information displayed by executing the **man** command for the corresponding AIX® command.

Make sure to use the HDLM volume group operation utility. If you perform these operations without using this utility, the status of a volume group might become incorrect. If the volume group status does become incorrect, use AIX® commands to correct the volume group.

In parameters, only specify volume groups that were created using the HDLM utility. If you specify (in a parameter) a volume group that was not created using the utility, an error check is not performed, so the status of a volume group might become incorrect.

■ Examples

Example 1: To create the volume group **d1mvg1** for HDLM use:

1. When the HDLM driver **d1mfdrv2** and **d1mfdrv3** use different LUs, execute the following command to create the volume group **d1mvg1**:

```
# /usr/DynamicLinkManager/bin/dlmmkvg -s 32 -y d1mvg1 d1mfdrv2 d1mfdrv3
```
2. Execute the following command to check the status of the volume group **d1mvg1** for HDLM use:

```
# /usr/DynamicLinkManager/bin/dlmlsvg -p d1mvg1
```

PV_NAME	PV STATE	TOTAL PPs	FREE PPs	FREE DISTRIBUTION
d1mfdrv2	active	542	36	00..00..00..00..36
d1mfdrv3	active	542	36	00..00..00..00..36

Example 2: To correct the status when the AIX® physical volume **hdisk4** is mixed with the HDLM volume group **d1mvg1**:

1. Check the status of the volume group **d1mvg1** for HDLM use:

```
# /usr/DynamicLinkManager/bin/dlmlsvg -p d1mvg1
```

PV_NAME	PV STATE	TOTAL PPs	FREE PPs	FREE DISTRIBUTION
d1mfdrv2	active	542	36	00..00..00..00..36
d1mfdrv3	active	542	36	00..00..00..00..36
hdisk4	active	542	36	00..00..00..00..36
2. Delete the mixed AIX® physical volume **hdisk4** from the HDLM volume group **d1mvg1**:

```
# reducevg d1mvg1 hdisk4
```
3. Recheck the status of the HDLM volume group **d1mvg1**:

```
# /usr/DynamicLinkManager/bin/dlmlsvg -p d1mvg1
```

PV_NAME	PV STATE	TOTAL PPs	FREE PPs	FREE DISTRIBUTION
d1mfdrv2	active	542	36	00..00..00..00..36
d1mfdrv3	active	542	36	00..00..00..00..36

Example 3: To correct the status when the AIX® physical volume **datavg1** is mixed with the HDLM driver **d1mfdrv4** (this example executes AIX® commands):

1. Check the status of the HDLM volume group **datavg1**:

```
# lsvg -p datavg1
```

PV_NAME	PV STATE	TOTAL PPs	FREE PPs	FREE DISTRIBUTION
hdisk2	active	542	36	00..00..00..00..36
hdisk3	active	542	36	00..00..00..00..36
d1mfdrv4	active	542	36	00..00..00..00..36
2. Delete the mixed HDLM volume **d1mfdrv4** from the AIX® volume group **datavg1**:

```
# reducevg datavg1 d1mfdrv4
```
3. Recheck the status of the AIX® volume group **datavg1**:

```
# lsvg -p datavg1
```

PV_NAME	PV STATE	TOTAL PPs	FREE PPs	FREE DISTRIBUTION
hdisk2	active	542	36	00..00..00..00..36
hdisk3	active	542	36	00..00..00..00..36

7.3 dlmcfmgr (Utility for Managing the HDLM Configuration)

- **Format**

/usr/DynamicLinkManager/bin/dlmcfmgr

- **Function**

This utility configures the HDLM device. This utility is used, for example, when installing HDLM or when changing the path configuration.

7.4 Utility for Setting the HDLM Execution Environment (dlmodmset)

- **Format**

```
/usr/DynamicLinkManager/bin/dlmodmset
{-l { on | off | -ls log-file-size} [-s]
|-e { on | off } [-s]
|-b maximum-simultaneous-I/O-requests [-s]
|-r { on | off } [-s]
|-o
|-h }
```

- **Description**

This utility sets ODM to define HDLM operations.

- **Parameters**

-l { on | off | -ls *log-file-size*} Enables or disables the log acquisition functionality. **On:** Valid (this is the default). **Off:** Invalid

-ls *log-file-size* Specifies the log file size in kilobytes (KB). Use a value from 100 to 9900. The default (and recommended) value is 1000.

-s Prevents the confirmation message from being displayed when the command is executed.

-e {on | off} Enables or disables error checking for specifying the hdisk (rmdev, chdev, and commands for operating volume groups). **On:** Valid. **Off:** Invalid (this is the default). The default is **on**.

-b maximum-simultaneous-I/O-requests Specifies the maximum number of I/O requests that are allowed. Use a value from 16384 to 1000000. The default is 16384.

Note: The changed settings do not get reflected to the HDLM driver configuration. In order to reflect the changed settings, you must either reconfigure the HDLM driver or reboot the machine.

The maximum number of concurrent I/O requests can be calculated by using the following formulas:

- When the OS uses a 32-bit kernel: $(4 + \text{number of LUs}) \times 64 + 2560$
- When the OS uses a 64-bit kernel: $(4 + \text{number of LUs}) \times 128 + 2560$

Set *number-of-LUs*, by including (in the total number of LUs connecting to the host) consider the number of LUs to be.

-r { on | off} Enables or disables the LUN RESET option. To use GPFS+RVSD, specify **On**. **On:** Enable, **Off:** Disable

-o Displays the format of the dlmodmset utility.

-h Displays help. The following is an example for displaying the setting information:

```
# /usr/DynamicLinkManager/bin/dlmodmset -o
Inquiry Log           : on
Inquiry Log File Size : 1000
hdisk error check flag : off
HDLM pbuf count       : 16384
Lun Reset             : on
KAPL10800-I The dlmodmset utility completed normally.
#
```

Table 7.4 Formula for Determining the Maximum Simultaneous I/O Requests Setting

Formula for 32-Bit OS	Formula for 64-Bit OS
$(4 + \text{Number of LUs}) \times 64 = 2560$	$(4 + \text{Number of LUs}) \times 128 = 2560$

Note: If the `hd_pbuf_cnt` value that is displayed in the “`ioo`” command result is greater than the value you received by using the formula, then set the maximum simultaneous I/O requests to a value that is greater than the sum of the `hd_pbuf_cnt` value and 2650, but does not exceed 1000000.

7.5 Utility for Modifying the HDLM Execution Environment (dlmchenv)

■ Format

/usr/DynamicLinkManager/bin/dlmchenv [[-s] [-l] [-v OS-mode] | -h]

■ Description

This utility adjusts HDLM to the upgraded operating environment when you upgrade the operating system or change the kernel mode.

■ Parameters

If you do not specify any parameter, the utility adjusts the SMIT menu and the operating link environment according to the version of the operating system.

-s: Changes the HDLM SMIT menu. If you specify **-v OS-mode** after the **-s** parameter, the utility changes the SMIT menu according to the specified OS mode. If you do not specify **-v OS-mode**, the utility changes the SMIT menu according to the current OS version.

-l: Changes the HDLM operating link environment. If you specify **-v OS-mode** after the **-l** parameter, the utility sets the operating link according to the specified OS mode. If you do not specify **-v OS-mode**, the utility sets the operating link according to the current OS version.

-v OS-mode: Specify the OS mode. If you specify **-v OS-mode** without specifying the **-s** or **-l** parameter, the utility sets the SMIT menu and operating link environment according to the specified OS mode.

Table 7.5 lists the available OS modes, and their corresponding OS versions and kernel modes.

Table 7.5 OS Modes

OS modes	OS versions and kernel modes
2	AIX 5L V5.1 (32-bit version)
3	AIX 5L V5.1 (64-bit version)
4	AIX 5L V5.2 (32-bit version)
5	AIX 5L V5.2 (64-bit version)
6	AIX 5L V5.3 (32-bit version)
7	AIX 5L V5.3 (64-bit version)

-h: Displays the format of the utility for modifying the HDLM execution environment.

7.6 dlmchkdev (utility for checking the device configuration)

- **Format**

/usr/DynamicLinkManager/bin/dlmchkdev

- **Functions**

This utility checks the correspondences between HDLM devices and LUs, and displays those that are invalid. The correspondence between an HDLM device and an LU is invalid when multiple LUs are assigned to one HDLM device.

Note: If all HDLM devices have been deleted, the dlmchkdev utility cannot be executed.

- **Examples**

Example 1: When there are no invalid paths

```
#/usr/DynamicLinkManager/bin/dlmchkdev
KAPL12201-I An invalid path was not found.
KAPL12204-I The dlmchkdev utility completed normally.
```

Example 2: When there are invalid paths

```
#/usr/DynamicLinkManager/bin/dlmchkdev
LIST OF INVALID PATH
PathID HDevName Device LDEV
000000 dlmfdrv0 hdisk22 9970/9980.35001.0053
000001 dlmfdrv0 hdisk72 9970/9980.35002.0053
000002 dlmfdrv1 hdisk23 9970/9980.35001.0054
000003 dlmfdrv1 hdisk73 9970/9980.35001.0005
KAPL12202-E An invalid path was found. Do not add or delete paths.
KAPL12205-W The dlmchkdev utility completed.
```

7.7 Utility for Changing the HDLM HBA (dlmHBAdel)

- **Format**

`/usr/DynamicLinkManager/bin/dlmHBAdel {parent-device-name-of-the HDLM-driver} -h`

Note: You can also use lower-case characters (`dlmhbadel`).

- **Description**

This utility deletes path information about the specified `fscsi` device instance.

- **Parameters**

parent-device-name-of-the HDLM-driver: Specify the device name for the host bus adapter you want to replace.

-h: Displays the format of the utility for changing the HDLM HBA.

7.8 Utility for Clearing HDLM Persistent Reservation (dlmpr)

■ Format

`/usr/DynamicLinkManager/bin/dlmpr {{-k | -c} [hdiskn] | -h}`

■ Description

The persistent reservation of a logical unit (LU) may not be canceled due to some reason when multiple hosts share a volume group rather than making up a cluster configuration using HACMP. In this case, this utility clears the Reservation Key to cancel the persistent reservation.

■ Parameters

-k: Specify this parameter to display the Reservation Key. The utility displays an asterisk (*) for a Reservation Key of another host. If the Reservation Key is not set, [0x0000000000000000] is displayed.

- **Regist Key:** The registered Keys are displayed.
- **Key Count:** The number of registered Keys is displayed.

-c: Specify this parameter to clear the Reservation Key.

hdiskn: Specify the physical volume (hdiskn) for which you want to display the Reservation Key. You can specify more than one volume. **Note:** If you do not specify this parameter, the utility displays the Reservation Keys for all the physical volumes.

-a: When multiple physical volumes (hdiskn) are specified, even if an error occurs during processing, the processing continues for all physical volumes.

-h: Displays the format of the utility for clearing HDLM persistent reservation.

Note: [0x????????????????] appears for Reservation Key if the destination storage subsystem does not support the persistent reservation or if a hardware error occurs.

■ Examples

To check the Reservation Keys, and then clear the Reservation Keys other than those for the local host:

1. Execute the `dlmpr` utility to display the Reservation Keys for `hdisk1`, `hdisk2`, `hdisk3`, `hdisk4`, `hdisk5`, and `hdisk6`.

```
# /usr/DynamicLinkManager/bin/dlmpr -k hdisk1 hdisk2 hdisk3 hdisk4 hdisk5 hdisk6
self Reservation Key : [0xaaaaaaaaaaaaaaaa]
hdisk1 Reservation Key : [0xaaaaaaaaaaaaaaaa]
        Regist Key : [0xaaaaaaaaaaaaaaaa], Key Count : 1
hdisk2 Reservation Key : [0xbbbbbbbbbbbbbbbbbb]*
        Regist Key : [0xaaaaaaaaaaaaaaaa], Key Count : 2
        Regist Key : [0xbbbbbbbbbbbbbbbbbb], Key Count : 2
hdisk3 Reservation Key : [0xbbbbbbbbbbbbbbbbbb]*
        Regist Key : [0xbbbbbbbbbbbbbbbbbb], Key Count : 4
hdisk4 Reservation Key : [0xaaaaaaaaaaaaaaaa]
        Regist Key : [0xaaaaaaaaaaaaaaaa], Key Count : 4
hdisk5 Reservation Key : [0x0000000000000000]
hdisk6 Reservation Key : [0x0000000000000000]
        Regist Key : [0xaaaaaaaaaaaaaaaa], Key Count : 1
        Regist Key : [0xbbbbbbbbbbbbbbbbbb], Key Count : 1
```

2. Execute the `dlmpr` utility to clear the Reservation Keys for other hosts (marked by an asterisk (*)).

```
# /usr/DynamicLinkManager/bin/dlmpr -c hdisk2 hdisk3
```

3. The confirmation message appears. Enter `y` to clear. Otherwise, enter `n`.

```
KAPL10641-I Reservation Key will now be cleared. Is this OK? [y/n]:y
KAPL10642-I Reservation Key of hdisk2 was cleared.
KAPL10642-I Reservation Key of hdisk3 was cleared.
```

7.9 Utility for Removing HDLM Devices (dlmrmddev)

- **Format**

`/usr/DynamicLinkManager/bin/dlmrmdev [-A [-s] | -h]`

- **Description**

During uninstallation or update installation of HDLM, this utility deletes the HDLM drivers and HDLM alert drivers.

Using the **-A** parameter unmounts the file system used by HDLM, and deactivates the volume group used by HDLM, before deleting the HDLM drivers and HDLM alert drivers.

- **Parameters**

When no parameters are specified, the utility only performs deletion of the HDLM drivers and HDLM alert drivers.

-A: Unmounts the file system, and deactivates the volume group used by HDLM, before deleting the HDLM drivers and HDLM alert drivers.

-s: Does not display a confirmation message for unmounting and deactivating the volume group, when the **-A** parameter is specified.

-h: Displays the format of the utility for removing HDLM devices.

Note: Before executing the `dlmrmddev` utility, stop all processes and services using the paths managed by HDLM. If you execute the `dlmrmddev` utility without stopping the processes and services that are using the paths managed by HDLM, HDLM devices might not be deleted completely.

7.10 dlmsetup (for HDLM installation configuration support)

- **Format**

/directory-where-cd-rom-is-mounted-or-copied/hdlnmtool/dlmsetup {-i install-filepath [-odm odm-settings-file] [-set dlnk-settings-file] [-s] | -h}

- **Function**

This utility performs HDLM installation, the set operation, and environment setup using the `dlmodmset` utility, in one operation. You must first specify the settings in another file. For details about how to perform a new installation or update installation of HDLM using the `dlmsetup` utility, see section 3.4.5.

- **Parameters**

-i install-filepath: Specifies the directory on which the CD-ROM is mounted or to which the CD-ROM has been copied.

-odm odm-settings-file: Specifies the name of the file in which odm environment settings are defined. Specify the file path.

-set dlnk-settings-file: Specifies the name of the file in which environment settings for the set operation are defined. Specify the file path.

-s: Prevents the confirmation message from being displayed when the command is executed.

-h: Displays the format of the `dlmsetup` utility.

Note: When using the `dlmsetup` utility, refer to section 3.4.5.

Make sure that you specify a directory path after the *-i*, *-odm*, or *-set* options.

Chapter 8 Troubleshooting

This chapter describes the troubleshooting procedures for HDLM:

- How to check information in case of an error (see section 8.1)
- Actions you should take when HDLM detects a path error (see section 8.2)
- Actions you should take when an error occurs in an HDLM program (see section 8.3)
- How to call the Hitachi Data Systems Support Center (see section 8.4)
- Actions taken for other errors (see section 8.4)

For details on HDLM usage precautions, see the **HDLM Release Notes** document.
For details on hardware setup and maintenance, contact your Hitachi Data Systems representative or the Hitachi Data Systems Support Center.

8.1 Error Information Checking

You can use the following information to check for an error:

- Information collected by the error information collection utility, **DLMgetras**
- Information displayed in the **Path List** view of the HDLM GUI,
- Information displayed by the **dlnkmgr view** command, and/or
- Messages that are output when an error occurs.

8.1.1 Information collected by the error information collection utility, DLMgetras

Immediately after an error occurs, execute the error information collection utility **DLMgetras**, since restarting the machine may delete information collected by **DLMgetras**.

Note: When you use a Device Manager client to display the Path Management window and operate HDLM, error information is output to a folder in the Device Manager client (the folder specified in JavaWebStart). These log files are not collected by the **DLMgetras** utility. If an error occurs, ensure that you collect the log files output to the Device Manager client, as well as the error information collected by the **DLMgetras** utility.

8.1.2 Information Displayed in the Path List View

You can use the **Path List** view to check for error information (see section 4.2.4.5).

Note: If an error occurs, make sure to collect the log files output to the Device Manager client, as well as the error information collected by the **DLMgetras** utility.

When a path error occurs, the items that you need to check are:

- **Status:** The Offline(E) status indicates that a path is offline due to an error. The Online(E) status indicates that an error occurred in the last online path to a device.
- **PathID:** ID that HDLM assigned to the path at system startup, also called *AutoPATH_ID*.
- **Path Name:** Name that identifies a physical path. A path name consists of the following four items separated by periods: HBA adapter number, bus number, target ID, and host LUN. Table 8.1 lists these items and their representation in AIX.

Obtain the following information about the path name items as follows:

- **HBA adapter number.** Execute the following command to display the HBA number:

```
# lsdev -Cc disk
```
- **Bus number.** Execute the following command to display the parent bus number:

```
# lsdev -Cc disk
```

– **Target ID.**

For fibre channel, execute the following command to display the target ID, which is the value of `scsi_id`:

```
# lsattr -El device-name
```

For SCSI, execute the following command to display the target ID, which is the leftmost value of `connwhere`:

```
# odmget CuDv device-name
```

– **Host LU number.** For fibre channel, execute the following command to display the host LU number (value of `lun_id`):

```
# lsattr -El device-name
```

For SCSI, execute the following command to display the host LU number, which is the second value from the left of `connwhere`:

```
# odmget -q "name=physical-volume-name" CuDv
```

Table 8.1 Physical Path Representation in AIX® Systems

Items in PathName	Representation in AIX® Systems
HBA adapter number (example in Figure 8.1: 08)	HBA port number
Bus number (example in Figure 8.1: 14)	PCI bus number
Target ID (example in Figure 8.1: 00000000000000E2)	Target ID
Host LU number (example in Figure 8.1: 0001)	Logical Unit ID (LUN)

- **Subsystem:** Name identifying the storage subsystem. A storage subsystem name consists of the following three items separated by periods:

- Vendor ID: The name of the storage subsystem vendor (e.g., HITACHI)
- Product ID: The model name of the storage subsystem (e.g., 9200) (refer to Table 4.1)
- Serial number: The serial number of the storage subsystem (e.g., 6879)

To physically identify a storage subsystem, use the storage subsystem management program to view the above information.

- **LUN:** The number assigned to the LU that is managed within the storage subsystem. This number combined with the **Subsystem** name identifies the LU that is accessed by a path. Use the management program for the subsystem to physically identify the LU.

For the 9900V, 9900, or 7700E, the **LUN** indicates the LDEV ID: the first two digits are the CU number, and last two digits are the LDEV number within the CU. For the 9500V, 9200, 5800, and 5700E, the **LUN** indicates the internal LU number in the subsystem.

- **CHA:** Port number of channel adapter mounted on the storage subsystem. To physically identify the channel adapter, use the management program for the subsystem.
- **I/O-Count:** Total number of times path I/O occurred (decimal)
- **I/O-Errors:** Total number of path I/O errors (decimal)

8.1.3 Information Displayed by the dlnkmgr view Command

You can use the **dlnkmgr** command together with the **view** operation to check for error information. For example, specify **-path** parameter of the **view** operation to display the path information. Figure 8.1 shows an example of the results of executing the **dlnkmgr** command's **view** operation.

```
>dlnkmgr view -path -hdev f
Paths:000002 OnlinePaths:000002
PathStatus IO-Count IO-Errors
Online 1486 0

PathID PathName DskName iLU ChaPort Status Type IO-Count IO-Errors DNum HDevName
000000 0004.0001.0000000000000000.0001 HITACHI.DF600F .0051 0005 0A Online Own 1427 0 0 F
000003 0005.0001.0000000000000007A.0001 HITACHI.DF600F .0051 0005 1A Online Non 59 0 0 F
KAPL01001-I HDLM command completed successfully. Operation name = view
>
```

Figure 8.1 Result of Executing the View Operation with the **-path** Parameter

Note:

- If an error occurs, make sure to collect the log files output to the Device Manager client, as well as the error information collected by the **DLMgetras** utility.
- Equipment that is not mounted is also displayed when the **-hdev** parameter is not used.

Check the following items in the display for path errors:

- **PathID**: ID that HDLM assigned to the path at system startup, also called *AutoPATH_ID*.
- **PathName**: Name that identifies a physical path. A path name consists of the following four items separated by periods (refer to Table 8.1): HBA adapter number, bus number, target ID, and host LUN. Obtain information about the path name items as follows:

- **HBA adapter number**. Execute the following command to display the HBA number:

```
# lsdev -Cc disk
```

- **Bus number**. Execute the following command to display the parent bus number:

```
# lsdev -Cc disk
```

- **Target ID**.

For fibre channel, execute the following command to display the target ID, which is the value of **scsi_id**:

```
# lsattr -El device-name
```

For SCSI, execute the following command to display the target ID, which is the leftmost value of **connwhere**:

```
# odmget CuDv device-name
```

- **Host LU number**. For fibre channel, execute the following command to display the host LU number (value of **lun_id**):

```
# lsattr -El device-name
```

For SCSI, execute the following command to display the host LU number, which is the second value from the left of **connwhere**:

```
# odmgget -q "name=physical-volume-name" CuDv
```

- **DskName**: Name identifying the storage subsystem. A storage subsystem name consists of the following three items separated by periods:

- Vendor ID: The name of the storage subsystem vendor (e.g., HITACHI).
- Product ID: The emulation type, product identifier, or model name of the storage subsystem (e.g., OPEN-3).

If you specify the **-stname** parameter with the **view** operation, the model name of the storage subsystem is displayed (refer to Table 4.1).

If you do not specify the **-stname** parameter for the 9900V, 9900, and 7700E, the product ID displays the emulation type of the storage subsystem (e.g., 3990, 2105).

If you do not specify the **-stname** parameter for the 9500V, 9200, 5800, or 5700E, the product ID displays the product identifier specified for the storage subsystem.

- Serial number: The serial number of the storage subsystem (e.g., 15001).

Note: To physically identify the storage subsystem, use the management program for the storage subsystem to reference these information items.

- **iLU**: The number assigned to the LU that is managed within the storage subsystem. This number combined with the subsystem name (indicated in **DskName**) identifies the LU that is accessed by a path. Use the management program for the subsystem to physically identify the LU.

For the 9900V, 9900, or 7700E, the **iLU** indicates the LDEV ID: the first two digits are the CU number, and last two digits are the LDEV number within the CU. For the 9500V, 9200, 5800, and 5700E, the entire **iLU** indicates the internal LU number in the subsystem.

- **ChaPort**: Port number of CHA mounted on the storage subsystem. (ChaPort is abbreviated as "CP".) To physically identify the channel adapter, use the management program for the subsystem to reference this port number.

- **Status**: Status of the path:

- Online: Path is online.
- Offline(C): Path is offline due to a user-issued command.
- Offline(E): Path is offline due to an error.
- Online(E): An error occurred in the last online path to the device.

- **I/O-Count**: Total number of times path I/O occurred (decimal).

- **I/O-Errors**: Total number of path I/O errors (decimal).

- **Dnum**: A device number, which is equivalent to a logical volume number in AIX®. A device number beginning from 0 is assigned to each device in the LU. In AIX®, this value is fixed to 0 because one LU contains one device. This name is the same as the DNum displayed by the **view** operation.

- **HdevName**: The name of the host device. In AIX®, the logical device file name of the HDLM device (dlmfdrvn, where n is the driver's instance number) is displayed. This name is the same as the HDevName displayed by the **view** operation.

8.1.4 Messages that are Output When an Error Occurs

Examining the output message in the OS log allows you to check the information about the error.

To obtain detailed information about a path, check the following windows according to the type of message.

- For the HDLM GUI: Path List view in the Path Management window
- For the HDLM Web GUI: Show Path List subwindow
- For a command: Execution results of the `dlnmgr` command's `view` operation. For details on this operation, see section 6.7.

Figure 8.2 shows an error message that is output if a path error occurs.

```
KAPL08022-E
  A path error occurred.
  ErrorCode=%x, PathID=%d, PathName=%x.%x.%x.%x, DNum=%d, HDevName=%s
```

Note: *%d* is a decimal number, *%x* is a hexadecimal number, and *%s* is a character string.

Figure 8.2 Sample Error Message

Check the following items in the display for path errors:

- **ErrorCode:** The error number when the OS detected the path error.
- **PathID:** The ID assigned to a path. This ID is called the AutoPATH_ID. AutoPATH_IDs are re-assigned every time the management-target is restarted or every time the path configuration is changed. When you want to add a new LU without restarting the management-target, AutoPATH_IDs are re-assigned to each path of the LU when you execute the `dlmcfmgr` utility.

This path ID is the same as the path ID displayed in the following windows:

- For the HDLM GUI: Path List view in the Path Management window
- For the HDLM Web GUI: Show Path List subwindow

The path ID is also the same as PathID displayed by the `dlnmgr` command's `view` operation. For details on this operation, see section 6.7.

- **PathName:** Name of the physical path. A path name consists of the HBA number, bus number TID, and LUN. **Note:** This name is the same as the path name displayed in the Path List view in the Path Management window for the HDLM GUI, and in the Show Path List subwindow for the HDLM Web GUI.
- **Dnum:** Device number, which is equivalent to a logical volume number in AIX. A device number beginning from 0 is assigned to each device in the LU. In AIX, this value is fixed to 0 because one LU contains one device. This is the same as DNum displayed by the `view` operation.
- **HdevName:** Host device name. In AIX, the HDLM driver's special file name (`dlmfdrvn`, where *n* is the driver's instance number) is displayed. This is the same as HDevName displayed by the `view` operation. For details on this operation, see section 6.7.

8.2 Actions Taken for a Path Error

When a path error is detected, HDLM performs failover for the path and outputs the KAPL08022-E message. You can troubleshoot path errors using the HDLM GUI or the HDLM Web GUI.

To perform troubleshooting for a path error using the HDLM GUI:

1. **Examine the messages:** See the KAPL08022-E message that is output to syslog in the management-target host by using applications or tools for monitoring messages. For details about the contents of the message, see section 8.1.4 and Chapter 9.
2. **Obtain path information:** You can obtain the path information by opening the **Path List** view of the HDLM GUI, the **Show Path List** of the HDLM Web GUI, or by executing the following command:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -path -iem> pathinfo.txt
```

where **pathinfo.txt** is the redirection-output file name. Use a file name that matches your environment. For details on the path information, refer to section 6.7.

3. **Identify the error path:** Check the path information to find the error path. The path whose status indication is **Offline(E)** or **Online(E)** is the error path. When using the GUI, if an intermittent error occurs, the path icon flashes. (The icon lights for 3 seconds and then goes out for 0.2 seconds, repeatedly).

4. **Narrow down the hardware that may have the error:**

When using the GUI, check the **Subsystem**, **LUN**, and **CHA** fields of the line indicating the error path to narrow down the hardware that may be the cause of the error. To physically identify the hardware corresponding to **Subsystem**, **LUN**, and **CHA**, use the management program for the storage subsystem (e.g., 9900 Remote Console).

When using the **view** command, check the **DskName**, **iLU**, and **ChaPort** of the error path 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 management program for the storage subsystem (e.g., 9900V Remote Console - Storage Navigator).

5. **Identify the error location and correct the error:** Use the AIX® and hardware management tools to identify the error location, and then take corrective action.
6. **Place the offline path(s) online:** After recovery from the error, place the path(s) online that were offline due to the error. For information on using the GUI to check path information, see section 5.5.1.2 or 5.5.1.3. For instructions on using the **dlnkmgr online** command to place offline path(s) online, see section 6.5.

Note: When you attempt to place all paths online, the KAPL01039-W message is displayed if any path cannot be placed online. To ignore the path that cannot be placed online and continue processing, type **y**. To cancel the processing, type **n** or another character.

Note: If you have difficulty placing an **Offline(E)** path online, first change the path status to **Offline(C)** (using the HDLM GUI or **dlnkmgr online** command), and then place the path online. HDLM automatically checks whether the target paths are available, and puts available paths in the **Online** status and unavailable paths in the **Offline(E)** status. The paths in the **Offline(E)** status have not yet recovered from an error. Take appropriate corrective action for the error, and place the paths online.

Note: If an error exists in two or more paths or if path health checking or automatic failback is running, response to the `dlkmgr` online command may be slow.

To perform troubleshooting for a path error using the HDLM Web GUI:

1. **Examine the messages:** See the KAPL08022-E message that is output to the OS log. For details about the contents of the message, see section 8.1.4 and Chapter 9.
2. **Obtain path information:** You can obtain the path information by using the Show Path List of the HDLM Web GUI:
 - a) From the Device Manager main console, select the management-target host to start the HDLM Web GUI.
 - b) Click the Show Path List in the management-target host subwindow of the method frame.
3. **Identify the error path:** Check the path information that is displayed in the Show Path List subwindow to find the error path. The path whose status indication is **Offline(E)** or **Online(E)** is the error path. When using the GUI, if an intermittent error occurs, the path icon flashes. (The icon lights for 3 seconds and then goes out for 0.2 seconds, repeatedly).
4. **Narrow down the hardware that may have the error**
Check the value displayed in the **Subsystem**, **LUN**, and **CHA** columns for the error path to identify the hardware that may be the cause of the error. To physically identify the hardware corresponding to **Subsystem**, **LUN**, and **CHA**, use the management program for the storage subsystem.
5. **Identify the error location and correct the error:** Use the AIX® and hardware management tools to identify the error location, and then take corrective action. For hardware maintenance, contact your hardware vendor or maintenance company if there is a maintenance contract.
6. **Place the offline path(s) online.** Use the Show Path List subwindow:
 - a) From the **Device Manager** main console, select the management-target host to start the HDLM Web GUI.
 - b) Click the **Show Path List** in the management-target host subwindow of the **Method** frame.
The Show Path List subwindow appears in the information frame.
 - c) Select the offline path, then click the **Online** button. Offline paths that are displayed are placed online. A maximum of 15 paths are displayed in the Show Path List subwindow. When you want to display more than 16 paths, from the pull-down list box displayed in the title part of Path List, select a range of the number of paths.
Note: If any path cannot be placed online due to an error, the KAPL11134-W message appears. To ignore these paths and continue processing, click the OK button. To cancel the processing, click the Cancel button. Check the status of the paths that cannot be placed online and take appropriate corrective action.
 - d) Close the HDLM Web GUI.

Note: Even if you select the paths in the `Offline (E)` status in the Show Path List subwindow and click the **Online** button, some paths may not be placed online. In this case, use the Show Path List subwindow to change those paths from the `Offline (E)` status to the `Offline (C)` status. Then, place the paths online. The system automatically checks whether the target paths are available, puts available paths into the Online status, and puts unavailable paths into the `Offline (E)` status. The paths in the `Offline (E)` status have not recovered from an error yet. Take corrective action for the error, and then use the Show Path List subwindow to place the paths online again.

8.3 Actions Taken for a Program Error

You can troubleshoot HDLM program errors using the HDLM GUI or the HDLM Web GUI.

To perform troubleshooting for a program error using the HDLM GUI:

1. **Examine the message:** If an error occurs in the HDLM program, a message whose message ID is other than KAPL08xxx is output to syslog in the management-target host. Check the output message. Messages with error level E (Error) or higher require corrective action.
2. **Take action for the error:** Take the action recommended for the message in Chapter 9. If the same error occurs again after you take the corrective action, check the status of the HDLM program using the HDLM GUI or the **dlnkmgr view** command line, as shown below:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -sys
```

Note: One of two error messages may appear after executing the command:
KAPL01012-E or KAPL01013-E.

- The KAPL01012-E message indicates that a connection could not be established with the HDLM manager. If this message appears, start the HDLM manager. See section 5.2.1.
- The KAPL01013-E message indicates that an error occurred in the internal processing of the HDLM command. If this message appears, restart the management-target host.

If the same error occurs again after you take the above action, obtain the information necessary for contacting maintenance personnel.

3. **Check the HDLM program status:**

When using the HDLM GUI, open the **Component information** window (see section 4.2.4.6), and check the display for **HDLM manager**, **HDLM driver**, and **HDLM alert driver**, and take the following action:

- If the **HDLM manager** status is **Dead**, start the HDLM manager (see section 5.2.1).
- If the **HDLM alert driver** status is **Dead**, restart the management-target host. If the **HDLM alert driver** was removed, create it using the **cfgmgr** or **dlnmcfmgr** command.
- If the **HDLM driver** status is **Dead**, restart the management-target host.

When using the command line, execute the following command:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -sys
```

- If the KAPL01012-E message is displayed in response to the **dlnkmgr view -sys** command, start the HDLM manager (see section 5.2.1).
- If the KAPL01013-E message is displayed in response to the **dlnkmgr view -sys** command, restart the management-target host

If the same error occurs again after you take the above action, obtain the information necessary for contacting maintenance personnel.

4. **Obtain program information:** Obtain the information you should report to maintenance personnel. For AIX® systems, HDLM provides the **DLMgetras** utility for collecting error information that should be reported to maintenance personnel (see section 7.1 and section 8.3.1). When an error occurs in the HDLM GUI or HDLM Web GUI, collect the screenshot at the time the error occurred.
5. **Contact maintenance personnel:** Contact maintenance personnel, and report the obtained information (see section 8.4).

To perform troubleshooting for a program error using the HDLM Web GUI:

1. **Examine the message:** If an error occurs in the HDLM program, a message whose message ID is other than KAPL08xxx is output to the OS log. Check the output message. Messages with error level E (Error) or higher require corrective action.
2. **Take action for the error:** Take the action recommended for the message in Chapter 9. If the same error occurs again after you take the corrective action, check the status of the HDLM program using the **Show HDLM Component Information** subwindow.
3. **Check the HDLM program status:**
 - a) Click **Show HDLM Component Information** in the management-target-host subwindow of the **Method** frame.
 - b) Check the information that is displayed for **HDLM manager**, **HDLM driver**, and **HDLM alert driver**, and take the appropriate action:
 - If the **HDLM manager** status is **Dead**, start the HDLM manager (see section 5.2.1).
 - If the **HDLM alert driver** or **HDLM driver** status is **Dead**, restart the management-target host.

If the same error occurs again after you take the above action, obtain the information necessary for contacting maintenance personnel

1. **Obtain program information:** Use the **DLMgetras** utility for collecting error information that should be reported to maintenance personnel (see section 7.1 and section 8.3.1).
2. **Contact maintenance personnel:** Contact maintenance personnel, and report the obtained information (see section 8.4)

8.3.1 Additional Notes about Obtaining Program Information

When HDLM is linked with Device Manager 2.40, and a Device Manager client is used to operate HDLM, error information is output to a directory in the Device Manager client (the folder that is specified in JavaWebStart). These log files are not collected by the utility for capturing HDLM error information. If an error occurs, ensure that you collect the log files that are output to the Device Manager client, and the error information that is collected by the utility for collecting HDLM error information.

When HDLM is linked with Device Manager 3.00 or later, and a Device Manager client is used to operate HDLM, error information is output to a directory on the Device Manager server. You can use the log file collection command (the HiCommand Common Maintenance command) to collect these log files from the Device Manager server. You cannot collect these log files by using the utility for collecting HDLM error information. If an error occurs, ensure that you collect the log files that are output to the Device Manager server, and the error information that is collected by the utility for collecting HDLM error information. When the OS for the Device Manager server is Solaris™, a directory name containing a space cannot be specified in the collection directory for the HiCommand Common Maintenance command.

8.4 Actions Taken 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 for collecting HDLM error information, and then report the collected information to the HDLM vendor or maintenance company if there is a maintenance contract for HDLM. For details about the DLMgetras utility and the information it collects, see section 7.1.

When you use the HDLM GUI from a Device Manager client, error information is output to a folder (whose name is set in Java Web Start) on the Device Manager client. You cannot collect these log files by using the DLMgetras utility. If an error occurs, make sure that you collect the log files output to the Device Manager client, as well as the error information collected by the DLMgetras utility.

When you use the HDLM Web GUI from a Device Manager client,, error information is output to a directory in the Device Manager server. You can use the log file collection command (the HiCommand Common Maintenance command) to collect these log files from the Device Manager server. You cannot collect these log files by using the DLMgetras utility. If an error occurs, make sure that you collect the log files output to the Device Manager server, as well as the error information collected by the DLMgetras utility.

For details on the log file collection command of the HiCommand Common Maintenance command, see section B.1.

8.5 Calling the Hitachi Data Systems Support Center

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the problem as possible, including:

- The circumstances surrounding the error or failure,
- The exact content of any error messages displayed on the host system(s),
- The HDLM program information collected as described in section 8.1, and
- For 9900V, 9900, or 7700E, the remote service information messages (R-SIMs) logged on the Remote Console PC and the reference codes and severity levels of the recent R-SIMs.

The worldwide Hitachi Data Systems Support Centers are:

- Hitachi Data Systems North America/Latin America
San Diego, California, USA
1-800-348-4357
- Hitachi Data Systems Europe
Contact Hitachi Data Systems Local Support
- Hitachi Data Systems Asia Pacific
North Ryde, Australia
011-61-2-9325-3300

Chapter 9 HDLM Messages

Table 9.3 – Table 9.20 lists the HDLM messages by message ID and provide recommended actions for the messages, if appropriate.

HDLM issues the following types of messages:

- HDLM command messages (see Table 9.3)
- HDLM GUI messages (see Table 9.4)
- HDLM Web GUI messages (see Table 9.5)
- HDLM API messages (see Table 9.6)
- HDLM manager messages (see Table 9.7)
- HDLM driver (filter component) messages (see Table 9.8)
- HDLM alert driver messages (see Table 9.9)
- HDLM driver (core logic component) messages (see Table 9.10)
- HDLM Management Target Messages (see Table 9.11)
- HDLM installation program messages (see Table 9.12)
- Messages from the error information collection utility (see Table 9.13)
- Message from the HDLM Volume Group Operation Utility (see Table 9.14)
- Messages from the HDLM device removing utility (see Table 9.15)
- Messages from the Utility for Modifying the HDLM Execution Environment (see Table 9.16)
- Messages from the utility for changing the HDLM HBA (see Table 9.17)
- Messages from the utility for clearing HDLM persistent reservation (see Table 9.18)
- Messages from the utility for setting the HDLM execution environment ODM (see Table 9.19)
- Messages from the utility for VCS (see Table 9.20)
- Messages from Utility for Checking the Device Configuration (see Table 9.21)
- Messages from Utility for HDLM Installation Configuration Support (see Table 9.22)

Message ID. Each message has a message ID. The format of the message ID is: **KAPLmmnnnl**.

Table 9.1 describes the message ID format.

Table 9.2 describes the terms that may appear in HDLM messages or message descriptions. The term “HDLM” in Table 9.2 below may be replaced by “DLM” or “Dynamic Link Manager” in the actual message displayed by HDLM.

Table 9.1 Message ID Format

Format	Meaning
KAPL	Indicates that the message is an HDLM message
<i>nnn</i>	<p>Number of the HDLM module that issued the message</p> <p>01: HDLM command 02: HDLM GUI 03: HDLM API 04: HDLM manager 05: HDLM driver (filter component) 06: HDLM alert driver 07: HDLM driver (core logic component) 08: HDLM management target 09: HDLM installation program 10: The following utilities: HDLM error information collection utility (KAPL100<i>nn</i>) HDLM volume group operation utility (KAPL105<i>nn</i>) HDLM devices removing utility (KAPL105<i>nn</i>) HDLM execution environment modification utility (KAPL106<i>nn</i>) HDLM HBA change utility (KAPL106<i>nn</i>) HDLM persistent reservation clearance utility (KAPL106<i>nn</i>) HDLM execution environment ODM setting utility (KAPL108<i>nn</i>) 11: HDLM Web GUI</p>
<i>nnn</i>	Message serial number for the module
<i>l</i>	<p>Message level</p> <p>C: Critical E: Error W: Warning I: Information</p>

Table 9.2 Terms in Messages

Term	Description
%d	Decimal number
%s	Character string
%x	Hexadecimal number
aa...aa	Variable (if there are multiple variables in a message, aa...aa is followed by bb...bb, cc...cc, and so on)
CS	Cluster support
FO	Failover
LB	Load balancing
Operation name	Type of the operation that is entered after dlnkmgr in the command.
Service status	Running status of the service
Mounted drive	A drive that the file system recognizes

Table 9.3 HDLM Command Messages (dlnkmgr and operations)

Message ID	Message	Recommended Action
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 terminated normally.</p> <p><i>aa...aa</i>: clear, help, offline, online, set, view</p> <p><i>bb...bb</i>: the year of grace/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>: clear, offline, online, set, view</p> <p>Action</p> <p>None.</p>
KAPL01003-W	No operation name is specified.	<p>Details</p> <p>The 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>The specified operation name is invalid.</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 section 6.3.</p>
KAPL01005-W	A parameter is invalid. Operation name = <i>aa...aa</i> , parameter = <i>bb...bb</i>	<p>Details</p> <p>The specified parameter is invalid.</p> <p><i>aa...aa</i>: clear, set, online, offline, view</p> <p><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 section 6.3.</p>

Message ID	Message	Recommended Action
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>: clear, set, offline, view</p> <p>Action</p> <p>Execute <code>help operation-name</code> of the HDLM command (<code>dlnmgr</code>) to check the parameter. Specify the correct parameter, and then retry. For details on the <code>help</code> operation, section 6.3.</p>
KAPL01007-W	A duplicate parameter is specified. Operation name = <i>aa...aa</i> , parameter = <i>bb...bb</i>	<p>Details</p> <p>A duplicate parameter is specified.</p> <p><i>aa...aa</i>: clear, offline, online, set, view</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>The necessary parameter value is not specified.</p> <p><i>aa...aa</i>: offline, online, set, view</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>The parameter value is invalid.</p> <p><i>aa...aa</i>: offline, online, set, view</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 the correct value for the parameter, and then retry.</p>

Message ID	Message	Recommended Action
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>: view</p> <p>Action</p> <p>Execute the <code>view</code> operation of the HDLM command (<code>dlmkmgr</code>) to check whether the HDLM manager has started. Start the HDLM manager if it has not started, and then retry the HDLM command. For details on the <code>view</code> operation, see section 6.7.</p>
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 whose cause does not seem to be a user operation occurred during command processing.</p> <p><i>aa...aa</i>: clear, offline, online, set, view, reload, none</p> <p><i>bb...bb</i>: Function name and contents of error</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, 7.1.</p>
KAPL01014-W	No authority to execute the HDLM command. Operation name = <i>aa...aa</i>	<p>Details</p> <p>You are not authorized to execute the HDLM command as the administrator.</p> <p><i>aa...aa</i>: clear, offline, online, set, view</p> <p>Action</p> <p>Execute the command as a user with root privileges.</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, online</p> <p>Action</p> <p>Use the <code>view</code> operation of the HDLM command (<code>dlmkmgr</code>) to check the specification, and then retry.</p>

Message ID	Message	Recommended Action
KAPL01016-W	The target CHA port was not found. Operation name = <i>aa...aa</i>	<p>Details</p> <p>The path ID indicated by -pathid and required by the -cha parameter is not an object of HDLM management.</p> <p><i>aa...aa</i>: offline, online</p> <p>Action</p> <p>Use the <code>view</code> operation of the HDLM command (<code>dlnkmgr</code>) to check the specification, and then retry. For details on the <code>view</code> operation, see section 6.7.</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>: view</p> <p>Action</p> <p>Use the <code>view</code> operation of the HDLM command (<code>dlnkmgr</code>) to check the specification, and then retry. For details on the <code>view</code> operation, see section 6.7.</p>
KAPL01019-W	The target path was not found. Operation name = <i>aa...aa</i>	<p>Details</p> <p>The path to be operated could not be found.</p> <p><i>aa...aa</i>: offline, online, view</p> <p>Action</p> <p>Use the <code>view</code> operation of the HDLM command (<code>dlnkmgr</code>) to check the specification, and then retry. For details on the <code>view</code> operation, see section 6.7.</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 unneeded applications to increase the amount of free memory, and then retry.</p>
KAPL01023-W	The last Online path for the device cannot be placed Offline(C).	<p>Details</p> <p>The path specified in the <code>offline</code> operation cannot be placed in the <code>Offline(C)</code> status because it is the last path for the applicable logical unit.</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 section 6.7.</p>

Message ID	Message	Recommended Action
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>The specified parameters cannot be specified at the same time.</p> <p><i>aa...aa</i>: offline, online, set, view</p> <p><i>bb...bb</i>: Parameters cannot be specified at the same time</p> <p>Action</p> <p>Execute <code>help operation-name</code> of the HDLM command (<code>dlnkmgr</code>) to check the parameter that can be specified, and then retry. For details on the <code>help</code> operation, see section 6.3.</p>
KAPL01036-E	The Offline path cannot be placed online. PathID = <i>aa...aa</i>	<p>Details</p> <p>The path could not be recovered.</p> <p><i>aa...aa</i>: Path ID(decimal 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 = <i>aa...aa</i> 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 multipath 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><i>aa...aa</i>: Path ID(decimal 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 the processing, enter <code>n</code>. For details on the <code>online</code> operation, see section 6.5.</p>
KAPL01040-W	The entered value is invalid. Re-enter [y/n]:	<p>Details</p> <p>A value other than y and n was entered. Enter y or n.</p> <p>Action</p> <p>Enter <code>y</code> or <code>n</code>.</p>
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 response was made three times in reply to the request.</p> <p><i>aa...aa</i>: clear, offline, online, set</p> <p>Action</p> <p>To execute the operation, re-execute the HDLM command.</p>

Message ID	Message	Recommended Action
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>: Duplicated parameter value</p> <p>Action</p> <p>Delete the duplicate parameter value name, 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>There are too many parameter values.</p> <p><i>aa...aa</i>: offline, online, set, 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 (<code>dlnkmgx</code>) to check the parameter value, 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>dlnkmgx</code>) to check the operation name. And then retry.</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>, <code>set</code></p> <p>Action</p> <p>If you want to execute operation of the HDLM command, enter <code>y</code>. If you want to terminate the processing, enter <code>n</code>.</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 the online processing, enter <code>y</code>. If you want to terminate the processing, enter <code>n</code>.</p>

Message ID	Message	Recommended Action
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 in the <code>online</code> operation. To place all the paths Online, enter <code>y</code>. To not place them online, enter <code>n</code>.</p> <p>Action</p> <p>If you want to execute the online processing, enter <code>y</code>. If you want to terminate the processing, enter <code>n</code>.</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 <code>offline</code> operation will be started. To continue the <code>offline</code> operation, enter <code>y</code>. To cancel the operation, enter <code>n</code>.</p> <p>Action</p> <p>If you want to execute the offline processing, enter <code>y</code>. If you want to terminate the processing, enter <code>n</code>.</p>
KAPL01053-I	If you are sure that there would be no problem when the path is placed in the Offline(C) status, enter <code>y</code> . Otherwise, enter <code>n</code> . [y/n]:	<p>Details</p> <p>The <code>offline</code> operation will be started. To continue the <code>offline</code> operation, enter <code>y</code>. To cancel the operation, enter <code>n</code>.</p> <p>Action</p> <p>If you want to execute the offline processing, enter <code>y</code>. If you want to terminate the processing, enter <code>n</code>.</p>
KAPL01054-W	During the offline operation processing of the HDLM command, a path that cannot be placed in the Offline(C) status was detected. PathID = <code>aa...aa</code> Would you like to continue the processing of the offline operation? [y/n]:	<p>Details</p> <p>A path that cannot be placed Offline(C) was detected during multipath offline processing. To ignore this path and perform offline processing for the next path, enter <code>y</code>. To cancel offline processing, enter <code>n</code>.</p> <p><code>aa...aa</code>: Path ID(decimal number)</p> <p>Action</p> <p>If you want to continue processing of the <code>offline</code> operation of the HDLM command for other paths, enter <code>y</code>. If you want to terminate the processing, enter <code>n</code>.</p>

Message ID	Message	Recommended Action
KAPL01055-I	All the paths which pass the specified <i>aa...aa</i> 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 <i>-hba</i> or <i>-cha</i> 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>: <i>-hba</i> or <i>-cha</i></p> <p>Action</p> <p>If you want to execute the offline processing for the paths that pass the specified target, enter <i>y</i>. If you want to terminate the processing, enter <i>n</i>.</p>
KAPL01056-I	If you are sure that there would be no problem when all the paths which pass the specified <i>aa...aa</i> 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>: <i>CHA</i>, <i>HBA</i></p> <p>Action</p> <p>If you want to execute the offline processing for the paths that pass the specified target, enter <i>y</i>. If you want to terminate the processing, enter <i>n</i>.</p>
KAPL01057-I	All the paths which pass the specified <i>aa...aa</i> will be changed to the Online status. Is this OK? [y/n]:	<p>Details</p> <p>Multiple paths will all be placed in Online status because the <i>-hba</i> or <i>-cha</i> parameter was specified. To continue the operation, enter <i>y</i>; to cancel the operation, enter <i>n</i>.</p> <p><i>aa...aa</i>: <i>CHA</i>, <i>HBA</i></p> <p>Action</p> <p>If you want to execute the online processing for the paths that pass the specified target, enter <i>y</i>. If you want to terminate the processing, enter <i>n</i>.</p>
KAPL01058-W	The specified parameter value is not needed. Operation name = <i>aa...aa</i> , parameter = <i>bb...bb</i> , parameter value = <i>cc...cc</i>	<p>Details</p> <p>A parameter value was specified in a parameter that does not need any parameter value.</p> <p><i>aa...aa</i>: <i>clear</i>, <i>offline</i>, <i>online</i>, <i>set</i>, <i>view</i></p> <p><i>bb...bb</i>: Parameter name</p> <p><i>cc...cc</i>: Parameter value</p> <p>Action</p> <p>Execute <i>help operation-name</i> of the HDLM command (<i>dlnkmgx</i>) to check the parameter and parameter value, and then retry.</p>

Message ID	Message	Recommended Action
KAPL01059-W	Cannot specify the parameter <i>aa...aa</i> at the same time if you specify parameter <i>bb...bb</i> and parameter value <i>cc...cc</i> . Operation name = <i>dd...dd</i>	<p>Details</p> <p>A parameter value conflicts with the specification of another parameter.</p> <p><i>bb...bb</i>: Parameter name</p> <p><i>cc...cc</i>: Parameter value</p> <p><i>aa...aa</i>: Parameter name</p> <p><i>dd...dd</i>: view, set</p> <p>Action</p> <p>Execute <code>help operation-name</code> of the HDLM command (<code>dlnkmgr</code>) to check the parameter and parameter value, and then retry.</p>
KAPL01060-I	The user terminated the operation. Operation name = <i>aa...aa</i>	<p>Details</p> <p>The command processing will be aborted because n was entered in reply to the acknowledgment.</p> <p><i>aa...aa</i>: online, offline, set, clear</p> <p>Action</p> <p>None.</p>
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 the online/offline operation.</p> <p><i>aa...aa</i>: Number of paths where online/offline operation is successful(decimal number)</p> <p><i>bb...bb</i>: Online or Offline(C)</p> <p><i>cc...cc</i>: Number of paths where online/offline is unsuccessful(decimal number)</p> <p><i>dd...dd</i>: online, offline</p> <p>Action</p> <p>None.</p>
KAPL01063-I	The target path(s) are already <i>aa...aa</i> .	<p>Details</p> <p>As a result of executing the online/offline operation, the specified path is already placed Online/Offline(C).</p> <p><i>aa...aa</i>: Online or Offline(C)</p> <p>Action</p> <p>Use the view operation of the HDLM command (<code>dlnkmgr</code>) to check the status of the path.</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>

Message ID	Message	Recommended Action
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 will be aborted because an invalid license key was entered three times.</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 into 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 into the emergency license.</p> <p><i>aa...aa</i>: Year (4 numeric characters)/Month (01-12)/Day (01-31)</p> <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 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 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 need not install a license because a permanent license has already been installed.</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
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 failback is disabled.</p> <p>Action</p> <p>Enable automatic failback, 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 failback, the error monitoring interval, and the number of times the error is to occur.</p> <p>Action</p> <p>Set the intermittent error monitoring interval to a value that is equal to or more than <i>(automatic-failback-checking-interval x number-of-times-error-is-to-occur-for-intermittent-error-monitoring)</i>.</p>
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: /var/tmp/hdlm_license</i></p> <p>Action</p> <p>Save the correct license key file in the designated, and then re-execute.</p> <p><i>/var/tmp/hdlm_license</i></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 HDLM-installable license key in the license key file.</p> <p><i>aa...aa: /var/tmp/hdlm_license</i></p> <p>Action</p> <p>Make sure that the license key file is correct, and then re-execute.</p> <p><i>/var/tmp/hdlm_license</i></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 directory:</p> <p><i>aa...aa: /var/tmp/hdlm_license</i></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, save the correct license key file in the designated directory, and then re-execute the HDLM command.</p> <p><i>aa...aa: /var/tmp/hdlm_license</i></p>

Message ID	Message	Recommended Action
KAPL01084-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> /var/tmp/hdlm_license</p> <p>Action</p> <p>If a license key file exists, delete it.</p> <p><i>aa...aa</i> /var/tmp/hdlm_license</p>
KAPL01088-W	The specified parameter values cannot be specified at the same time. Operation name = <i>aa...aa</i> , parameter = <i>bb...bb</i> , parameter values = <i>cc...cc</i>	<p>Details</p> <p>The specified parameter values cannot be specified at the same time.</p> <p><i>aa...aa</i>:view</p> <p><i>bb...bb</i>: Parameter name</p> <p><i>cc...cc</i>: Parameter values cannot be specified at the same time</p> <p>Action</p> <p>Execute <code>help operation-name</code> of the HDLM command (<code>dlnkmgr</code>) to check the parameter that can be specified, and then retry.</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 view sys -lic operation. Then, if necessary, re-execute the HDLM command's set -lic operation. 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 operations:</p> <ul style="list-style-type: none"> ▪ Simultaneous executions of the HDLM command's set -lic operation ▪ Execution of the HDLM command's set -lic operation simultaneously with an update of the license for an update installation
KAPL01095-E	An attempt to acquire the HDLM version information has failed. details = <i>aa...aa</i>	<p>Details</p> <p>The HDLM version information could not be acquired correctly.</p> <p><i>aa...aa</i>: Code showing reason for error</p> <p>Action</p> <p>Re-execute. 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>

Message ID	Message	Recommended Action
KAPL01096-E	An attempt to acquire the Service Pack version information has failed. details = aa...aa	<p>Details</p> <p>The Service Pack version information could not be acquired correctly.</p> <p><i>aa...aa</i>: Code showing reason for error</p> <p>Action</p> <p>Re-execute. 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>
KAPL01097-W	All the current trace files will be deleted. Is this OK? [y/n]	<p>Details</p> <p>If you set a value 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 <code>y</code>. To cancel the operation, enter <code>n</code>.</p> <p>Action</p> <p>If you want to execute operation of the HDLM command, enter <code>y</code>. If you want to terminate the processing, enter <code>n</code>.</p>
KAPL01100-I	<i>aa...aa</i>	<p>Details</p> <p>This message indicates the executed command line.</p> <p>Action</p> <p>None.</p>

Note: When you reinstall HDLM, default values are assigned to the function settings in the Options window. If needed, reset these values according to your preference.

Table 9.4 HDLM GUI Messages

Message ID	Message	Recommended Action
KAPL02001-I	HDLM GUI has started normally.	<p>Details</p> <p>HDLM GUI has started.</p> <p>Action</p> <p>None.</p>
KAPL02002-I	HDLM GUI has terminated.	<p>Details</p> <p>HDLM GUI has terminated.</p> <p>Action</p> <p>None.</p>
KAPL02003-E	You lack permission to start HDLM GUI.	<p>Action</p> <p>Execute the command as a user with root privileges.</p>
KAPL02004-E	An error occurred during internal processing of HDLM GUI. HDLM GUI cannot start. Details = <i>aa...aa</i>	<p>Details</p> <p>During GUI startup, an error that might not be caused by a user operation occurred.</p> <p><i>aa...aa</i>: Failed API name:</p> <ul style="list-style-type: none"> ▪ JHSPGetPathBy ▪ JHSPGetManagerStatus ▪ JHSPGetDriverStatus ▪ JHSPGetADriverStatus ▪ JHSPVerifyAuthorization <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.</p>
KAPL02005-E	An attempt to start HDLM GUI has failed due to insufficient memory.	<p>Details</p> <p>Sufficient memory to process the HDLM GUI could not be obtained.</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 found.</p> <p>Action</p> <p>Set up a path between the host and storage subsystem, and then restart the host.</p>

Message ID	Message	Recommended Action
KAPL02007-E	The HDLM manager could not be connected. The <i>aa...aa</i> operation has been stopped.	<p>Details</p> <p>During the Option window startup or Set Option Information operation, the system could not access the HDLM manager.</p> <p><i>aa...aa</i>: Get Option Information or Set Option Information</p> <p>Action</p> <p>Execute the <i>view</i> operation of the HDLM command (<i>adlinkmgr</i>) to check whether the HDLM manager has started. If the HDLM manager has not started, start the HDLM manager and then restart HDLM GUI.</p>
KAPL02011-I	Would you like to execute the <i>aa...aa</i> operation? [OK/Cancel]	<p>Details</p> <p>This is confirmation for execution of the operation. 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>The operation has started.</p> <p><i>aa...aa</i>: Operation</p> <ul style="list-style-type: none"> ▪ CSV Output ▪ Set Option Information ▪ Refresh ▪ Online ▪ Offline ▪ Clear Data <p>Action</p> <p>None.</p>
KAPL02013-I	<i>aa...aa</i> has terminated normally.	<p>Details</p> <p>The operation has terminated normally.</p> <p><i>aa...aa</i>: Operation</p> <ul style="list-style-type: none"> ▪ CSV Output ▪ Define Option Information ▪ Refresh ▪ Clear Data <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL02014-W	No data has been input in <i>aa...aa</i> .	<p>Details</p> <p>No value has been entered in the input field of the Option window.</p> <p><i>aa...aa</i>: Input item</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>Data has not been input for the specified item.</p>
KAPL02015-W	A value which is not a number has been input in <i>aa...aa</i> .	<p>Details</p> <p>Non-numeric value has been entered in the input field of the Option window.</p> <p><i>aa...aa</i>: Input item</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 numeric value for the specified item.</p>

Message ID	Message	Recommended Action
KAPL02016-W	A value which is outside of the valid range has been input in <i>aa...aa</i> .	<p>Details</p> <p>The value entered in the input field of the Option window is not within the valid range.</p> <p><i>aa...aa</i>: Input item</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>For the specified item, specify a numeric value within the valid range described in this manual.</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 the online processing, click OK. To cancel the online processing, click Cancel.</p>
KAPL02018-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? [OK/Cancel]	<p>Details</p> <p>The paths that are not online among the currently displayed 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 the online processing, click OK. To cancel the 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 the offline processing, click OK. To cancel the offline processing, click Cancel.</p>

Message ID	Message	Recommended Action
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 confirmation to determine whether you want to change the selected path(s) to 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 the offline processing, click OK. To cancel the 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 operation has completed.</p> <p><i>aa...aa</i>: Number of paths successfully processed(decimal number)</p> <p><i>bb...bb</i>: Online or Offline</p> <p><i>cc...cc</i>: Number of failed paths(decimal number)</p> <p>Action</p> <p>Check the operation log for the Path ID(s) of the path(s) that resulted in the online or offline operation error.</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 performing online processing of multiple paths, a path that cannot be changed to Online was detected. If you want to ignore the path and continue, enter y. To cancel the operation, enter n.</p> <p><i>aa...aa</i>: Path ID(decimal number)</p> <p>Action</p> <p>If you wish to continue online processing, click the OK button; to cancel online processing, click the Cancel button. For the paths that caused the online processing error, correct the error and then re-execute the online processing.</p>

Message ID	Message	Recommended Action
KAPL02023-W	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>Details</p> <p>During offline processing of multiple paths, a path that cannot be changed to Offline(C) was detected. If you want to ignore the path and continue, enter <i>y</i>. To cancel the operation, enter <i>n</i>. <i>aa...aa</i>: Path ID(decimal number)</p> <p>Action</p> <p>If you want to continue the offline processing, click OK. To cancel the offline processing, click Cancel. For paths that cannot be processed, take the following actions.</p> <p>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.</p>
KAPL02026-W	The target path of the <i>aa...aa</i> operation could not be found.	<p>Details</p> <p>The target path of the operation could not be found. <i>aa...aa</i>: Operation</p> <ul style="list-style-type: none"> ▪ Online ▪ Clear Data ▪ CSV Output ▪ Get Path Information ▪ Refresh <p>Action</p> <p>Click Refresh to update the view contents, 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 = <i>aa...aa</i>	<p>Details</p> <p>The path specified in the offline operation cannot be set to Offline(C) because it is the last path to the applicable logical unit. <i>aa...aa</i>: Path ID(decimal number)</p> <p>Action</p> <p>Click Refresh to update the view contents, check the path status, and then retry.</p>
KAPL02028-W	You lack write permission for the <i>aa...aa</i> .	<p>Details</p> <p>You lack write permission for the specified CSV file. <i>aa...aa</i>: 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>

Message ID	Message	Recommended Action
KAPL02029-E	An error occurred during internal processing of the HDLM GUI. The <i>aa...aa</i> operation has been stopped. Details = <i>bb...bb</i>	<p>Details</p> <p>During the HDLM GUI processing, an error which might not be caused by a user operation occurred.</p> <p><i>aa...aa</i>: Internal Processing Name</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 <p><i>bb...bb</i>: Issuing API Name</p> <ul style="list-style-type: none"> ▪ JHSPGetOption ▪ JHSPSetOption ▪ JHSPOnlinePath ▪ JHSPOfflinePath ▪ JHSPGetPathBy ▪ JHSPClearStatistics ▪ JHSPGetManagerStatus ▪ JHSPGetDriverStatus ▪ JHSPGetADriverStatus ▪ JHSPGetClusterService <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.</p>

Message ID	Message	Recommended Action
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 sufficient memory available for the HDLM GUI processing.</p> <p><i>aa...aa</i>: Internal processing names</p> <ul style="list-style-type: none"> ▪ CSV Output ▪ 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 <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 the HDLM GUI processing.</p> <p><i>aa...aa</i>: Internal processing names</p> <ul style="list-style-type: none"> ▪ CSV Output ▪ 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 <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.</p>

Message ID	Message	Recommended Action
KAPL02039-E	There is no response from the management-target host.	<p>Details</p> <p>There is no response from Device Manager Agent.</p> <p>Action</p> <p>Check whether Device Manager Agent has started. If Device Manager Agent has not started, start Device Manager Agent and then restart HDLM GUI.</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 number)</p> <p>Action</p> <p>Remove the error in the path, and then retry.</p>
KAPL02042-E	An unexpected error occurred. The HDLM GUI cannot start.	<p>Details</p> <p>An exception occurred when starting 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.</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</p> <p><i>bb...bb</i>: The Path ID to which the operation was attempted(decimal number)</p> <p>Action</p> <p>Click Refresh to update the view contents, and then 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>
KAPL02046-E	An attempt to read the start parameter failed. The HDLM GUI cannot start.	<p>Details</p> <p>An attempt to read the parameter required to start HDLM GUI failed.</p> <p>Action</p> <p>Check whether Device Manager Server has started. If Device Manager Server has not started, start Device Manager Server and then restart the HDLM GUI.</p>

Message ID	Message	Recommended Action
KAPL02052-W	The HDLM manager could not be connected.	<p>Details</p> <p>The HDLM manager could not be accessed during the start processing of the HDLM GUI.</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>adlinkmgr</code>) to check whether the HDLM manager has started. If the HDLM manager has not started, start the HDLM manager and then restart HDLM GUI.</p>
KAPL02053-I	Would you like to terminate the HDLM GUI? [OK/Cancel]	<p>Details</p> <p>Terminate the HDLM GUI. To continue, click OK. Otherwise, click Cancel.</p> <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	<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>Details</p> <p>Indicates the number of the processed paths when the offline request was registered during the Reserve processing.</p> <p><i>aa...aa</i>: The number of paths succeeded in the offline processing(decimal number)</p> <p><i>bb...bb</i>: The number of paths for which the offline request was registered(decimal number)</p> <p><i>cc...cc</i>: The number of paths failed in the offline processing(decimal number)</p> <p><i>dd...dd</i>: the offline processing</p> <p>Action</p> <p>For the Path ID(s) of the failed path(s), see the operation log. Click Refresh if you want to check the registered path(s) in 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), resulting from the online/offline operation.</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>

Message ID	Message	Recommended Action
KAPL02056-E	An attempt to acquire the operating permissions of Device Manager failed. The HDLM GUI cannot start.	<p>Details</p> <p>An attempt to acquire the operating permissions of Device Manager failed.</p> <p>Action</p> <p>Check whether Device Manager Server has started. If Device Manager Server has not started, start Device Manager Server and then restart the HDLM GUI.</p>
KAPL02057-E	The Help window cannot start.	<p>Details</p> <p>There is no Web browser installed, or the installation of a Web browser failed.</p> <p>Action</p> <p>Confirm that Web browser is installed. If Web browser is installed on the machine, confirm that the PATH environment variable is set.</p>
KAPL02059-E	Window could not be opened.	<p>Details</p> <p>X Window System is not available, or the DISPLAY environment variable is not set correctly.</p> <p>Action</p> <p>Check that the DISPLAY environment variable is set properly.</p>
KAPL02060-E	The version of JRE required by HDLMGUI has not been installed.	<p>Details</p> <p>The version of JRE required by HDLMGUI has not been installed.</p> <p>Action</p> <p>Install the JRE required by HDLM GUI by referring to the User's Guide, and then start HDLM GUI. You can make sure of existence of JRE by checking if your computer has /usr/java131/bin/java directory.</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 configuration of paths was changed during HDLM GUI startup processing.</p> <p>Action</p> <p>Click Refresh after you confirm the reconfiguration of the path is not done.</p>
KAPL02062-E	The getting PathInformation has been stopped because the path configuration was changed during HDLM GUI startup processing.	<p>Details</p> <p>The information of the path could not be acquired because the configuration of paths was changed during the processing of the Refresh operation.</p> <p>Action</p> <p>Click Refresh after you confirm the reconfiguration of the path is not done.</p>

Message ID	Message	Recommended Action
KAPL02063-W	The version number cannot be displayed.	<p>Details</p> <p>The version number couldn't be acquired because it failed in reading of a parameter file to start HDLM GUI.</p> <p>Action</p> <p>The version number cannot be displayed, but the operation of HDLM GUI can execute. If you want to display the version number, install the HDLM again.</p>
KAPL02064-W	The getting PathInformation has been stopped because the path configuration was changed during HDLM GUI startup processing.	<p>Details</p> <p>An intermittent error cannot be detected by using the values specified for the following: the checking interval for automatic failback, the error monitoring interval, and the number of times the error is to occur.</p> <p>Action</p> <p>Set the intermittent error monitoring interval to a value that is equal to or more 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 path configuration was changed during HDLM GUI startup processing.	<p>Details</p> <p>The path information could not be get because the configuration of the path was changed when getting the latest path information after the Offline, Online, or Clear Data.</p> <p>Action</p> <p>Click Refresh after you confirm the reconfiguration of the path is not done.</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 correctly.</p> <p><i>aa...aa</i>: Code showing reason for error</p> <p>Action</p> <p>Re-execute. If the same error occurs even after removing the reservation, execute the <code>DLMgetras</code> utility for collecting HDLM error information to collect the error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>

Message ID	Message	Recommended Action
KAPL02077-W	An attempt to acquire the Service Pack version information failed. Details = aa...aa	<p>Details</p> <p>The Service Pack version information could not be acquired correctly.</p> <p>aa...aa: Code showing reason for error</p> <p>Action</p> <p>Re-execute. If the same error occurs even after removing the reservation, execute the <code>DLMgetras</code> utility for collecting HDLM error information to collect the error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>
KAPL02078-I	The Help window has started. Browser = aa...aa	<p>Details</p> <p>The Help window started normally.</p> <p>aa...aa: Netscape, Mozilla</p> <p>Action</p> <p>None.</p>
KAPL02079-W	An attempt to start the Help window has failed. Browser = aa...aa	<p>Details</p> <p>An attempt to start the Help window has failed because the browser could not be started.</p> <p>aa...aa: Netscape, Mozilla</p> <p>Action</p> <p>Confirm that Netscape or Mozilla have been installed.</p> <p>If they have been installed, confirm that the PATH environment variables for Netscape or Mozilla have been set.</p>
KAPL02080-W	All the current trace files will be deleted. Is this OK? [OK/Cancel]	<p>Details</p> <p>If you set a value 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, click OK. To cancel the operation, click Cancel.</p> <p>Action</p> <p>If you want to continue the operation, click OK. To cancel the operation, click Cancel.</p>
KAPL02200-I	GUI information - aa...aa	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p>aa...aa: Trace information (Character string)</p> <p>Action</p> <p>None.</p>

Table 9.5 HDLM Web GUI Messages

Message ID	Message	Recommended Action
KAPL11001-I	HDLM Web GUI will now start. User ID = <i>aa...aa</i>	<p>Details</p> <p>Initialization completed normally and HDLM Web GUI will start.</p> <p><i>aa...aa</i>: User ID</p> <p>Action</p> <p>None.</p>
KAPL11002-E	An authentication error occurred. HDLM Web GUI cannot start. Details = <i>aa...aa</i>	<p>Details</p> <p>During HDLM Web GUI startup, an authentication error occurred.</p> <p><i>aa...aa</i>: One of the following causes of the authentication error:</p> <ul style="list-style-type: none"> ▪ Authentication failed ▪ Expired authentication information ▪ The format of the authentication information is invalid ▪ Unexpected error <p>Action</p> <p>Log in to Device Manager again and restart HDLM Web GUI. If the error occurs repeatedly, execute the HiCommand common maintenance command to collect the error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL11003-E	An attempt to connect the authentication server has failed. HDLM Web GUI cannot start.	<p>Details</p> <p>During HDLM Web GUI startup, connection to the authentication server failed.</p> <p>Action</p> <p>Check if the HiCommand Single Sign On Service and HiCommand Common Web Service are running on the server. If they are not running, start each service, and then restart HDLM Web GUI.</p>

Message ID	Message	Recommended Action
KAPL11004-E	An attempt to access the repository has failed. HDLM Web GUI cannot start. Details = <i>aa...aa</i>	<p>Details</p> <p>During HDLM Web GUI startup, access to the HiCommand common repository failed.</p> <p><i>aa...aa</i>: One of the following causes of the access error:</p> <ul style="list-style-type: none"> ▪ An invalid class was specified ▪ A nonexistent element was specified ▪ A nonexistent property was specified ▪ Timeout ▪ Insufficient memory ▪ Nonexistent repository ▪ Invalid repository ▪ Nonexistent session ▪ No execution permission ▪ Nonexistent account ▪ User authentication failed ▪ Unexpected error <p>Action</p> <p>Log in to Device Manager again and restart HDLM Web GUI. If the error occurs repeatedly, execute the HiCommand common maintenance command to collect the error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL11005-E	The selected host does not exist. HDLM Web GUI cannot start. Host = <i>aa...aa</i>	<p>Details</p> <p>During HDLM Web GUI startup, the selected management-target host could not be found among the hosts managed by Device Manager.</p> <p><i>aa...aa</i>: Host name selected in the HDvM host management window</p> <p>Action</p> <p>Check whether the host you selected exists in the hosts managed by Device Manager. For information on how to register hosts in Device Manager, see the manual for Device Manager.</p>
KAPL11007-E	An attempt to connect HiCommand Server has failed. HDLM Web GUI cannot start.	<p>Details</p> <p>During HDLM Web GUI startup, connection to HiCommand Server failed.</p> <p>Action</p> <p>Check if HiCommand Server is running. If it is not running, start the HiCommand Server service, and then restart HDLM Web GUI.</p>

Message ID	Message	Recommended Action
KAPL11008-E	An error occurred at the time of accessing HiCommand Server. HDLM Web GUI cannot start. Error code = <i>aa...aa</i>	<p>Details</p> <p>During HDLM Web GUI startup, an error occurred in the internal processing of HiCommand Server.</p> <p><i>aa...aa</i>: Error code returned from HiCommand Server</p> <p>Action</p> <p>Based on the error code, remove the cause of the problem that occurred with HiCommand Server, and then restart HDLM Web GUI. For more information on error codes, see the manual for Device Manager.</p>
KAPL11009-E	There is no response from the management-target host. HDLM Web GUI cannot start. Host = <i>aa...aa</i>	<p>Details</p> <p>During HDLM Web GUI startup, communication with HDvM Agent on the management-target host failed.</p> <p><i>aa...aa</i>: Host name selected on the HDvM host management window</p> <p>Action</p> <p>Check whether Device Manager - Agent has started. If it has not started, start and then restart HDLM Web GUI.</p>
KAPL11012-E	Cannot start HDLM Web GUI due to insufficient memory on the management-target host. Host = <i>aa...aa</i>	<p>Details</p> <p>During HDLM Web GUI startup, the memory required for processing on the management-target host could not be allocated.</p> <p><i>aa...aa</i>: Host name selected in the HDvM host management window</p> <p>Action</p> <p>Terminate unnecessary applications on the management-target host to increase the amount of free memory, or restart the host.</p>

Message ID	Message	Recommended Action
KAPL11013-E	An error occurred during internal processing on the management-target host. HDLM Web GUI cannot start. Host = <i>aa...aa</i> , Details = <i>bb...bb</i>	<p>Details</p> <p>During HDLM Web GUI startup, an error that might not have been caused by a user operation occurred in processing on the management-target host.</p> <p><i>aa...aa</i>: Host name selected in the HDvM host management window</p> <p><i>bb...bb</i>: One of the following failed API names:</p> <ul style="list-style-type: none"> ▪ JHSPGetOption ▪ JHSPSetOption ▪ JHSPOnlinePath ▪ JHSPOfflinePath ▪ JHSPGetPathBy ▪ JHSPClearStatistics ▪ JHSPGetManagerStatus ▪ JHSPGetDriverStatus ▪ JHSPGetADriverStatus ▪ JHSPGetClusterService <p>Action</p> <p>Collect the error information on the server and the management-target host, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the <code>HiCommand</code> common maintenance command.</p> <p>Management-target host</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information.</p>

Message ID	Message	Recommended Action
KAPL11014-E	An unexpected error occurred in the management-target host. HDLM Web GUI cannot start. Host = <i>aa...aa</i>	<p>Details</p> <p>During HDLM Web GUI startup, an exception occurred in the processing on the management-target host.</p> <p><i>aa...aa</i>: Host name selected in the HDvM host management window</p> <p>Action</p> <p>Collect the error information on the server and the management-target host, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the HiCommand common maintenance command.</p> <p>Management-target host</p> <p>Execute the <code>DLMgetras</code> utility for collecting HDLM error information.</p>
KAPL11015-E	An unexpected error occurred in the server. HDLM Web GUI cannot start.	<p>Details</p> <p>During HDLM Web GUI startup, an exception occurred in the internal processing on the server.</p> <p>Action</p> <p>Execute the HiCommand common maintenance command to collect the error information on the server, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>

Message ID	Message	Recommended Action
KAPL11016-E	The HDLM Web GUI does not support the HDLM of the management-target host. Host = <i>aa...aa</i> , Error code = <i>bb...bb</i>	<p>Details</p> <p>The HDLM Web GUI cannot recognize the error code returned from the management-target host because the HDLM Web GUI does not support the HDLM.</p> <p><i>aa...aa</i>: Name of the target host <i>bb...bb</i>: Error code</p> <p>Action</p> <p>Upgrade the version of HDLM Web GUI to the following version:</p> <p>The version of HDLM Web GUI included in the HDLM installed in the management-target host.</p> <p>A later version than 1.</p> <p>For details about the HDLM Web GUI included in the HDLM, see the ENC for HDLM.</p> <p>If the problem is not resolved by the upgrade of HDLM Web GUI, collect the error information on the server and the management-target host, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the HiCommand common maintenance command.</p> <p>Management-target host</p> <p>Execute DLMgetras.</p>
KAPL11101-E	An authentication error occurred. Details = <i>aa...aa</i>	<p>Details</p> <p>An authentication error occurred.</p> <p><i>aa...aa</i>: Cause of the authentication error</p> <ul style="list-style-type: none"> ▪ Authentication failed ▪ Expired authentication information ▪ The format of authentication information is invalid ▪ Unexpected error <p>Action</p> <p>Log in Device Manager again and restart HDLM Web GUI. If the error occurs repeatedly, execute the HiCommand common maintenance command to collect the error information, and contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>

Message ID	Message	Recommended Action
KAPL11102-E	An attempt to connect the authentication server has failed.	<p>Details</p> <p>Connection to the authentication server failed.</p> <p>Action</p> <p>Check if HiCommand Suite Single Sign On Service and HiCommand Common Web Service are running on the server. If they are not running, start each service, and then restart HDLM Web GUI.</p>
KAPL11103-E	An attempt to access the repository has failed. Details = <i>aa...aa</i>	<p>Details</p> <p>Access to the HiCommand common repository has failed.</p> <p><i>aa...aa</i>: Cause of the access error</p> <ul style="list-style-type: none"> ▪ An invalid class was specified ▪ A nonexistent element was specified ▪ A nonexistent property was specified ▪ Timeout ▪ Insufficient memory ▪ Nonexistent repository ▪ Invalid repository ▪ Nonexistent session ▪ No execution authority ▪ Nonexistent account ▪ User authentication failed ▪ Unexpected error <p>Action</p> <p>Log in Device Manager again and restart HDLM Web GUI. If the error occurs repeatedly, execute the HiCommand common maintenance command to collect the error information, and contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL11104-E	An unexpected error occurred in the server.	<p>Details</p> <p>An exception occurred during processing on the server.</p> <p>Action</p> <p>Execute the HiCommand common maintenance command to collect the error information on the server, and contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>

Message ID	Message	Recommended Action
KAPL11105-E	No management-target host has been registered.	<p>Details</p> <p>No host has been registered in HiCommand Server.</p> <p>Action</p> <p>Check if the host is registered in Device Manager. For information on how to register/confirm the host in Device Manager, see the manual for Device Manager.</p>
KAPL11107-E	An attempt to connect HiCommand Server has failed. The host information cannot be acquired.	<p>Details</p> <p>At the time of acquiring host information, the connection to HiCommand Server failed.</p> <p>Action</p> <p>Check if HiCommand Server is running. If it is not running, start the HiCommand Server service, and then restart HDLM Web GUI.</p>
KAPL11108-E	An error occurred at the time of accessing to HiCommand Server. The host information cannot be acquired. Error code = <i>aa...aa</i>	<p>Details</p> <p>At the time of acquiring host information, an attempt to access HiCommand Server failed.</p> <p><i>aa...aa</i> : error code returned from HiCommand Server (Character string)</p> <p>Action</p> <p>Based on the error code, remove the cause of the problem that occurred with the HiCommand Server, and then restart HDLM Web GUI. For more information on error codes, see the manual for Device Manager.</p>
KAPL11109-E	There is no response from the management-target host. Host = <i>aa...aa</i>	<p>Details</p> <p>An attempt to communicate with Device Manager Agent of the management-target host has failed.</p> <p><i>aa...aa</i>: Name of the target host</p> <p>Action</p> <p>Check whether Device Manager Agent has started. If Device Manager Agent has not started, start Device Manager Agent.</p>

Message ID	Message	Recommended Action
KAPL11111-E	The management-target host is being used. Host = <i>aa...aa</i> , Using user = <i>bb...bb</i>	<p>Details</p> <p>Access to the management-target host for the operation failed because another operation was already being executed on the host.</p> <p><i>aa...aa</i>: Name of the target host</p> <p><i>bb...bb</i>: User ID of the user who started the operation being executed on the management-target host</p> <p>Action</p> <p>Wait for the other user to complete the operation. Once the user's operation is complete, try to perform the operation again.</p>
KAPL11112-E	<i>aa...aa</i> cannot be executed due to insufficient memory on the management-target host. Host = <i>bb...bb</i>	<p>Details</p> <p>The memory required for processing on the management-target host could not be allocated.</p> <p><i>aa...aa</i>: Operation name</p> <ul style="list-style-type: none"> ▪ 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 <p><i>bb...bb</i>: Name of the target host</p> <p>Action</p> <p>Terminate unnecessary applications on the management-target host to increase the amount of free memory, or restart the host.</p>

Message ID	Message	Recommended Action
KAPL11113-E	An error occurred during internal processing in the management-target host. Host = <i>aa...aa</i> , Details = <i>bb...bb</i>	<p>Details</p> <p>An error that might not have been caused by a user operation occurred during processing in the management-target host.</p> <p><i>aa...aa</i>: Name of the target host</p> <p><i>bb...bb</i>: Failed API name:</p> <ul style="list-style-type: none"> ▪ JHSPGetOption ▪ JHSPSetOption ▪ JHSPOnlinePath ▪ JHSPOfflinePath ▪ JHSPGetPathBy ▪ JHSPClearStatistics ▪ JHSPGetManagerStatus ▪ JHSPGetDriverStatus ▪ JHSPGetADriverStatus ▪ JHSPGetClusterService <p>Action</p> <p>Collect the error information on the server and the management-target host, and contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the HiCommand common maintenance command.</p> <p>Management-target host</p> <p>Execute <code>DLMgetras</code>.</p>
KAPL11114-E	An unexpected error occurred in the management-target host. Host = <i>aa...aa</i>	<p>Details</p> <p>An exception occurred during processing in the management-target host.</p> <p><i>aa...aa</i>: Name of the target host</p> <p>Action</p> <p>Collect the error information on the server and the management-target host, and contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the HiCommand common maintenance command.</p> <p>Management-target host</p> <p>Execute <code>DLMgetras</code>.</p>

Message ID	Message	Recommended Action
KAPL11116-E	The HDLM manager could not be connected. Host = <i>aa...aa</i>	<p>Details</p> <p>The HDLM manager could not be accessed on the management-target host at the time of getting/setting option information.</p> <p><i>aa...aa</i>: Name of the target host</p> <p>Action</p> <p>See the HDLM Component Information subwindow or execute the <code>view</code> operation of the HDLM command on the management-target host to check if HDLM Manager is running on the management-target host. If it is not running, start HDLM Manager.</p>
KAPL11117-E	The configuration does not support the simultaneous use of the load balancing and cluster support functions. Host = <i>aa...aa</i>	<p>Details</p> <p>The load balancing function is not available in the cluster environment when, in the target storage subsystems for the management by HDLM, there is a storage subsystem that does not support the persistent reservation.</p> <p><i>aa...aa</i>: Name of the target host</p> <p>Action</p> <p>Change all the storage subsystems managed by HDLM on the management-target host to ones that support persistent reservation. To find out whether your storage subsystems support persistent reservation, contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>
KAPL11118-E	The load balancing function is not supported because MSCS is installed. Host = <i>aa...aa</i>	<p>Details</p> <p>The load balancing function cannot be enabled because MSCS is installed.</p> <p><i>aa...aa</i>: name of the target host</p> <p>Action</p> <p>The load balancing function is not supported in an environment with MSCS installed. If you want to use the load balancing function, uninstall MSCS.</p>

Message ID	Message	Recommended Action
KAPL11120-W	No data has been input in <i>aa...aa</i> .	<p>Details</p> <p>No value has been entered in the input field of the HDLM Environment Settings subwindow.</p> <p><i>aa...aa</i> : Input item</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 numeric value within the valid range.</p>
KAPL11121-W	A value which is not a number has been input in <i>aa...aa</i> .	<p>Details</p> <p>Non-numeric value has been entered in the input field of the HDLM Environment Settings subwindow.</p> <p><i>aa...aa</i> : Input item</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 numeric value within the valid range.</p>

Message ID	Message	Recommended Action
KAPL11122-W	A value which is outside of the valid range has been input in <i>aa...aa</i> .	<p>Details</p> <p>The value entered in the input field of the HDLM Environment Settings subwindow is not within the valid range.</p> <p><i>aa...aa</i> : Input item</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 numeric value within the valid range.</p>
KAPL11123-I	Would you like to execute the <i>aa...aa</i> operation? [OK/Cancel]	<p>Details</p> <p>The Set Option Information/Clear Data/CSV Output operation will be executed. If you want to execute the operation, click OK. To cancel the operation, click Cancel.</p> <p><i>aa...aa</i> : operation</p> <ul style="list-style-type: none"> ▪ Set Option Information ▪ Clear Data ▪ CSV output <p>Action</p> <p>If you want to execute the operation, click OK. To cancel the operation, click Cancel.</p>
KAPL11124-E	No path was detected. Host = <i>aa...aa</i>	<p>Details</p> <p>The target path of the operation could not be found on the management-target host.</p> <p><i>aa...aa</i>: Name of the target host</p> <p>Action</p> <p>Connect the path between the host and the storage subsystems, and then restart the host. After that, click Refresh.</p>
KAPL11125-I	The currently selected paths will be changed to the <i>aa...aa</i> status. Is this OK? [OK/Cancel]	<p>Details</p> <p>The currently selected paths will be changed to the Online/Offline status. If you want to continue, click OK. If you do not want to proceed, click Cancel.</p> <p><i>aa...aa</i> : Online or Offline</p> <p>Action</p> <p>If you want to execute the operation, click OK. To cancel the operation, click Cancel.</p>

Message ID	Message	Recommended Action
KAPL11126-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? [OK/Cancel]	<p>Details</p> <p>The paths which are not online among the currently displayed 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 the online processing, click OK. To cancel the online processing, click Cancel.</p>
KAPL11127-W	The target path of the online operation cannot be found.	<p>Details</p> <p>Because the currently displayed paths are all online, the online operation cannot be executed.</p> <p>Action</p> <p>Select the path, and then execute the online operation.</p>
KAPL11128-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 confirmation to determine whether you want to change the selected path(s) to 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 the offline processing, click OK. To cancel the offline processing, click Cancel.</p>
KAPL11129-W	The target path of the offline operation has not been selected.	<p>Details</p> <p>Because no path has been selected from the currently displayed paths, the offline operation cannot be executed.</p> <p>Action</p> <p>Select the path, and then execute the offline operation.</p>
KAPL11130-I	The <i>aa...aa</i> operation is executing.	<p>Details</p> <p>The operation is being executed.</p> <p><i>aa...aa</i> operation</p> <ul style="list-style-type: none"> ▪ Online ▪ Offline ▪ Clear Data ▪ Refresh <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL11131-E	The target path of the <i>aa...aa</i> operation cannot be found. Host = <i>bb...bb</i> , Path ID = <i>cc...cc</i>	<p>Details</p> <p>The target path of the operation does not exist on the management-target 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 name of the target host (Character string)</p> <p><i>cc...cc</i>: Path ID of the nonexistent path(decimal number)</p> <p>Action</p> <p>Click Refresh and confirm the path status, and then perform the operation again.</p>
KAPL11132-E	The Offline path cannot be placed Online. Host = <i>aa...aa</i> , Path ID = <i>bb...bb</i>	<p>Details</p> <p><i>aa...aa</i>: Name of the target host</p> <p><i>bb...bb</i>: Path ID of the failed path(decimal number)</p> <p>Action</p> <p>Remove the error in the path, and then retry.</p>
KAPL11133-I	The target path(s) are already <i>aa...aa</i> . Host = <i>bb...bb</i>	<p>Details</p> <p>The specified paths are already Online/Offline(C), resulting from the online/offline processing.</p> <p><i>aa...aa</i>: Online or Offline(C)</p> <p><i>bb...bb</i>: Name of the target host</p> <p>Action</p> <p>Click Refresh to check the status of the path.</p>

Message ID	Message	Recommended Action
KAPL11134-W	A path that cannot be placed in the <i>aa...aa</i> status has been detected. PathID = <i>bb...bb</i> Would you like to continue the <i>cc...cc</i> processing? [OK/Cancel]:	<p>Details</p> <p>During online/offline processing of multiple paths, a path that cannot be changed to Online/Offline(C) was detected. If you want to ignore the path and continue, enter <i>y</i>. To cancel the operation, enter <i>n</i>.</p> <p><i>aa...aa</i>: Online or Offline(C) (Character string)</p> <p><i>bb...bb</i>: Path ID of the unchangeable path(decimal number)</p> <p><i>cc...cc</i>: Operation (Character string)</p> <ul style="list-style-type: none"> ▪ Online ▪ Offline <p>Action</p> <p>If you want to continue the online/offline processing, click OK. To cancel the online/offline processing, click Cancel. For paths that cannot be processed, take the following actions.</p> <p>For a path that failed to run online, remove the error, and then run the service online again. For a path that failed to run offline, execute DLMgetras to collect error information, and then contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL11135-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> . Host = <i>dd...dd</i>	<p>Details</p> <p>The online/offline operation has completed.</p> <p><i>aa...aa</i>: Number of paths successfully processed(decimal number)</p> <p><i>bb...bb</i>: Online or Offline (Character string)</p> <p><i>cc...cc</i>: Number of failed paths(decimal number)</p> <p><i>dd...dd</i>: name of the target host (Character string)</p> <p>Action</p> <p>For the Path ID(s) of the failed path(s), see the operation log.</p>

Message ID	Message	Recommended Action
KAPL11136-W	The last Online path or Online(E) path to the LU cannot be placed in the Offline(C) status. Host = <i>aa...aa</i> , PathID = <i>bb...bb</i>	<p>Details</p> <p>The target path of the offline operation is the last path of the LU and cannot be placed in the offline status.</p> <p><i>aa...aa</i>: Name of the target host (Character string)</p> <p><i>bb...bb</i>: Path ID of the specified path(decimal number)</p> <p>Action</p> <p>Click Refresh to update the view contents, check the path status, and then retry.</p>
KAPL11137-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) could not be placed Offline(C). Host = <i>dd...dd</i>	<p>Details</p> <p>This message displays the number of processed paths when an offline request was registered during Reserve processing.</p> <p><i>aa...aa</i>: the number of paths succeeded in the offline processing(decimal number)</p> <p><i>bb...bb</i>: the number of paths for which the offline request was registered(decimal number)</p> <p><i>cc...cc</i>: the number of paths failed in the offline processing(decimal number)</p> <p><i>dd...dd</i>: name of the target host (Character string)</p> <p>Action</p> <p>For the Path ID(s) of the failed path(s), see the operation log. Click Refresh if you want to check the registered path(s) in a batch job.</p>
KAPL11138-I	<i>aa...aa</i> has started. Host = <i>bb...bb</i>	<p>Details</p> <p>Operation has started.</p> <p><i>aa...aa</i>: Operation (Character string)</p> <ul style="list-style-type: none"> ▪ CSV Output ▪ Set Option Information ▪ Refresh ▪ Online ▪ Offline ▪ Clear Data <p><i>bb...bb</i>: Name of the target host (Character string)</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL11139-I	<i>aa...aa</i> has completed normally. Host = <i>bb...bb</i>	<p>Details</p> <p>Operation has completed normally. <i>aa...aa</i>: Operation</p> <ul style="list-style-type: none"> ▪ CSV Output ▪ Set Option Information ▪ Refresh ▪ Clear Data <p><i>bb...bb</i>: Name of the target host (Character string)</p> <p>Action</p> <p>None.</p>
KAPL11140-I	<i>aa...aa</i> has completed normally.	<p>Details</p> <p>Operation has completed normally. <i>aa...aa</i>: operation (Character string)</p> <ul style="list-style-type: none"> ▪ Set Option Information <p>Action</p> <p>None.</p>
KAPL11142-I	The HDLM GUI will now start.	<p>Details</p> <p>When the management-target host has the version 05-01 or earlier, of HDLM installed, the HDLM GUI (GUI displayed by the application itself) is invoked for a host that is displayed in the Navigation frame.</p> <p>Action</p> <p>None.</p>
KAPL11143-E	The Refresh operation has been stopped because the configuration of paths was changed during the processing of the Refresh operation. Host = <i>aa...aa</i>	<p>Details</p> <p>The information of the path could not be acquired because the configuration of paths was changed during the processing of the Refresh operation. <i>aa...aa</i>: Name of the target host (Character string)</p> <p>Action</p> <p>Click Show Configuration or Show Path List after you confirm the reconfiguration of the path is not done.</p>

Message ID	Message	Recommended Action
KAPL11144-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 failback, the error monitoring interval, and the number of times the error is to occur.</p> <p>Action</p> <p>Set the intermittent error monitoring interval to a value that is equal to or more than (<i>automatic-failback-checking-interval x number-of-times-error-is-to-occur-for-intermittent-error-monitoring</i>).</p>
KAPL11145-W	The getting PathInformation has been stopped because the configuration of paths was changed during the processing of the getting PathInformation. Host = <i>aa...aa</i>	<p>Details</p> <p>The path information could not be get because the configuration of the path was changed when invoking the HDLM Web GUI or getting the latest path information after the Offline, Online, or Clear Data.</p> <p><i>aa...aa</i>: Name of the target host (Character string)</p> <p>Action</p> <p>Click Show Configuration or Show Path List after you confirm the reconfiguration of the path is not done.</p>

Message ID	Message	Recommended Action
KAPL11146-E	The HDLM Web GUI does not support the <i>aa...aa</i> processing of the management-target host. Host = <i>bb...bb</i> , Error code = <i>cc...cc</i>	<p>Details</p> <p>The HDLM Web GUI cannot recognize the error code of the operation because the HDLM Web GUI does not support the HDLM.</p> <p><i>aa...aa</i>: Operation name</p> <ul style="list-style-type: none"> ▪ 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 <p><i>bb...bb</i>: Name of the target host</p> <p><i>cc...cc</i>: Error code</p> <p>Action</p> <p>Upgrade the version of HDLM Web GUI to the following version:</p> <p>The version of HDLM Web GUI included in the HDLM installed in the management-target host.</p> <p>A later version than 1.</p> <p>For details about the HDLM Web GUI included in the HDLM, see the ENC for HDLM.</p> <p>If the problem is not resolved by the upgrade of HDLM Web GUI, collect the error information on the server and the management-target host, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the HiCommand common maintenance command.</p> <p>Management-target host</p> <p>Execute DLMgetras.</p>

Message ID	Message	Recommended Action
KAPL11147-E	Configuration figure cannot be displayed for this storage. Host = <i>aa...aa</i> , Storage = <i>bb...bb</i>	<p>Details</p> <p>The configuration figure cannot be displayed for the selected storage subsystem because the HDLM Web GUI does not support the Configuration subwindow for the selected storage subsystem.</p> <p><i>aa...aa</i>: Name of the target host <i>bb...bb</i>: Name of Storage Subsystem</p> <p>Action</p> <p>Display the Path List subwindow to refer the path information for the selected storage subsystem.</p> <p>If you want to display the Configuration subwindow for the selected storage subsystem, upgrade the version of HDLM Web GUI to following version:</p> <p>The version of HDLM Web GUI included in the HDLM installed in the management-target host.</p> <p>The newer version than 1</p> <p>See the ENC for HDLM, to check the version of HDLM Web GUI included in the HDLM.</p> <p>If the problem is not resolved by the upgrade of HDLM Web GUI, collect the error information on the server and the management-target host, and contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the HiCommand common maintenance command.</p> <p>Management-target host</p> <p>Execute <code>DLMgetras</code>.</p>

Message ID	Message	Recommended Action
KAPL11148-E	The HDLM Web GUI does not support the path information of the management-target host. Host = <i>aa...aa</i> , PathID = <i>bb...bb</i> , Data item = <i>cc...cc</i> , Data = <i>dd...dd</i>	<p>Details</p> <p>The HDLM Web GUI cannot display the path information acquired from the management-target host because the HDLM Web GUI does not support the HDLM.</p> <p><i>aa...aa</i>: Name of the target host <i>bb...bb</i>: Path ID <i>cc...cc</i>: Data item <i>dd...dd</i>: Data in path information</p> <p>Action</p> <p>Upgrade the version of HDLM Web GUI to the following version:</p> <p>The version of HDLM Web GUI included in the HDLM installed in the management-target host.</p> <p>A later version than 1.</p> <p>For details about the HDLM Web GUI included in the HDLM, see the ENC for HDLM.</p> <p>If the problem is not resolved by the upgrade of HDLM Web GUI, collect the error information on the server and the management-target host, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the HiCommand common maintenance command.</p> <p>Management-target host</p> <p>Execute DLMgetras.</p>
KAPL11149-I	<i>aa...aa</i> has started.	<p>Details</p> <p>The operation or information acquisition will now start.</p> <p><i>aa...aa</i>:</p> <ul style="list-style-type: none"> ▪ Operation Refresh ▪ Get information Get host list <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL11150-I	<i>aa...aa</i> has completed normally.	<p>Details</p> <p>The operation or the information acquisition operation finished normally.</p> <p><i>aa...aa</i>:</p> <ul style="list-style-type: none"> ▪ Operation Refresh ▪ Get information Get host list <p>Action</p> <p>None.</p>
KAPL11151-I	<i>aa...aa</i> has started. Host = <i>bb...bb</i>	<p>Details</p> <p>Information acquisition has started.</p> <p><i>aa...aa</i>: Get information</p> <ul style="list-style-type: none"> ▪ Get path information ▪ Get component information ▪ Get option information <p><i>bb...bb</i>: Name of the target host</p> <p>Action</p> <p>None.</p>
KAPL11152-I	<i>aa...aa</i> has completed normally. Host = <i>bb...bb</i>	<p>Details</p> <p>The information acquisition ended normally.</p> <p><i>aa...aa</i>: Get information</p> <ul style="list-style-type: none"> ▪ Get path information ▪ Get component information ▪ Get option information <p><i>bb...bb</i>: Name of the target host</p> <p>Action</p> <p>None.</p>
KAPL11153-I	<i>aa...aa</i> is displayed. Object = <i>bb...bb</i> , User ID = <i>cc...cc</i>	<p>Details</p> <p>The screen was displayed normally.</p> <p><i>aa...aa</i>: Screen name</p> <ul style="list-style-type: none"> ▪ Host List ▪ About ▪ Path List ▪ Configuration ▪ HDLM Component Information ▪ HDLM Environment Settings <p><i>bb...bb</i>: Character string displayed for page navigation</p> <p><i>cc...cc</i>: User ID</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL11159-W	An attempt to acquire the HDLM version information failed. Host = <i>aa...aa</i> , Details = <i>bb...bb</i>	<p>Details</p> <p>The HDLM version information could not be acquired correctly.</p> <p><i>aa...aa</i>: Name of the target host</p> <p><i>bb...bb</i>: Code showing reason for occurrence of error</p> <p>Action</p> <p>Re-execute. If the same error occurs even after removing the reservation, execute the <code>DLMgetras</code> utility for collecting HDLM error information to collect the error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>
KAPL11160-W	An attempt to acquire the Service Pack version information failed. Host = <i>aa...aa</i> , Details = <i>bb...bb</i>	<p>Details</p> <p>The Service Pack information could not be acquired correctly.</p> <p><i>aa...aa</i>: Name of the target host</p> <p><i>bb...bb</i>: Code showing reason for occurrence of error</p> <p>Action</p> <p>Re-execute. If the same error occurs even after removing the reservation, execute the <code>DLMgetras</code> utility for collecting HDLM error information to collect the error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>
KAPL11161-W	The HDLM Web GUI version information cannot be displayed. Details = <i>aa...aa</i>	<p>Details</p> <p>The HDLM Web GUI version information cannot be displayed because the HDLM Web GUI version information could not be acquired correctly at the initialization of the HDLM Web GUI.</p> <p><i>aa...aa</i>: Code showing reason for occurrence of error</p> <p>Action</p> <p>Restart the HiCommand Single Sign On Service. If the same error occurs even after removing the reservation, execute the HiCommand common maintenance command to collect the error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>

Message ID	Message	Recommended Action
KAPL11162-W	The HDLM Web GUI Service Pack version information cannot be displayed. Details = <i>aa...aa</i>	<p>Details</p> <p>The HDLM Web GUI Service Pack version information cannot be displayed because the HDLM Web GUI Service Pack version information could not be acquired correctly at the initialization of the HDLM Web GUI.</p> <p><i>aa...aa</i>: Code showing reason for occurrence of error</p> <p>Action</p> <p>Restart the HiCommand Single Sign On Service. If the same error occurs even after removing the reservation, execute the HiCommand common maintenance command to collect the error information, and then contact your HDLM vendor or maintenance company if there is a maintenance contract for HDLM.</p>
KAPL11163-W	All the current trace files will be deleted. Is this OK? Host = <i>aa...aa</i> [OK/Cancel]	<p>Details</p> <p>If you set a value 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, click OK. To cancel the operation, click Cancel.</p> <p><i>aa...aa</i>: Name of the target host</p> <p>Action</p> <p>If you want to continue the operation, click OK. To cancel the operation, click Cancel.</p>
KAPL11701-I	Setting operating permissions option was set to Guest only.	<p>Action</p> <p>None.</p>
KAPL11702-W	The default setting was set because the property file of HDLM Web GUI could not be read.	<p>Details</p> <p>The <code>dlmservlet.properties</code> file does not exist, or cannot be read.</p> <p>Action</p> <p>Check whether the <code>dlmservlet.properties</code> file exists.</p> <p>If it does not exist, create the file and set each item. For details about the setting for each item and the directory in which the file is to be created, see section 3.13.5 or 3.13.6.</p> <p>If the <code>dlmservlet.properties</code> file exists, check the read permission for the file. If read operation is not permitted, grant read permission.</p>

Message ID	Message	Recommended Action
KAPL11703-W	The property file of HDLM Web GUI has invalid strings.	<p>Details</p> <p>The invalid strings exist in the <code>dmlservlet.properties</code> file.</p> <p>Action</p> <p>Make sure that the correct item name is in the <code>dmlservlet.properties</code> file by referring to section 3.13.5 or 3.13.6.</p>
KAPL11704-W	The default setting was set because the invalid setting was set to the Setting operating permissions option.	<p>Details</p> <p>The default value is set because invalid strings exist in the <code>dmlservlet.properties</code> file.</p> <p>Action</p> <p>Make sure that the correct value is in the <code>dmlservlet.properties</code> file by referring to section 3.13.5.</p>
KAPL11705-W	An attempt to acquire the HDLM Web GUI version information failed. Details = <i>aa...aa</i>	<p>Details</p> <p>The HDLM Web GUI version information could not be acquired correctly at the initialization of the HDLM Web GUI.</p> <p><i>aa...aa</i>: Code showing reason for occurrence of error</p> <p>Action</p> <p>Restart the HiCommand Single Sign On Service. If the same error occurs even after removing the reservation, execute the HiCommand common maintenance command to collect the error information, and then contact your HDLM vendor or maintenance company if you have a maintenance contract.</p>
KAPL11706-W	An attempt to acquire the HDLM Web GUI Service Pack version information failed. Details = <i>aa...aa</i>	<p>Details</p> <p>The HDLM Web GUI Service Pack version information could not be acquired correctly at the initialization of the HDLM Web GUI.</p> <p><i>aa...aa</i>: Code showing reason for occurrence of error</p> <p>Action</p> <p>Restart the HiCommand Single Sign On Service. If the same error occurs even after removing the reservation, execute the HiCommand common maintenance command to collect the error information, and then contact your HDLM vendor or maintenance company if you have a maintenance contract.</p>

Message ID	Message	Recommended Action
KAPL11801-I	GUI information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p><i>aa...aa</i> : Trace information (Character string)</p> <p>Action</p> <p>None.</p>
KAPL11802-I	XML reception - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p><i>aa...aa</i> : XML information (Character string)</p> <p>Action</p> <p>None.</p>
KAPL11803-I	XML transmission - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p><i>aa...aa</i> : XML information (Character string)</p> <p>Action</p> <p>None.</p>
KAPL11901-I	<i>aa...aa</i> has started.	<p>Details</p> <p>The operation has started on the management-target 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 <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 management-target 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 for the operation.(decimal number)</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL11903-I	<i>aa...aa</i> has completed normally.	<p>Details</p> <p>Operation has completed normally on the management-target 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 <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL11904-E	<i>aa...aa</i> has completed abnormally. Error status = <i>bb...bb</i>	<p>Details</p> <p>Operation has completed abnormally on the management-target 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 <p><i>bb...bb</i>: Error-status-returned-from-API (Character string)</p> <ul style="list-style-type: none"> ▪ HSP_ENOPART ▪ HSP_ENOPSID ▪ HSP_ENOPATH ▪ HSP_ENOSPC ▪ HSP_ENOHOLD ▪ HSP_ENOONLN ▪ HSP_ENOOFLN ▪ HSP_EBADOPT ▪ HSP_BADPARM ▪ HSP_ENOAUTH ▪ HSP_ERCOVERR ▪ HSP_ECLCONF ▪ HSP_ERROR ▪ HSP_NOCLUSTER ▪ HSP_OFFRSV ▪ HSP_OFFRJC ▪ HSP_ENOPGR ▪ HSP_EPATHCONF <p>Action</p> <p>Collect the error information on the server and the management-target host, and contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the HiCommand common maintenance command.</p> <p>Management-target host</p> <p>Execute <code>DLMgetras</code>.</p>

Message ID	Message	Recommended Action
KAPL11905-E	An unexpected error occurred.	<p>Details</p> <p>An exception occurred during processing in the management-target host.</p> <p>Action</p> <p>Collect the error information on the server and the management-target host, and contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p> <p>To collect error information:</p> <p>Server</p> <p>Execute the HiCommand common maintenance command.</p> <p>Management-target host</p> <p>Execute DLMgetras</p>
KAPL11906-I	GUI information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</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 determining the cause of the problem (if any).</p> <p><i>aa...aa</i> : XML information (Character string)</p> <p>Action</p> <p>None.</p>
KAPL11908-I	XML transmission - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p><i>aa...aa</i> : XML information (Character string)</p> <p>Action</p> <p>None.</p>

Table 9.6 HDLM API Messages

Message ID	Message	Recommended Action
KAPL03001-I	HDLM API information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p><i>aa...aa</i> : Trace information</p> <p>Action</p> <p>None.</p>
KAPL03003-E	HDLM API Error information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</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.</p>
KAPL03004-C	A critical error occurred in the HDLM API. (<i>aa...aa</i>)	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</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.</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 determining the cause of the problem (if any).</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.</p>

Message ID	Message	Recommended Action
KAPL03007-E	An error occurred during communication with the HDLM manager. (<i>aa...aa</i>)	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</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.</p>
KAPL03008-E	An error occurred during log input to the HDLM alert driver. (<i>aa...aa</i>)	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</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.</p>
KAPL03999-E	An unexpected error occurred.	<p>Details</p> <p>A conflict occurred in the versions of the modules that HDLM uses internally.</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.</p>

Table 9.7 HDLM Manager Messages

Message ID	Message	Recommended Action
KAPL04001-I	HDLM manager started.	<p>Details</p> <p>HDLM manager has started successfully.</p> <p>Action</p> <p>None.</p>
KAPL04002-E	Could not start the HDLM manager.	<p>Details</p> <p>HDLM manager failed to start because the environment is incorrect for the manager to run properly.</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.</p>
KAPL04003-E	The startup parameter is invalid.	<p>Details</p> <p>The parameter held internally by the HDLM manager is incorrect.</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.</p>
KAPL04004-I	HDLM manager will now terminate.	<p>Details</p> <p>HDLM manager will be terminated.</p> <p>Action</p> <p>None.</p>
KAPL04008-E	Cannot open the option definition file (<i>aa...aa</i>).	<p>Details</p> <p>HDLM manager cannot start normally (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 using the file (or has opened the file with Notepad), or whether the file has been deleted inadvertently.</p>

Message ID	Message	Recommended Action
KAPL04009-E	The option definition is invalid.	<p>Details</p> <p>HDLM manager cannot start normally (some of the definition in the option definition file is invalid).</p> <p>Action</p> <p>If the KAPL04033-W message is output after this message, execute <code>dlnmgr view -sys -sfunc</code> and check the option settings.</p> <p>For options with setting values that have returned to default values, use the <code>dlnmgr set</code> operation to reset the values.</p> <p>If the KAPL04033-W message is not output, restart HDLM Manager.</p> <p>If the same error occurs, re-install HDLM.</p>
KAPL04010-E	Could not open the error log file.	<p>Details</p> <p>HDLM manager cannot start normally (unable to open the error log file <code>/var/DynamicLinkManager/log/dlnmgr [1-16] .log</code>).</p> <p>Action</p> <p>Check whether another program is using the file (or has opened the file with Notepad), or whether the error log file has been deleted inadvertently.</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 <code>/var/opt/DynamicLinkManager/log/dlnmgr [1-16] .log</code>.</p> <p>Action</p> <p>Check that the disk has sufficient free space.</p>
KAPL04012-E	Could not create a communication pipe. RC = <i>aa...aa</i>	<p>Details</p> <p>HDLM manager cannot start normally (unable to create a pipe file to be used in communication with HDLM commands).</p> <p><i>aa...aa</i>. OS error code(decimal 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.</p>

Message ID	Message	Recommended Action
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 during the communication with the HDLM command.</p> <p><i>aa...aa</i>: OS error code(decimal 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.</p>
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 during the communication with the HDLM command.</p> <p><i>aa...aa</i>: OS error code(decimal 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.</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 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.</p>
KAPL04021-I	HDLM manager information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p><i>aa...aa</i>: HDLM manager trace information</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL04022-W	HDLM manager warning information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p><i>aa...aa</i>: 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.</p>
KAPL04023-E	HDLM manager error information - <i>aa...aa</i>	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p><i>aa...aa</i>: 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.</p>
KAPL04024-C	A critical error occurred in the HDLM manager. (<i>aa...aa</i>)	<p>Details</p> <p>This information is required for determining the cause of the problem (if any).</p> <p><i>aa...aa</i>: 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.</p>
KAPL04025-C	A memory shortage occurred in the HDLM manager.	<p>Details</p> <p>Sufficient memory to process the HDLM manager could not be obtained.</p> <p>Action</p> <p>Increase the amount of memory available for the process.</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>The temporary license is valid.</p> <p><i>aa...aa</i>: Expiration day</p> <p><i>bb...bb</i>: Year (4 numeric characters)/Month (01-12)/Day (01-31)</p> <p>Action</p> <p>Install the permanent license by the expiration day.</p>

Message ID	Message	Recommended Action
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>The emergency license is valid.</p> <p><i>aa...aa</i>: Expiration day</p> <p><i>bb...bb</i>: Year (4 numeric characters)/Month (01-12)/Day (01-31)</p> <p>Action</p> <p>Install the emergency license by the expiration day.</p>
KAPL04028-E	The temporary license expired.	<p>Details</p> <p>The temporary license expired.</p> <p>Action</p> <p>Install the permanent license.</p>
KAPL04029-E	The emergency license expired.	<p>Action</p> <p>Install the permanent license.</p>
KAPL04030-E	The temporary license has already expired.	<p>Action</p> <p>Install the permanent license.</p>
KAPL04031-E	The emergency license has already expired.	<p>Action</p> <p>Install the 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>An option definition file was re-created using the default values. The specified values are set when some of the options have been read.</p> <p>Action</p> <p>As for the options other than the defaults, use the <code>dlnkmgr set</code> operation to set the options again.</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 (<code>/usr/DynamicLinkManager/config/dlnmgr.xml</code>) using the default values has failed.</p> <p>Action</p> <p>Remove unnecessary files to secure free space on the file system, or check the write permissions for the directory and file.</p>

Message ID	Message	Recommended Action
KAPL04035-I	The path health check will now start. Total number of paths = <i>aa...aa</i>	<p>Details</p> <p>The path health check will now start. <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>The path health check has completed normally. <i>aa...aa</i>: Number of paths targeted for the path health check. <i>bb...bb</i>: Number of error paths by the path health check.</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>There were no error paths as a result of executing the path health check. <i>aa...aa</i>: PathID for executing the path health check.</p> <p>Action</p> <p>None.</p>

Note: When you reinstall HDLM, default values are assigned to the function settings in the Options window. If needed, reset these values according to your preference.

Table 9.8 HDLM Driver (Filter Component) Messages

Message ID	Message	Recommended Action
KAPL05003-I	The HDLM driver (filter component) was successfully attached to Disk (<i>aa...aa</i>), Partition (<i>bb...bb</i>).	<p>Details</p> <p>The path corresponding to Disk (<i>aa...aa</i>: SCSI device decimal sequence number) and Partition (<i>bb...bb</i>: Fixed at 0) was successfully registered in the core logic.</p> <p>Action</p> <p>None.</p>
KAPL05008-E	Could not allocate memory. (<i>aa...aa.bb...bb</i>)	<p>Details</p> <p>The OS memory allocation function was started but an error was returned from the memory allocation function.</p> <p><i>aa...aa</i>: Number of program lines (Hexadecimal number)</p> <p><i>bb...bb</i>: Memory capture size (Hexadecimal number)</p> <p>Action</p> <p>Check whether the HDLM driver has started normally. If it has not 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.</p>
KAPL05011-E	Could not attach the HDLM driver (filter component) to Disk (<i>aa...aa</i>), Partition (<i>bb...bb</i>). (<i>cc...cc.dd...dd</i>)	<p>Details</p> <p>Registration of the path corresponding to Disk (<i>aa...aa</i>: SCSI device decimal sequence number) and Partition (<i>bb...bb</i>: Partition decimal number) failed in the core logic.</p> <p><i>cc...cc</i>: Error code (Hexadecimal number)</p> <p><i>dd...dd</i>: Filter driver management table address (Hexadecimal number)</p> <p>Action</p> <p>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>

Message ID	Message	Recommended Action
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 in the core logic.</p> <p>Action</p> <p>None.</p>
KAPL05018-W	The FO processing in the path (<i>aa...aa</i>) failed. (<i>bb...bb.cc...cc</i>)	<p>Details</p> <p>FO processing failed in the path (<i>aa...aa</i>: Identifier of the core logic path where FO processing failed (Hexadecimal number)).</p> <p><i>bb...bb</i>: Error code (Hexadecimal number)</p> <p><i>cc...cc</i>: Fixed at 0</p> <p>Action</p> <p>The I/O being processed is discarded. Check the status of the device path and take an appropriate action.</p>
KAPL05021-I	Processing of IOCTL(<i>aa...aa</i>) completed normally.	<p>Details</p> <p>The processing for the requested IOCTL operation was successful.</p> <p><i>aa...aa</i>(Hexadecimal number): IOCTL code</p> <p>Action</p> <p>None.</p>
KAPL05023-E	Could not process the IOCTL(<i>aa...aa</i>). (<i>bb...bb.cc...cc</i>)	<p>Details</p> <p>Processing corresponding to the requested IOCTL (<i>aa...aa</i>: IOCTL code (Hexadecimal number)) is unsuccessful.</p> <p><i>bb...bb</i>: Fixed at 0</p> <p><i>cc...cc</i>: Fixed at 0</p> <p>Action</p> <p>Check the message of the HDLM command (<code>dlmcmdgr</code>) or the HDLM manager, and then take the appropriate action. If you do not know the appropriate 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 and report the error and detail code.</p>

Message ID	Message	Recommended Action
KAPL05037-W	The disk does not support persistent reservation, so the reservation for the LUs could not be set. <i>dlnmfdrv aa...aa</i>	<p>Details</p> <p>The open request to the filter driver or the <i>dlnkmgr</i> set -rsv on 2 execution request was accepted for the disk not supporting persistent reservation. <i>dlnmfdrv (aa...aa: Filter driver instance number (decimal number))</i></p> <p>Action</p> <p>If this message is displayed for a disk that is not supported by HDLM, there is no problem. If this message is displayed for a disk that is supported by HDLM, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL05501-E	The path could not be created. (<i>aa...aa, bb...bb, cc...cc</i>)	<p>Details</p> <p>The driver instance could not be registered in the kernel side. <i>aa...aa</i>: Logical device file name of the HDLM device <i>bb...bb</i>: Logical device file name of <i>hdisk</i> <i>cc...cc</i>: Error code(decimal number)</p> <p>Action</p> <p>Contact your HDLM vendor or maintenance company if you have a maintenance contract for HDLM. <i>cc...cc</i>: Path ID of the SCSI device(decimal number)</p>
KAPL05502-E	A path information error was detected. (<i>dlnmfdrv aa...aa, hdisk bb...bb</i>)	<p>Details</p> <p>When the HDLM device was configured, invalid path information was detected. The corresponding path was not configured. <i>aa...aa</i>: Logical device file name of the HDLM device <i>bb...bb</i>: Logical device file name of <i>hdisk</i></p> <p>Action</p> <p>Execute the <i>dlnmrmdev</i> utility for deleting HDLM drivers to delete the HDLM device and then execute the <i>dlnmcfgmgr</i> utility for managing the HDLM configuration to reconfigure the HDLM device.</p>

Message ID	Message	Recommended Action
KAPL05819-I	Data for maintenance: <i>aa...aa bb...bb cc...cc dd...dd</i> .	<p>Details</p> <p>The filter driver outputs this message for maintenance.</p> <p><i>aa...aa</i>: HDLM Device minor number(decimal number)</p> <p><i>bb...bb</i>: Message output location information(decimal number)</p> <p><i>cc...cc</i>: Detailed information 1(decimal number)</p> <p><i>dd...dd</i>: Detailed information 2(decimal number)</p> <p>Action</p> <p>None.</p>

Table 9.9 HDLM Alert Driver Messages

Message ID	Message	Recommended Action
KAPL06003-I	Initialization of the HDLM alert driver (<i>aa...aa</i>) was successful.	<p>Details</p> <p>Initialization of the alert driver (<i>aa...aa</i>: alert driver management table address (Hexadecimal number)) completed normally.</p> <p>Action</p> <p>None.</p>
KAPL06004-E	Could not allocate memory. (<i>aa...aa.bb...bb</i>)	<p>Details</p> <p>An attempt to reserve memory to save alert information has failed.</p> <p><i>aa...aa</i>: Program line (Hexadecimal number)</p> <p><i>bb...bb</i>: Target memory size (Hexadecimal number)</p> <p>Action</p> <p>Check whether the HDLM driver has started normally. If it has not 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 and report the error and detail code.</p>
KAPL06009-I	Invalid IOCTL (<i>aa...aa</i>) was received. The processing is canceled.	<p>Details</p> <p>A request having an invalid IOCTL code (<i>aa...aa</i>: IOCTL code (Hexadecimal number)) was issued to the alert driver.</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL06010-E	Could not process the IOCTL(<i>aa...aa</i>). (<i>bb...bb.cc...cc</i>)	<p>Details</p> <p>Although the IOCTL request (<i>aa...aa</i>: code (Hexadecimal number)) from the manager or API was accepted, it is not one of the requests expected to be processed by the alert driver.</p> <p><i>bb...bb</i>: error code (Hexadecimal number)</p> <p><i>cc...cc</i>: 0 (fixed)</p> <p>Action</p> <p>Check the message of the HDLM command (<code>dlnkmgx</code>) or HDLM manager, and then take the appropriate action. If you do not know the appropriate 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 and report the error and detail code.</p>
KAPL06013-E	Could not write log information into the log buffer. (<i>aa...aa.bb...bb</i>)	<p>Details</p> <p>When a log output request was made from the filter driver, the log information was discarded because of a memory allocation failure. Alternatively, although a HDLM driver message or HDLM alert driver message, or a non-emergency message (C/I) by the core logic was generated, its log information was discarded by the HDLM alert driver.</p> <p><i>aa...aa</i>: log message code (Hexadecimal number)</p> <p><i>bb...bb</i>: log area size (Hexadecimal number)</p> <p>Action</p> <p>Check whether any other error occurred. The information that could not be written is discarded.</p> <p>Review the actual memory size when another error does not occur.</p> <p>When the actual memory size is insufficient, increase the actual memory size.</p> <p>When the actual memory size is sufficient, 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.</p>

Message ID	Message	Recommended Action
KAPL06014-E	Could not write emergency information into the emergency information buffer. (<i>aa...aa.bb...bb</i>)	<p>Details</p> <p>When a log output request was made from the filter driver, the log information was discarded because of a memory allocation failure. Alternatively, although an emergency message (such as a path error message) detected by the core logic was generated as an output message, its log information was discarded by the HDLM alert driver.</p> <p><i>aa...aa</i>: Message code (Hexadecimal number)</p> <p><i>bb...bb</i>: Buffer size (Hexadecimal number)</p> <p>Action</p> <p>Check whether any other error occurred. The information that could not be written is discarded.</p> <p>Review the actual memory size if another error does not occur.</p> <p>If the actual memory size is insufficient, increase the actual memory size.</p> <p>If the actual memory size is sufficient, 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.</p>
KAPL06022-I	Methods Information for Filter Driver: <i>aa...aa bb...bb cc...cc dd...dd</i> .	<p>Details</p> <p>The filter driver outputs this message for maintenance.</p> <p><i>aa...aa</i>: Device minor number</p> <p><i>bb...bb</i>: hdisk minor number</p> <p><i>cc...cc</i>: Message output location information</p> <p><i>dd...dd</i>: Error Code</p> <p>Action</p> <p>None.</p>

Table 9.10 HDLM Driver (Core Logic Component) Messages

Message ID	Message	Recommended Action
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 number)</p> <p><i>bb...bb</i>: Internal function number of the core logic(decimal number)</p> <p><i>cc...cc</i>: Detailed information 2(decimal number)</p> <p><i>dd...dd</i>: Detailed information 3(decimal number)</p> <p>Action</p> <p>None.</p>

Table 9.11 HDLM Management Target Messages

Message ID	Message	Recommended Action
KAPL08019-E	The path (<i>aa...aa</i>) detected an error (<i>bb...bb</i>). (<i>cc...cc</i>)	<p>Details</p> <p>An error occurred in the path because of a condition such as a disconnection.</p> <p><i>aa...aa</i>: Path identifier (Hexadecimal number)</p> <p><i>bb...bb</i>: Error code (Hexadecimal number)</p> <p><i>cc...cc</i>: 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>

Message ID	Message	Recommended Action
KAPL08022-E	A path error occurred. ErrorCode = <i>aa...aa</i> , PathID = <i>bb...bb</i> , PathName = <i>cc...cc.dd...dd.ee...eeff...ff</i> , DNum = <i>gg...gg</i> , HDevName = <i>hh...hh</i>	<p>Details</p> <p>A physical or logical error occurred in the path.</p> <p><i>aa...aa</i>: OS error code (Hexadecimal number)</p> <p><i>bb...bb</i>: Path ID (same as PathID of view -path)(decimal number)</p> <p><i>cc...cc</i>: HBA adapter number (same as PathName of view -path) (Character string)</p> <p><i>dd...dd</i>: Bus number (Character string)</p> <p><i>ee...ee</i>: Target ID (Hexadecimal number)</p> <p><i>ff...ff</i>: Host LU number (same as PathName of view -path) (Hexadecimal number)</p> <p><i>gg...gg</i>: Dev number (same as DNum of view -path)(decimal number)</p> <p><i>hh...hh</i>: Host device name</p> <p>Action</p> <p>There could be an error in the path. Restore the path displayed in the message to running status.</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 was recovered from the error.</p> <p><i>aa...aa</i>: Path ID (same as PathID of view -path)(decimal number)</p> <p><i>bb...bb</i>: HBA adapter number (same as PathName of view -path) (Character string)</p> <p><i>cc...cc</i>: Bus number(same as PathName of view -path) (Character string)</p> <p><i>dd...dd</i>: Target ID(same as PathName of view -path) (Hexadecimal number)</p> <p><i>ee...ee</i>: Host LU number (same as PathName of view -path) (Hexadecimal number)</p> <p><i>ff...ff</i>: Device number (same as DNum of view -path)</p> <p><i>gg...gg</i>: Host Dev name(same as HDevName of view -path)</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
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 path of one LU because of a condition such as a disconnection.</p> <p><i>aa...aa</i>: Path ID (same as PathID of view -path)(decimal number)</p> <p>Action</p> <p>Errors are detected in all the paths connected to the LUs. Make the path shown in the error message or the paths connected to the target LU.</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 the items subject to automatic failback 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 view -path)(decimal number)</p> <p>Action</p> <p>An intermittent error was occurring. The path may have a problem. Switch the path shown in the message into Online.</p>
KAPL08028-I	A message corresponding to the automatic error information collection was detected. Error information will now be collected.	<p>Details</p> <p>Automatic error information collection will now start because a message corresponding to the automatic error information collection was detected.</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.</p>

Table 9.12 HDLM Installation Program Messages

Message ID	Message	Recommended Action
KAPL09001-E	There is no system management permission.	<p>Details</p> <p>In HDLM Web GUI (Windows):</p> <p>The current user does not have the administrator permission to install HDLM Web GUI.</p> <p>In HDLM Web GUI (Solaris):</p> <p>The current user does not have the root permission to install HDLM Web GUI.</p> <p>Action</p> <p>In HDLM Web GUI (Windows):</p> <p>Execute the program as a member of the Administrators group.</p> <p>In HDLM Web GUI (Solaris):</p> <p>Re-execute the installation program as a user with root permission.</p>
KAPL09002-E	The disk does not have sufficient free space.	<p>Details</p> <p>In HDLM Web GUI (Windows):</p> <p>The target drive of the installation does not have sufficient free space to install HDLM Web GUI.</p> <p>In HDLM Web GUI (Solaris):</p> <p>The target file system of the installation does not have sufficient free space to install HDLM Web GUI.</p> <p>Action</p> <p>In HDLM Web GUI (Windows):</p> <p>Change the installation destination or delete unnecessary files to increase the amount of free space, and then retry.</p> <p>In HDLM Web GUI (Solaris) :</p> <p>Increase the amount of free space in /opt, and then retry.</p>

Message ID	Message	Recommended Action
KAPL09003-E	Cannot install in this system.	<p>Details</p> <p>In HDLM for AIX: HDLM cannot be installed on this system.</p> <p>In HDLM Web GUI (Windows, Solaris): HDLM Web GUI cannot be installed on this system.</p> <p>Action</p> <p>In AIX: Install HDLM in an AIX (PowerPC) system.</p> <p>In HDLM Web GUI (Windows): Install HDLM Web GUI in a Windows 2000 system.</p> <p>In HDLM Web GUI (Solaris): Install HDLM Web GUI in a Solaris 8 or 9 system.</p>
KAPL09008-W	The license code is invalid.	<p>Details</p> <p>The license code is incorrect.</p> <p>Action</p> <p>Check the license code, and then re-enter it.</p>
KAPL09011-E	Cannot find a license key file "/var/DLM/dlm.lic_key".	<p>Details</p> <p>The license key file /var/DLM/dlm.lic_key is not in the specified directory.</p> <p>Action</p> <p>Create a license key file, and re-execute the installation program.</p>
KAPL09012-I	All HDLM drivers were removed.	<p>Details</p> <p>All the drivers and alert drivers were successfully removed, all the managers were successfully stopped, and HDLM was stopped.</p> <p>Action</p> <p>None.</p>
KAPL09013-E	Some HDLM drivers could not be removed.	<p>Details</p> <p>An attempt to remove several HDLM devices has failed. The <code>dlmrmddev</code> utility for deleting HDLM drivers was executed, but HDLM devices or HDLM alert drivers could not be removed, or HDLM managers could not be terminated.</p> <p>Action</p> <p>Check the HDLM device status and remove the devices.</p>

Message ID	Message	Recommended Action
KAPL09019-E	An attempt to cancel the registration of the bundle PP name of Hitachi Network Objectplaza Trace Library 2 failed.	<p>Action</p> <p>Manually cancel the registration of the bundle PP name and uninstall Hitachi Network Objectplaza Trace Library 2. If the attempt to cancel the registration of the bundle PP name and to uninstall 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 uninstall Hitachi Network Objectplaza Trace Library 2 failed.	<p>Details</p> <p>An attempt to uninstall HNTRLib2 has failed.</p> <p>Action</p> <p>Manually uninstall Hitachi Network Objectplaza Trace Library 2. If the attempt to uninstall 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>
KAPL09022-E	HDLM cannot be uninstalled. HDLM <i>aa...aa</i> is running.	<p>Details</p> <p>HDLM cannot be uninstalled because either of HDLM manager, HDLM driver or HDLM alert driver is running.</p> <p><i>aa...aa</i> = HDLM driver, HDLM manager, HDLM alert driver</p> <p>Action</p> <p>Execute the <code>d1mrmdev</code> utility, and then re-execute the uninstallation program.</p>
KAPL09023-E	A file or directory related to HDLM could not be found.	<p>Details</p> <p>A target file to copy to the directory of Device Manager Agent could not be found among the files related to HDLM</p> <p>Action</p> <p>Re-execute the HDLM installation program.</p>

Message ID	Message	Recommended Action
KAPL09024-E	An attempt to copy a file or directory related to HDLM has failed.	<p>Details</p> <p>An attempt to copy a file related to HDLM to the directory of Device Manager - Agent has failed. Alternatively, an attempt to copy help files during the installation failed.</p> <p>Action</p> <p>If you detect this message while executing the HDLM installation program, re-execute the HDLM installation program. If you detect this message while executing the Device Manager - Agent installation program, re-execute the Device Manager - Agent installation program.</p>
KAPL09025-W	An attempt to delete a file or directory has failed.	<p>Details</p> <p>An attempt to delete a file related to HDLM from the directory of Device Manager - Agent has failed.</p> <p>Action</p> <p>If the following files or directories are on the host, remove them manually.</p> <p>/usr/HDVM/agent/docroot/webstart/HDLM.jnlp</p> <p>/usr/HDVM/agent/classes/com/Hitachi/soft/HiCommand/DVM/agent/module/HDLMManager.class</p> <p>/usr/HDVM/agent/docroot/webstart/hdlm</p> <p>/usr/HDVM/agent/docroot/hdlmhelp</p> <p>/usr/HDVM/agent/classes/jp</p> <p>/usr/HDVM/agent/classes/com/Hitachi/soft/HiCommand/DVM/agent/module/hdlm</p>
KAPL09028-E	An attempt to install Hitachi Network Objectplaza Trace Library 2 failed.	<p>Details</p> <p>An attempt to install HNTRLlib2 failed.</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contact of HDLM.</p>
KAPL09029-E	This version of HDLM cannot be updated by installation. Uninstall the already installed version of HDLM.	<p>Details</p> <p>This version of HDLM cannot be updated by installation. Uninstall the HDLM that has already been installed.</p> <p>Action</p> <p>Uninstall the HDLM that has already been installed.</p>

Message ID	Message	Recommended Action
KAPL09047-E	Downgrading from <i>aa...aa</i> to <i>bb...bb</i> is not supported.	<p>Details</p> <p>Downgrade installation is not supported.</p> <p><i>aa...aa</i> : DLManger.rte <i>Level-of-the-fileset</i></p> <p><i>bb...bb</i> : DLManger.rte <i>Level-of-the-fileset</i></p> <p>Action</p> <p>Uninstall HDLM, and then re-execute the installation program.</p>
KAPL09048-E	HDLM cannot be installed. HDLM <i>aa...aa</i> is running.	<p>Details</p> <p>An attempt to install HDLM failed because either of HDLM<i>aa...aa</i> is running.</p> <p><i>aa...aa</i> = HDLM driver, HDLM manager, HDLM alert driver</p> <p>Action</p> <p>Execute the <code>d1mrmdev</code> utility, and then re-execute the installation program.</p>
KAPL09052-E	HDLM Web GUI cannot be installed. The new version has already been installed.	<p>Details</p> <p>Since the new version of HDLM Web GUI has already been installed, you cannot install HDLM Web GUI.</p> <p>Action</p> <p>Uninstall HDLM Web GUI, and then install it again.</p>
KAPL09053-E	Installation is not possible because HiCommand Common Component does not exist.	<p>Details</p> <p>Since HiCommand Common Component does not exist on the system, you cannot install HDLM Web GUI.</p> <p>Action</p> <p>Install HiCommand Device Manager, and then reinstall HDLM Web GUI.</p>
KAPL09054-E	Installation is not possible because the HiCommand Common Component process is not running.	<p>Details</p> <p>Since HiCommand Common Component process is not running, you cannot install HDLM Web GUI.</p> <p>Action</p> <p>Start HiCommand Single Sign On Service and HiCommand Common Web Service and then reinstall HDLM Web GUI.</p>

Message ID	Message	Recommended Action
KAPL09055-E	Installation is not possible because HiCommand Device Manager does not exist.	<p>Details</p> <p>Since HiCommand Device Manager does not exist, you cannot install HDLM Web GUI.</p> <p>Action</p> <p>Install HiCommand Device Manager, and then reinstall HDLM Web GUI.</p>
KAPL09056-E	The installed version of HiCommand Device Manager does not support HDLM Web GUI.	<p>Details</p> <p>Since the HiCommand Device Manager on the system does not support the HDLM Web GUI, you cannot install HDLM Web GUI.</p> <p>Action</p> <p>Uninstall the currently installed HiCommand Device Manager. After installing HiCommand Device Manager version 3.0 or later, reinstall HDLM Web GUI.</p>
KAPL09058-E	An attempt to register application information in HiCommand Common Component failed.	<p>Details</p> <p>Since the system failed to register the application information in HiCommand Common Component, you cannot install HDLM Web GUI.</p> <p>Action</p> <p>Contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>
KAPL09059-E	An attempt to register the information in the repository for HiCommand Common Component failed.	<p>Details</p> <p>Since the system failed to register view definition and data definition information in the repository, you cannot install HDLM Web GUI.</p> <p>Action</p> <p>Contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>
KAPL09060-E	An attempt to register the Web contents in HiCommand Common Component failed.	<p>Details</p> <p>Since the system failed to register the Web contents in the repository, you cannot install HDLM Web GUI.</p> <p>Action</p> <p>Contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>

Message ID	Message	Recommended Action
KAPL09061-E	An attempt to start the HiCommand Common Component process failed.	<p>Details</p> <p>Since the system failed to start the HiCommand Common Component process after registering/deleting the Web contents in HiCommand Common Component, you cannot install/uninstall HDLM Web GUI.</p> <p>Action</p> <p>Contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>
KAPL09062-E	Uninstallation is not possible because the HiCommand Common Component process is not running.	<p>Details</p> <p>Since the HiCommand Common Component process is not running, you cannot uninstall HDLM Web GUI.</p> <p>Action</p> <p>Start HiCommand Single Sign On Service and HiCommand Common Web Service, and then uninstall HDLM Web GUI again.</p>
KAPL09063-E	Uninstallation is not possible because HiCommand Server is not running.	<p>Details</p> <p>Since HiCommand Server is not running, you cannot uninstall HDLM Web GUI.</p> <p>Action</p> <p>Start the HiCommand Server service, and then install HDLM Web GUI again.</p>
KAPL09064-E	An attempt to delete the application information in HiCommand Common Component failed.	<p>Details</p> <p>Since the system failed to delete the application information in HiCommand Common Component, you cannot uninstall HDLM Web GUI.</p> <p>Action</p> <p>Contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>
KAPL09065-E	An attempt to delete the information in the repository for HiCommand Common Component failed.	<p>Details</p> <p>Since the system failed to delete the view definition and data definition information in the repository, you cannot uninstall HDLM Web GUI.</p> <p>Action</p> <p>Contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>

Message ID	Message	Recommended Action
KAPL09066-E	An attempt to delete the Web contents in HiCommand Common Component failed.	<p>Details</p> <p>Since the system failed to delete the Web contents in the repository, you cannot uninstall HDLM Web GUI.</p> <p>Action</p> <p>Contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>
KAPL09067-I	The user terminated the <i>aa...aa</i> .	<p>Details</p> <p>Installation or uninstallation will be aborted because <i>n</i> or <i>no</i> was entered in reply to the acknowledgment for <i>y</i>, <i>yes</i>, <i>n</i>, or <i>no</i>.</p> <p><i>aa...aa</i>: installation/uninstallation</p> <p>Action</p> <p>None.</p>
KAPL09068-W	The entered value is invalid. Re-enter [y/n]:	<p>Details</p> <p>A value other than <i>y</i>, <i>yes</i>, <i>n</i>, or <i>no</i> was entered.</p> <p>Action</p> <p>Enter only the value <i>y</i>, <i>yes</i>, <i>n</i>, or <i>no</i>.</p>
KAPL09069-E	The entered value is invalid. The <i>aa...aa</i> will now terminate.	<p>Details</p> <p>The install or uninstall processing will be aborted because a value other than <i>y</i>, <i>yes</i>, <i>n</i>, or <i>no</i> was entered three times consecutively.</p> <p><i>aa...aa</i>: installation/uninstallation</p> <p>Action</p> <p>No action required. If you are installing or uninstalling, and are prompted for confirmation, enter only the value <i>y</i>, <i>yes</i>, <i>n</i>, or <i>no</i>.</p>
KAPL09070-I	HDLM Web GUI version <i>aa...aa</i> has been installed. Do you want to overwrite?	<p>Details</p> <p>The system confirms whether you want to overwrite the previous installation.</p> <p><i>aa...aa</i>: Version-number</p> <p>Action</p> <p>To overwrite the previous installation, choose Yes.</p>
KAPL09071-E	The specified installation folder is read-only. Specify a different folder.	<p>Details</p> <p>Since the install folder you specified is read-only, you cannot install HDLM Web GUI.</p> <p>Action</p> <p>Specify an installation folder that is not read-only.</p>

Message ID	Message	Recommended Action
KAPL09072-E	An internal error has occurred. Details = <i>aa...aa</i> <i>bb...bb</i>	<p>Details</p> <p>An error whose cause does not seem to be a user operation occurred during installation of HDLM Web GUI.</p> <p><i>aa...aa</i>: Function name called during the installation</p> <p><i>bb...bb</i>: Return value of function</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL09073-E	Failed to stop HiCommand Common Component process.	<p>Details</p> <p>Since the system failed to stop the HiCommand Common Component process before registering/deleting the Web contents in HiCommand Common Component, you cannot install/uninstall HDLM Web GUI.</p> <p>Action</p> <p>Contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>
KAPL09074-E	Failed to check HiCommand Common Component process.	<p>Details</p> <p>Since the system failed to check the HiCommand Common Component process before registering/deleting the Web contents in HiCommand Common Component, you cannot install/uninstall HDLM Web GUI.</p> <p>Action</p> <p>Contact the vendor of HDLM, or if you have a maintenance contract for HDLM, contact the maintenance company.</p>
KAPL09076-I	The permanent license was installed.	<p>Details</p> <p>The permanent license was installed.</p> <p>Action</p> <p>None.</p>
KAPL09077-I	The temporary license was installed. The license expires on <i>aa...aalbb...bblcc...cc</i> .	<p>Details</p> <p>The temporary license was installed.</p> <p><i>aa...aa</i>: Year (4 numeric characters)</p> <p><i>bb...bb</i>: Month (01-12)</p> <p><i>cc...cc</i>: Day (01-31)</p> <p>Action</p> <p>Install the permanent license by the expiration day.</p>

Message ID	Message	Recommended Action
KAPL09078-I	The emergency license was installed. The license expires on <i>aa...aalbb...bblcc...cc</i> .	<p>Details</p> <p>The emergency license was installed.</p> <p><i>aa...aa</i>: Year (4 numeric characters)</p> <p><i>bb...bb</i>: Month (01-12)</p> <p><i>cc...cc</i>: Day (01-31)</p> <p>Action</p> <p>Install the permanent license by the expiration day.</p>
KAPL09079-I	The permanent license has been installed.	<p>Action</p> <p>None.</p>
KAPL09080-I	The temporary license has been installed. The license expires on <i>aa...aalbb...bblcc...cc</i> .	<p>Details</p> <p>The temporary license has been installed.</p> <p><i>aa...aa</i>: Year (4 numeric characters)</p> <p><i>bb...bb</i>: Month (01-12)</p> <p><i>cc...cc</i>: Day (01-31)</p> <p>Action</p> <p>Install the permanent license by the expiration day.</p>
KAPL09081-I	The emergency license has been installed. The license expires on <i>aa...aalbb...bblcc...cc</i> .	<p>Details</p> <p>The emergency license has been installed.</p> <p><i>aa...aa</i>: Year (4 numeric characters)</p> <p><i>bb...bb</i>: Month (01-12)</p> <p><i>cc...cc</i>: Day (01-31)</p> <p>Action</p> <p>Install the permanent license by the expiration day.</p>
KAPL09082-W	The temporary license expired.	<p>Action</p> <p>Enter the permanent license key.</p>
KAPL09083-W	The emergency license expired.	<p>Action</p> <p>Enter the permanent license key.</p>
KAPL09086-W	The entered license key is invalid.	<p>Action</p> <p>Enter a valid license key.</p>
KAPL09087-E	The entered license key is invalid. Renewal of the license key will now stop.	<p>Details</p> <p>The renewal of the license key will be aborted because an invalid license key was entered three times.</p> <p>Action</p> <p>Obtain a valid license key, and then retry.</p>
KAPL09088-E	The entered license key is invalid. The HDLM installation will now terminate.	<p>Action</p> <p>Retry installation.</p>

Message ID	Message	Recommended Action
KAPL09089-W	License information cannot be acquired.	<p>Details</p> <p>You need to install a license because the license information cannot be acquired.</p> <p>Action</p> <p>Case of the license key file being placed in the designated directory (/var/tmp/hdlm_license):</p> <p>In this case, a license is installed from the license key file. No special operations are needed.</p> <p>For cases other than above:</p> <p>When the message that prompts you to enter the license key is displayed, enter the license key.</p> <p>Alternatively, cancel the installation, save the correct license key file in the designated directory, and then re-execute installation.</p> <p>/var/tmp/hdlm_license</p>
KAPL09090-W	This operation will now be continued without updating the license.	<p>Details</p> <p>This operation will be continued without updating the license.</p> <p>Action</p> <p>Install the permanent license later.</p>
KAPL09091-E	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>
KAPL09100-E	aa...aa cannot be installed. The same version has already been installed.	<p>Details</p> <p>The file cannot be installed because the file set output in the message is already installed.</p> <p>aa...aa: DLManager.rte or AutoPath.rte</p> <p>Action</p> <p>Uninstall the file set output in the message and then retry installation.</p>
KAPL09112-E	The license key file is invalid. File name = aa...aa	<p>Details</p> <p>The format of the license key file is invalid.</p> <p>aa...aa: /var/tmp/hdlm_license</p> <p>Action</p> <p>Save the correct license key file in the designated directory, and then re-execute.</p> <p>/var/tmp/hdlm_license</p>

Message ID	Message	Recommended Action
KAPL09113-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 HDLM-installable license key in the license key file.</p> <p><i>aa...aa</i> /var/tmp/hdlm_license</p> <p>Action</p> <p>Make sure that the license key file is correct, and then re-execute.</p> <p>/var/tmp/hdlm_license</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> /var/tmp/hdlm_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 installation, save the correct license key file in the designated directory, and then re-execute installation.</p> <p>/var/tmp/hdlm_license</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> /var/tmp/hdlm_license</p> <p>Action</p> <p>If a license key file exists, delete it.</p> <p>/var/tmp/hdlm_license</p>
KAPL09116-W	The command could not be installed. (command = <i>aa...aa</i>)	<p>Details</p> <p>The output HDLM command cannot be used.</p> <p><i>aa...aa</i> Command name</p> <p>Action</p> <p>The output command can be executed by using a different name. If you want to use the output name, use the output command to overwrite or re-install.</p> <p>Store a correct license key file in the designated directory, and then re-execute.</p>

Message ID	Message	Recommended Action
KAPL09135-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. Then, if necessary, update the license by using the <code>set -lic</code> operation during or after 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:</p> <p>Execution of the HDLM command's set -lic operation simultaneously with an update of the license for an update installation</p>
KAPL09505-E	<i>aa...aa</i> cannot be applied to the installed <i>bb...bb</i> .	<p>Details</p> <p>This HDLM or Service Pack (<i>aa...aa</i>) cannot be used for an update installation on the already installed HDLM or installed Service Pack (<i>bb...bb</i>).</p> <p><i>aa...aa</i>: the-HDLM-to-be-installed HDLM-version or the-ServicePack-to-be-installed HDLM-version</p> <p><i>bb...bb</i>: the-installed-HDLM HDLM-version or the-installed-ServicePack HDLM-version</p> <p>Action</p> <p>An update installation cannot be performed on the already installed HDLM or Service Pack. When installing a HDLM: Uninstall the installed HDLM or Service Pack, and then perform installation. When installing a Service Pack: Obtain, and then install, a Service Pack or corrected version that can be applied to the installed 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 same version as that of service pack to install is installed. Installation of Service Pack is stopped.</p> <p><i>aa...aa</i>: version of the Service Pack to install</p> <p>Action</p> <p>You do not have to install the Service Pack. Keep using HDLM already installed.</p>

Message ID	Message	Recommended Action
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 Service pack (<i>bb...bb</i>) is already installed. Installation of Service Pack (<i>aa...aa</i>) is stopped.</p> <p><i>aa...aa</i>: the version of the Service Pack to install</p> <p><i>bb...bb</i>: the version of the installed HDLM or the installed Service Pack</p> <p>Action</p> <p>You do not have to install the Service Pack. Keep using HDLM already installed.</p>

Note: When you reinstall HDLM, default values are assigned to the function settings in the Options window. If needed, reset these values according to your preference.

Table 9.13 Messages from the Error Information Collection Utility

Message ID	Message	Recommended Action
KAPL10001-W	No parameter has been specified.	<p>Details</p> <p>No parameter (directory to which collected information is output) has been specified.</p> <p>Action</p> <p>Check the parameters of the <code>DLMgetras</code> utility for collecting HDLM error information, and then retry.</p>
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.</p>
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 set to a directory to which collected information is output.</p> <p><i>aa...aa</i>: First parameter</p> <p>Action</p> <p>Check the parameters of the <code>DLMgetras</code> utility for collecting HDLM error information, and then retry.</p>

Message ID	Message	Recommended Action
KAPL10004-W	The parameter contains an incorrect value. Value = <i>aa...aa</i>	<p>Details</p> <p>The first parameter must be a directory. The second parameter must be -f.</p> <p><i>aa...aa</i>: Invalid parameter</p> <p>Action</p> <p>Check the parameters of the <code>DLMgetras</code> utility for collecting HDLM error information, and then retry.</p>
KAPL10005-W	The number of parameters is insufficient.	<p>Details</p> <p>The -f parameter exists but the file for defining the information to be collected does not exist.</p> <p>Action</p> <p>Check the parameters of the <code>DLMgetras</code> utility for collecting HDLM error information, and then retry.</p>
KAPL10006-W	The file for defining the information to be collected does not exist, or cannot be read. Value = <i>aa...aa</i>	<p>Details</p> <p>The file for defining the information to be collected does not exist, or the specified file exists but the permission to read the file is missing.</p> <p><i>aa...aa</i>: Name of the file for defining the information to be collected</p> <p>Action</p> <p>Check whether the specified file for defining the information to be collected exists, and check whether you have access permission for the specified file.</p>
KAPL10007-W	A directory has been specified in the third parameter. Value = <i>aa...aa</i>	<p>Details</p> <p>The -f parameter is specified to a directory.</p> <p><i>aa...aa</i>: Third parameter</p> <p>Action</p> <p>Check the parameters of the <code>DLMgetras</code> utility for collecting HDLM error information, and then retry.</p>
KAPL10008-W	You lack write permission for the specified directory. Value = <i>aa...aa</i>	<p>Details</p> <p>You do not have write permission for the specified file.</p> <p><i>aa...aa</i>: First parameter</p> <p>Action</p> <p>Check whether you have access permission for the specified directory. Also, check whether the specified directory name is correct.</p>

Message ID	Message	Recommended Action
KAPL10009-W	The specified directory already exists. Do you want to overwrite it? [y/n]:	<p>Details</p> <p>The specified directory already exists. Select y to overwrite it or n to cancel.</p> <p>Action</p> <p>The specified directory already exists. Enter y to overwrite the existing file. Enter n or press any other key to terminate the DLMgetras utility for collecting HDLM error information without executing it.</p>
KAPL10010-W	A root directory has been specified. Line = <i>aa...aa</i>	<p>Details</p> <p>The root "/" has been specified as a directory to be collected in the file for defining the information to be collected.</p> <p><i>aa...aa</i>: Line number of the file for defining information to be collected(decimal number)</p> <p>Action</p> <p>Delete the coding of the root directory from the specified file. The displayed directory will be ignored and the DLMgetras utility for collecting HDLM error information will continue.</p>
KAPL10011-W	More than one file or directory has been specified on one line. Line = <i>aa...aa</i> , Value = <i>bb...bb</i>	<p>Details</p> <p>Two or more file names or directory names exist in the file for defining the information to be collected.</p> <p><i>aa...aa</i>: Line number of the file for defining information to be collected(decimal number)</p> <p><i>bb...bb</i>: Indicated contents in a line</p> <p>Action</p> <p>After the DLMgetras utility for collecting HDLM error information terminates, check the contents of the file for defining the information to be collected. This file is shown in the message. If the contents of the file are incorrect, correct them and then try to collect error information again. The DLMgetras utility for collecting HDLM error information will ignore the specified file or directory and continue processing.</p>

Message ID	Message	Recommended Action
KAPL10012-W	The specified file or directory does not exist. Line = <i>aa...aa</i> , Value = <i>bb...bb</i>	<p>Details</p> <p>The specified file or directory does not exist in the file for defining the information to be collected.</p> <p><i>aa...aa</i>: Line number of the file for defining information to be collected(decimal number)</p> <p><i>bb...bb</i>: Indicated contents in a line</p> <p>Action</p> <p>After the <code>DLMgetras</code> utility for collecting HDLM error information terminates, check the contents of the file for defining the information to be collected. This file is shown in the message. If the contents of the file are incorrect, correct them and then try to collect error information again. The <code>DLMgetras</code> utility will ignore the specified file or directory and continue processing.</p>
KAPL10013-W	You lack read permission for the specified file. Line = <i>aa...aa</i> , Value = <i>bb...bb</i>	<p>Details</p> <p>You lack read permission for the specified file in the file for defining information to be collected.</p> <p><i>aa...aa</i>: Line number of the file for defining information to be collected(decimal number)</p> <p><i>bb...bb</i>: Indicated contents in a line</p> <p>Action</p> <p>After the <code>DLMgetras</code> utility for collecting HDLM error information terminates, check the contents of the file for defining the information to be collected. This file is shown in the message. If the contents of the file are incorrect, correct them and then try to collect error information again. The <code>DLMgetras</code> will ignore the specified file and continue processing.</p>

Message ID	Message	Recommended Action
KAPL10014-W	You lack read permission for the specified directory. Line = <i>aa...aa</i> , Value = <i>bb...bb</i>	<p>Details</p> <p>You lack read permission for the specified directory in the file for defining information to be collected.</p> <p><i>aa...aa</i>: Line number of the file for defining information to be collected(decimal number)</p> <p><i>bb...bb</i>: Indicated contents in a line</p> <p>Action</p> <p>After the <code>DLMgetras</code> utility for collecting HDLM error information terminates, check the contents of the file for defining the information to be collected. This file is shown in the message. If the contents of the file are incorrect, correct them and then try to collect error information again. The <code>DLMgetras</code> will ignore the specified file and continue processing.</p>
KAPL10015-W	The file format is invalid. Value = <i>aa...aa</i>	<p>Details</p> <p>The file format in the file for defining information to be collected is not a text file.</p> <p><i>aa...aa</i>: Third parameter</p> <p>Action</p> <p>After the <code>DLMgetras</code> utility for collecting HDLM error information terminates, check whether the file for defining the information to be collected is a text file. The file is shown in the message.</p>
KAPL10016-W	The root directory has been specified in the first parameter.	<p>Details</p> <p>A root "/" cannot be specified in a directory to which collected information is output.</p> <p>Action</p> <p>Check the parameters of the <code>DLMgetras</code> utility for collecting HDLM error information, and then re-execute.</p>
KAPL10017-W	You lack privileges for executing the utility for collecting HDLM error information.	<p>Details</p> <p>The <code>DLMgetras</code> utility for collecting HDLM error information must be executed by a user with root privileges.</p> <p>Action</p> <p>Re-execute as a user with root privileges.</p>

Message ID	Message	Recommended Action
KAPL10020-I	The file has been obtained successfully. File = <i>aa...aa</i> , Collection time = <i>bb...bb</i> (GMT: <i>bb...bb</i>)	<p>Details</p> <p>The file to be collected has been obtained.</p> <p><i>aa...aa</i>: Collected file name</p> <p><i>bb...bb</i>: the year of grace/month/day hour:minute:second</p> <p>Action</p> <p>None.</p>
KAPL10021-I	Processing terminated before completion because a signal was received.	<p>Details</p> <p>The process has been terminated by an operation such as Ctrl+C.</p> <p>Action</p> <p>The <code>DLMgetras</code> utility for collecting HDLM error information terminated before completion. If the directory is unnecessary, delete it, and all of the files it contains.</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.</p>
KAPL10030-I	A user terminated the utility for collecting HDLM error information.	<p>Details</p> <p>Processing of the <code>DLMgetras</code> utility has been terminated because <code>n</code> was sent as a confirmation reply.</p> <p>Action</p> <p>None.</p>
KAPL10031-W	The entered value is invalid. Continue operation ? [y/n]:	<p>Details</p> <p>A value other than <code>y</code> or <code>n</code> has been entered for a [y/n] request. Enter <code>y</code> or <code>n</code>.</p> <p>Action</p> <p>Enter <code>y</code> or <code>n</code>.</p>
KAPL10032-W	The entered value is invalid. The utility for collecting HDLM error information stops.	<p>Details</p> <p>Processing of the <code>DLMgetras</code> utility for collecting HDLM error information will terminate because an invalid response was sent three times to a request.</p> <p>Action</p> <p>Re-execute the <code>DLMgetras</code> utility.</p>
KAPL10033-W	The file does not exist. Filename = <i>aa...aa</i>	<p>Details</p> <p>The file to collect does not exist.</p> <p><i>aa...aa</i>: File to collect</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL10034-E	The file could not be copied. Filename = <i>aa...aa</i> , Details = <i>bb...bb</i>	<p>Details</p> <p>Execution of the cq command failed. <i>aa...aa</i>: File name you tried to copy <i>bb...bb</i>: cq output message</p> <p>Action</p> <p>An error occurred while the file to be collected was being copied. The user environment may be unstable. Check the system configuration.</p>
KAPL10035-E	An attempt to archive the error information failed. Details = <i>aa...aa</i>	<p>Details</p> <p>Execution of the tar command failed. <i>aa...aa</i>: tar output message</p> <p>Action</p> <p>See the details in the message, and then remove the cause of the error. For information about the error, collect the archive in the output directory specified at the time of execution, and then contact your HDLM vendor or your maintenance company if you have a maintenance contract for HDLM.</p>
KAPL10036-E	An attempt to compress the error information failed. Details = <i>aa...aa</i>	<p>Details</p> <p>Execution of the compress command failed. <i>aa...aa</i>: compress output message</p> <p>Action</p> <p>See the details in the message, and then remove the cause of the error. For information about the error, collect the archive in the output directory specified at the time of execution, and then contact your HDLM vendor or the maintenance company if you have a maintenance contract for HDLM.</p>

Table 9.14 Message from the HDLM Volume Group Operation Utility

Message ID	Message	Recommended Action
KAPL10501-W	The specified value is invalid.	<p>Details</p> <p>An invalid logical device file name has been specified for the HDLM device in a utility for operating HDLM volume groups.</p> <p>Action</p> <p>Specify <code>d1mfdrv n</code> (<i>n</i> stands for the instance number of the driver), and then retry.</p>
KAPL10521-W	A parameter is invalid. (parameter = <i>aa...aa</i>)	<p>Details</p> <p>Specified parameter is invalid.</p> <p><i>aa...aa</i> : invalid parameter</p> <p>Action</p> <p>Execute help of the <code>d1mrmddev</code> utility to check the parameters that can be specified, and then retry.</p>
KAPL10523-E	An attempt to unmount the file system has failed. (file system = <i>aa...aa</i>)	<p>Details</p> <p>An attempt to unmount the file system has failed.</p> <p><i>aa...aa</i> : failed file system</p> <p>Action</p> <p>Make sure of the status of the failed file system and then re-execute the program. Unmount the failed file system manually and re-execute the program.</p>
KAPL10524-E	An attempt to inactivate the volume group has failed. (volume group = <i>aa...aa</i>)	<p>Details</p> <p>An attempt to inactivate the volume group has failed.</p> <p><i>aa...aa</i> : failed volume group</p> <p>Action</p> <p>Make sure of the status of failed volume group and then re-execute the program. Inactivate the failed volume group manually and re-execute the program.</p>
KAPL10525-E	An internal error occurred in the <code>d1mrmddev</code> utility. (error code = <i>aa...aa</i>)	<p>Details</p> <p>In the <code>d1mrmddev</code> utility an error not caused by a user occurred.</p> <p>ErrorCode = <i>aa...aa</i> (decimal number)</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	Recommended Action
KAPL10526-I	An attempt to unmount the file system has succeeded. (file system = <i>aa...aa</i>)	<p>Details</p> <p>Unmount of the output file system succeeded.</p> <p><i>aa...aa</i> : file system succeeded</p> <p>Action</p> <p>None.</p>
KAPL10527-I	An attempt to inactivate the volume group has succeeded. (volume group = <i>aa...aa</i>)	<p>Details</p> <p>Inactivation of the output volume group succeeded.</p> <p><i>aa...aa</i> : volume group succeeded</p> <p>Action</p> <p>None.</p>
KAPL10528-I	The volume group will be made inactive, and the file system that is using HDLM will be unmounted. Is this OK? [y/n]:	<p>Details</p> <p>Notice unmount of the file system used by HDLM or inactivation of the volume group to prompt the users to make sure of the status.</p> <p>Action</p> <p>Type in "y" to continue the operation, or type "n" to stop the operation.</p>

Table 9.15 Messages from the HDLM Devices Removing Utility

Message ID	Message	Recommended Action
KAPL10521-W	A parameter is invalid. (parameter = %s)	Execute the dlmrmddev -h utility to check the parameter, and then re-execute.
KAPL10523-E	An attempt to unmount the file system has failed. (file system = %s)	Check the state of the failed file system, and then re-execute. Manually unmount the failed file system, and then re-execute.
KAPL10524-E	An attempt to inactivate the volume group has failed. (volume group = %s)	<p>Check the state of the failed volume group, and then re-execute.</p> <p>Manually inactivate the failed volume group, and then re-execute.</p>
KAPL10525-E	An internal error occurred in the dlmrmdev utility. (error code = %d)	Contact the Hitachi Data Systems Support Center.
KAPL10526-I	An attempt to unmount the file system has succeeded. (file system = %s)	None
KAPL10527-I	An attempt to inactivate the volume group has succeeded. (volume group = %s)	None
KAPL10528-I	The volume group will be made inactive, and the file system that is using HDLM will be unmounted. Is this OK? [y/n]:	Enter y to continue executing the operation, or enter n to cancel.

Table 9.16 Messages from the Utility for Modifying the HDLM Execution Environment

Message ID	Message	Recommended Action
KAPL10601-I	The dlmchenv utility completed normally.	<p>Details</p> <p>The dlmchenv utility completed normally.</p> <p>Action</p> <p>None.</p>
KAPL10602-I	The HDLM link will be changed to OS version = <i>aa...aa</i> , kernel mode = <i>bb...bb</i> . Would you like to continue? [y/n]:	<p>Details</p> <p>Select <i>y</i> to change the link to the displayed OS version, kernel mode, and <i>n</i> to not change the link.</p> <p>OS version = <i>aa...aa</i>:5.1/5.2/5.3</p> <p>kernel mode = <i>bb...bb</i>:32/64</p> <p>Action</p> <p>If you would like to change the link to the displayed OS version and kernel mode, enter <i>y</i>. Otherwise, enter <i>n</i>.</p>
KAPL10603-I	The HDLM SMIT menu will be changed to OS version = <i>aa...aa</i> . Would you like to continue? [y/n]:	<p>Details</p> <p>Select <i>y</i> to change the SMIT menu to the displayed OS version, and <i>n</i> to not change the SMIT menu.</p> <p><i>aa...aa</i>:5.1, 5.2, or 5.3</p> <p>Action</p> <p>If you would like to change the SMIT menu to the displayed OS version, enter <i>y</i>. Otherwise, enter <i>n</i>.</p>
KAPL10604-E	This version of the OS is not supported by HDLM. Uninstall HDLM.	<p>Details</p> <p>This version of the OS is not supported by HDLM. Uninstall HDLM.</p> <p>Action</p> <p>Uninstall HDLM.</p>
KAPL10605-W	A parameter is invalid. parameter = <i>aa...aa</i>	<p>Details</p> <p>A parameter is invalid.</p> <p><i>aa...aa</i>: invalid parameter</p> <p>Action</p> <p>Execute the dlmchenv -h utility to check the parameter, and then retry execution.</p>

Message ID	Message	Recommended Action
KAPL10606-E	HDLM cannot change the SMIT menu or link. HDLM <i>aa...aa</i> is running.	<p>Details</p> <p>The <code>d1mchenv</code> utility cannot be executed because the HDLM driver, HDLM alert driver, and HDLM manager have been started.</p> <p><i>aa...aa</i>: driver/alert driver/manager</p> <p>Action</p> <p>Execute the <code>d1mrmddev</code> utility for deleting HDLM drivers to delete the logical device files for the HDLM device and the HDLM alert driver from the running kernel, stop the HDLM manager, and then re-execute the <code>d1mchenv</code> utility.</p>
KAPL10607-E	A file or directory related to HDLM could not be found.	<p>Details</p> <p>The required file could not be found when changing the HDLM SMIT menu.</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL10608-E	An attempt to change the link has failed. Error Code = <i>aa...aa</i>	<p>Details</p> <p>Changing of the link failed.</p> <p><i>aa...aa</i>: internal code in <code>d1mchenv</code></p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL10609-E	An attempt to change the SMIT menu has failed. Error Code = <i>aa...aa</i>	<p>Details</p> <p>Changing of the SMIT menu failed.</p> <p><i>aa...aa</i>: internal code in <code>d1mchenv</code></p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>

Table 9.17 Messages from the Utility for Changing the HDLM HBA

Message ID	Message	Recommended Action
KAPL10620-I	The dlmHBAdel utility completed normally.	<p>Details</p> <p>The dlmHBAdel utility completed normally.</p> <p>Action</p> <p>None.</p>
KAPL10621-W	No parameter has been specified.	<p>Details</p> <p>No parameter has been specified.</p> <p>Action</p> <p>Execute the dlmHBAdel -h utility to check the parameter, and then retry execution.</p>
KAPL10622-W	A parameter is invalid. parameter = aa...aa	<p>Details</p> <p>The specified parameter is invalid.</p> <p>aa...aa: invalid parameter</p> <p>Action</p> <p>Execute the dlmHBAdel -h utility to check the parameter, and then retry execution.</p>
KAPL10624-W	The specified parent device of the HDLM driver does not exist. Device = aa...aa	<p>Details</p> <p>The specified parent device of the HDLM driver does not exist.</p> <p>aa...aa: specified parent device</p> <p>Action</p> <p>Execute the dlmHBAdel -h utility to check the parameter, and then retry execution.</p>
KAPL10625-E	An attempt to remove a path has failed. Error code = aa...aa	<p>Details</p> <p>An attempt to remove a path of the specified parent device has failed.</p> <p>aa...aa: internal code in dlmHBAdel</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	Recommended Action
KAPL10626-E	An attempt to remove a path has failed. Error code = <i>aa...aa</i> , HDLM driver = <i>bb...bb</i> , Disk = <i>cc...cc</i>	<p>Details</p> <p>An attempt to remove a path of the specified parent device has failed.</p> <p>Error Code = <i>aa...aa</i>: internal code in <code>d1mHBAde1</code></p> <p>HDLM driver = <i>bb...bb</i>: <code>d1mfdrvn</code></p> <p>Physical volume = <i>cc...cc</i>: <code>hdiskn</code> (<i>n</i>: instance number)</p> <p>Action</p> <p>If the error code is "5.62", deactivate the volume group used by the HDLM driver. If the error code is not "5.62", contact your HDLM vendor or the maintenance company if you have a maintenance contract for HDLM.</p>

Table 9.18 Messages from the Utility for Clearing HDLM Persistent Reservation

Message ID	Message	Recommended Action
KAPL10641-I	Reservation Key will now be cleared. Is this OK? [y/n]:	<p>Details</p> <p>Enter <i>y</i> to clear and <i>n</i> to not clear the Reservation Key.</p> <p>Action</p> <p>None.</p>
KAPL10642-I	Reservation Key of <i>aa...aa</i> was cleared.	<p>Details</p> <p>The Reservation Key has been cleared.</p> <p><i>aa...aa</i>: logical device file name for the HDLM management-target device</p> <p>Action</p> <p>None.</p>
KAPL10643-W	A necessary parameter is not specified.	<p>Details</p> <p>A parameter is not specified for the <code>d1mpr</code> utility.</p> <p>Action</p> <p>Execute the <code>d1mpr -h</code> utility to check the parameter, and then retry execution.</p>
KAPL10644-W	The specified parameters cannot be specified at the same time. parameter = <i>aa...aa</i>	<p>Details</p> <p>The specified parameters cannot be specified for the <code>d1mpr</code> utility at the same time.</p> <p><i>aa...aa</i>: specified parameter</p> <p>Action</p> <p>Execute the <code>d1mpr -h</code> utility to check the parameter, and then retry execution.</p>

Message ID	Message	Recommended Action
KAPL10645-W	A parameter value is invalid. parameter = <i>aa...aa</i>	<p>Details</p> <p>An invalid parameter value has been specified for the <code>d1mpr</code> utility.</p> <p><i>aa...aa</i>: specified parameter</p> <p>Action</p> <p>Specify the correct value for the parameter, and then retry.</p>
KAPL10646-W	A parameter is invalid. parameter = <i>aa...aa</i>	<p>Details</p> <p>An invalid parameter has been specified for the <code>d1mpr</code> utility.</p> <p><i>aa...aa</i>: specified parameter</p> <p>Action</p> <p>Execute help of the <code>d1mpr</code> utility to check the parameters that can be specified, and then retry.</p>
KAPL10648-E	An internal error occurred in the <code>d1mpr</code> utility. Error Code = <i>aa...aa</i>	<p>Details</p> <p>An error not caused by the user has occurred in the <code>d1mpr</code> utility.</p> <p><i>aa...aa</i>: error number(decimal number)</p> <p>Action</p> <p>If the message displays Error Code = 35 or Error Code = 36, check the path for any errors. If there is a path error, restore the path status and then retry. If the KAPL10648-E message has been issued but there is no path error, contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL10649-E	<i>aa...aa</i> : An attempt to perform Reservation Key clear processing has failed.	<p>Details</p> <p>An attempt to perform Reservation Key clear processing has failed.</p> <p><i>aa...aa</i>: logical device file name for the HDLM management-target device</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL10650-I	<i>aa...aa</i> : NO RESERVATION	<p>Details</p> <p>A LU has not been reserved.</p> <p><i>aa...aa</i>: logical device file name for the HDLM management-target device</p> <p>Action</p> <p>None.</p>
KAPL10651-I	The user terminated the operation.	<p>Details</p> <p>The <code>d1mpr</code> utility has been terminated because <code>n</code> was sent to a request.</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL10652-E	The entered value is invalid. The operation stops.	<p>Details</p> <p>An invalid response was sent three times consecutively to a request.</p> <p>Action</p> <p>Re-execute the <code>d1mpr</code> utility.</p>
KAPL10653-W	The entered value is invalid. Please re-enter it [y/n]:	<p>Details</p> <p>A value other than <code>y</code> or <code>n</code> has been entered for a [y/n] request.</p> <p>Action</p> <p>Enter <code>y</code> or <code>n</code>.</p>
KAPL10665-I	The <code>d1mpr</code> utility completed.	<p>Details</p> <p>The <code>d1mpr</code> utility completed normally.</p> <p>Action</p> <p>None.</p>

Table 9.19 Messages from the Utility for Setting the HDLM Execution Environment ODM

Message ID	Message	Recommended Action
KAPL10800-I	The <code>d1modmset</code> utility completed normally.	<p>Details</p> <p>The <code>d1modmset</code> utility completed normally.</p> <p>Action</p> <p>None.</p>
KAPL10801-W	No parameter has been specified. operation = <i>aa...aa</i>	<p>Details</p> <p>No parameter has been specified. <i>aa...aa</i> : Specified operation</p> <p>Action</p> <p>Execute help of the <code>d1modmset</code> utility to check the parameters that can be specified, and then retry.</p>
KAPL10802-W	A parameter is invalid. operation = <i>aa...aa</i> , parameter = <i>bb...bb</i>	<p>Details</p> <p>The specified parameter is invalid. <i>aa...aa</i> : Specified operation <i>bb...bb</i> : invalid parameter</p> <p>Action</p> <p>Execute help of the <code>d1modmset</code> utility to check the parameters that can be specified, and then retry.</p>

Message ID	Message	Recommended Action
KAPL10803-W	The log file size parameter value is invalid. Log file size parameter value = <i>aa...aa</i> , Valid value = <i>bb...bb</i>	<p>Details</p> <p>The log file size parameter value is invalid.</p> <p><i>aa...aa</i> : Specified value</p> <p><i>bb...bb</i> : Specifiable value range</p> <p>Action</p> <p>Specify the correct value for the parameter, and then retry.</p>
KAPL10804-E	An internal error occurred in the d1modmset utility. Error Code = <i>aa...aa</i>	<p>Details</p> <p>An error not caused by the user has occurred in the d1modmset utility.</p> <p><i>aa...aa</i> : Error Code (Character string)</p> <p>Action</p> <p>Contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.</p>
KAPL10805-I	The setup of the HDLM execution environment ODM will be changed. <i>aa...aa</i> = <i>bb...bb</i> . Is this OK? [y/n]:	<p>Details</p> <p>We recommend that you report the setup of the HDLM execution environment ODM that you want to change to the user for confirmation.</p> <p><i>aa...aa</i> : Inquiry Log/Inquiry Log File Size/hdisk error check flag</p> <p><i>bb...bb</i> : on/off/Log file size</p> <p>Action</p> <p>Enter y to execute setup, or enter n to cancel.</p>
KAPL10806-W	The entered value is invalid. Re-enter [y/n]:	<p>Details</p> <p>A value other than y or n has been entered for a [y/n] request. Enter [y/n].</p> <p>Action</p> <p>Enter y or n.</p>
KAPL10807-E	The entered value is invalid. The operation stops.	<p>Details</p> <p>An invalid response was sent three times consecutively to a request.</p> <p>Action</p> <p>Re-execute the d1modmset utility.</p>
KAPL10808-I	The user terminated the operation.	<p>Details</p> <p>The utility has been terminated because n was sent to a request.</p> <p>Action</p> <p>None.</p>

Message ID	Message	Recommended Action
KAPL10809-W	No operation has been specified.	<p>Details</p> <p>No operation has been specified.</p> <p>Action</p> <p>Execute help of the <code>d1modmset</code> utility to check the operations that can be specified, and then retry.</p>
KAPL10810-W	An operation is invalid. operation = <i>aa...aa</i>	<p>Details</p> <p>The specified operation is invalid.</p> <p><i>aa...aa</i>: invalid operation</p> <p>Action</p> <p>Execute help of the <code>d1modmset</code> utility to check the operations that can be specified, and then retry.</p>
KAPL10811-W	The <i>aa...aa</i> parameter value is invalid. <i>bb...bb</i> parameter value = <i>cc...cc</i> , Valid value = <i>dd...dd</i>	<p>Details</p> <p>The parameter value is invalid.</p> <p><i>aa...aa</i>: attribute name</p> <p><i>bb...bb</i>: attribute name</p> <p><i>cc...cc</i>: specified value (decimal number)</p> <p><i>dd...dd</i>: permitted range (character string)</p> <p>Action</p> <p>Specify the correct parameter value and then retry.</p>

Table 9.20 Messages from the Utility for VCS

Message ID	Message	Recommended Action
KAPL10850-I	The utility for VCS (%s %s) started.	None.
KAPL10851-E	The service group is not specified.	Specify the service group for the parameter, and then retry.
KAPL10852-E	The specified service group (%s) was not found.	Start it if VERITAS Cluster Server™ is not running. Register it if the service group is not registered in VERITAS Cluster Server™.
KAPL10853-W	The attribute (%s) was not found in the service group (%s).	Register it if the attribute is not registered in the service group.
KAPL10854-E	An attempt to clear the persistent reservation has failed. HDLM driver = %s, ErrorCode = %d	Recover at least one path if an error for all paths occurs. Clear the disk's persistent reservation by using the utility for dlmp. If the same message continues to be output after the above countermeasure, contact your HDLM vendor, or the maintenance company if there is a maintenance contract for HDLM.
KAPL10855-E	An attempt to acquire the minor number of the HDLM driver (%s) has failed.	Clear the disk's persistent reservation by using the utility for dlmp. If the same message continues to be output after the persistent reservation has been cleared, contact your HDLM vendor, or the maintenance company if there is a maintenance contract for HDLM.
KAPL10856-W	No HDLM driver configuration was found for the volume group (%s).	Configure it if the HDLM driver has not been configured for the volume group.
KAPL10857-I	The utility for VCS (dlm_vcs_pgr_release) completed normally.	None.

Table 9.21 Messages from Utility for Checking the Device Configuration

Message ID	Message	Recommended Action
KAPL12201-I	An invalid path was not found.	<p>Details</p> <p>No invalid paths were found.</p> <p>Path information for the configured HDLM device is correct.</p> <p>Action</p> <p>None.</p>
KAPL12202-E	An invalid path was found. Do not add or delete paths.	<p>Details</p> <p>At least one of the configured HDLM devices has invalid path information. Do not add or delete paths.</p> <p>Action</p> <p>Be recovered with the following process.</p> <p>Backup "dlmfdrv.conf" file if it exist, then execute the following command to create an empty "dlmfdrv.conf" file.</p> <pre># echo ">" /usr/DynamicLinkManager/drv/dlmfdrv.conf</pre> <p>Reboot the server.</p> <pre># shutdown -r now</pre> <p>Execute the following command to delete HDLM device ODM information.</p> <pre># odmdelete -o CuAt -q "name LIKE dlmfdrv* AND attribute=pvid"</pre> <p>Execute the following command to delete HDLM device.</p> <p>Note: Please ignore "KAPL09013-E" message by execute this command.</p> <pre># /usr/DynamicLinkManager/bin/dlrmdev</pre> <p>Execute the following command to delete "dlmfdrv.conf" file.</p> <pre># rm /usr/DynamicLinkManager/drv/dlmfdrv.conf</pre> <p>Restore "dlmfdrv.conf" file in to "/usr/DynamicLinkManager/drv/" if you backup at step1.</p> <p>Execute the following command to configure HDLM device.</p> <pre># /usr/DynamicLinkManager/bin/dlmcfgmgr</pre> <p>Carry out dlmchkdev again, and confirm pass information.</p>

Message ID	Message	Recommended Action
KAPL12203-E	An path information was not found.	<p>Details</p> <p>Acquisition of path information failed.</p> <p>The configured HDLM device was not found.</p> <p>Action</p> <p>Be being installed, or confirm whether or you compose a HDLM driver, and the one after HDLM 5.1 is to carry it out again.</p>
KAPL12204-I	The dlmchkdev utility completed normally.	<p>Details</p> <p>The Utility for checking the device configuration (dlmchkdev) terminated normally.</p> <p>Path information for the configured HDLM device is correct.</p> <p>Action</p> <p>None.</p>
KAPL12205-W	The dlmchkdev utility completed.	<p>Details</p> <p>The Utility for checking the device configuration (dlmchkdev) detected a configured HDLM device whose path information is invalid and then the utility terminated itself.</p> <p>Action</p> <p>Refer to coping of KAPL12202-E.</p>

Table 9.22 Messages from Utility for HDLM Installation Configuration Support

Message ID	Message	Recommended Action
KAPL12251-I	The dlmsetup utility completed.	<p>Action</p> <p>None.</p>
KAPL12252-I	A new installation of HDLM will now be performed. Is this OK? [y/n]:	<p>Action</p> <p>To execute a new installation of HDLM, enter "y". To stop without executing, enter "n".</p>
KAPL12253-I	An update installation of HDLM will now be performed. Is this OK? [y/n]:	<p>Action</p> <p>To execute an update installation of HDLM, enter "y". To stop without executing, enter "n".</p>
KAPL12254-I	The dlmodmset utility will now be executed. Is this OK? [y/n]:	<p>Action</p> <p>To execute the utility for setup of the HDLM execution ODM, enter "y". To stop without executing, enter "n".</p>
KAPL12255-I	The dlnmgr set command will now be executed. Is this OK? [y/n]:	<p>Action</p> <p>To execute the HDLM operation setup command, enter "y". To stop without executing, enter "n".</p>

Message ID	Message	Recommended Action
KAPL12256-I	The dlrmdev utility will now be executed. Is this OK? [y/n]:	Action To execute the release of the HDLM driver configuration, enter "y". To stop without executing, enter "n".
KAPL12257-W	The entered value is invalid. Re-enter. [y/n]:	Action Enter either "y" or "n".
KAPL12258-I	The entered value is invalid. The operation will now stop.	Action To execute dlmssetup again, re-execute.
KAPL12259-I	The user stopped the operation.	Action To execute dlmssetup again, re-execute.
KAPL12260-W	No parameter has been specified.	Action Specify the -h option in the utility for HDLM installation configuration support, confirm the option that should be specified, and then re-execute.
KAPL12261-W	A parameter is invalid. parameter = aa...aa	Details An invalid parameter is specified. aa...aa: The specified parameter Action Specify the -h option in the utility for HDLM installation configuration support, confirm the option that should be specified, and then re-execute.
KAPL12262-W	No parameter value has been specified. parameter = aa...aa	Details No parameter value has been specified. aa...aa: Parameter Action Specify the -h option in the utility for HDLM installation configuration support, confirm the option that should be specified, and then re-execute.
KAPL12263-E	The specified file does not exist. parameter = aa...aa, Filename = bb...bb	Details A file that does not exist is specified. aa...aa: Parameter bb...bb: The specified file name Action If -odm is set for the parameter: Execute dlmodm set, dlmcfgmgr, and then dlnkmgr set one after another, or specify odm-settings-file in dlmssetup again, and then re-execute. If -set is set for the parameter: Specify the desired parameters, and then execute the dlnkmgr set command.

Message ID	Message	Recommended Action
KAPL12264-E	An attempt to read the file has failed. parameter = <i>aa...aa</i> , Filename = <i>bb...bb</i>	<p>Details</p> <p>An attempt to read the file has failed.</p> <p><i>aa...aa</i>: Parameter</p> <p><i>bb...bb</i>: The specified file name</p> <p>Action</p> <p>If <code>-odm</code> is set for the parameter:</p> <p>Execute <code>dlmodm set</code>, <code>dlmcfgmgr</code>, and then <code>dlnkmgr set</code> one after another, or specify an <i>odm-settings-file</i> that can be read in <code>dlmsetup</code> again, and then re-execute.</p> <p>If <code>-set</code> is set for the parameter:</p> <p>Specify the desired parameters, and then execute the <code>dlnkmgr set</code> command.</p>
KAPL12265-E	There is an invalid character in the file. parameter = <i>aa...aa</i> , Filename = <i>bb...bb</i>	<p>Details</p> <p>An invalid character was discovered in the file.</p> <p><i>aa...aa</i>: Parameter</p> <p><i>bb...bb</i>: The specified file name</p> <p>Action</p> <p>If <code>-odm</code> is set for the parameter:</p> <p>Execute <code>dlmodm set</code>, <code>dlmcfgmgr</code>, and then <code>dlnkmgr set</code> one after another, or specify the modified <i>odm-settings-file</i> in <code>dlmsetup</code> again, and then re-execute.</p> <p>If <code>-set</code> is set for the parameter:</p> <p>Specify the desired parameters, and then execute the <code>dlnkmgr set</code> command.</p>
KAPL12266-E	The <i>aa...aa</i> does not exist.	<p>Details</p> <p>The utility or the command that you tried to execute was not in the expected location.</p> <p><i>aa...aa</i>: <code>dlmodmset</code>, <code>dlmcfgmgr</code>, <code>dlnkmgr</code>, <code>dlmchkdev</code> or <code>dlmrmddev</code>.</p> <p>Action</p> <p>The utility that you attempted to execute or the command was not in the expected location. If the utility or command that you tried to execute is <code>dlmodmset</code>, <code>dlmcfgmgr</code>, or <code>dlnkmgr</code>, the expected location is <code>/usr/DynamicLinkManager/bin</code>. If the utility that you tried to execute is <code>dlmchkdev</code> or <code>dlmrmddev</code>, the expected location is the directory in which the <code>dlmsetup</code> was executed.</p>

Appendix A HDLM Operations

A.1 Canceling Exclusive Use of a Disk (Normal Host)

You may set the persistent reservation for a volume group created on a shared disk (LU). In a non-cluster environment, shutting down the host while this volume group is still active prevents other hosts from manipulating that volume group. Before you shut down the host, execute the following command to deactivate the volume group.

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
```

If you shut down the host without inactivating the volume group, restart the host, activate the volume group, and then deactivate the volume group.

In a cluster environment, you do not need to deactivate the volume group because the cluster software locks or unlocks the disk.

A.2 Canceling Exclusive Use of a Disk (Error Host)

If an error occurs in the host that exclusively uses a disk by setting the persistent reservation in a non-cluster environment, any other host can no longer access the disk. In this case, execute the utility for clearing HDLM persistent reservation to cancel the reservation. Please refer to section Chapter 7 for further information on HDLM utilities.

A.3 Error Checking to Operations for Specifying the hdisk

With the HDLM driver enabled, you can set an error status for the hdisk for which the HDLM driver is configured when you use the `rmdev`, `chdev`, or the command for operating volume groups. When an error status is set, incorrect operations to the hdisk can be avoided. This setting can be performed by using the utility for setting the HDLM execution environment ODM (`dlmodmset`) with the `-e` parameter. Following is the command:

```
# /usr/DynamicLinkManager/bin/dlmodmset -e on
```

Following is the procedure for setting an error status for the hdisk:

1. Execute the `dlmrdev` utility to delete all the HDLM drivers:

```
# /usr/DynamicLinkManager/bin/dlmrdev
```
2. Do one of the following:
 - Restart the system:

```
# shutdown -Fr
```
 - Use the HDLM configuration manager to reconfigure the HDLM driver:

```
# /usr/DynamicLinkManager/bin/dlmcfgmgr
```

Note: For information about the utility for setting the HDLM execution environment ODM, see `dlmodmset` in Chapter 7.

A.4 Changing the Disk Attributes for an HDLM Driver

The disk attributes for an HDLM driver can be changed by using the `chdev` command. With this command, all the instance attributes and their lower `hdisk` attributes of the paths that are connected to the disk are changed. For details on whether the disk attributes for an HDLM driver can be changed by the `chdev` command, see the driver manual for each disk.

Following is the procedure for changing the disk attributes for an HDLM driver:

1. Deactivate the volume group used in HDLM:

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
```
2. Change the disk attributes using the `chdev` command. Following is an execution example of the command, which changes all the `hdisks` under `dlmfdrv1`:

```
# chdev -l dlmfdrv1 -a queue_depth=8
```
3. Activate the volume group:

```
# /usr/DynamicLinkManager/bin/dlmvaryonvg volume-group-name
```

Note: When changing the disk attributes by specifying the HDLM driver (`dlmfdrv`) with the `chdev` command, you cannot specify the `-P` and `-T` options. Deactivate the volume group used in HDLM:

```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
```

4. Check and record `hdisk` that corresponds to each `dlmfdrv` that you want to define.

Following is an example execution:

```
# /usr/DynamicLinkManager/bin/dlnkmgr view -drv | grep -w dlmfdrv6
000024 dlmfdrv6 hdisk10 9200.0010.0007
000025 dlmfdrv6 hdisk49 9200.0010.0007
000026 dlmfdrv6 hdisk80 9200.0010.0007
000027 dlmfdrv6 hdisk111 9200.0010.0007
```

5. Define `dlmfdrv`:

```
# rmdev -l dlmfdrv6
```
6. Change the disk attributes:

```
# chdev -l hdisk10 -a queue_depth=32 -a rw_timeout=60
```
7. Enable `dlmfdrv`:

```
# mkdev -l dlmfdrv6
```
8. Activate the volume group used in HDLM:

```
# /usr/DynamicLinkManager/bin/dlmvaryonvg volume-group-name
```

Note: Before you define the disk, be sure to delete or define its HDLM driver. Before you delete the disk, be sure to delete its HDLM driver.

A.5 Notes on Configuring an HDLM Driver

When the HDLM is configured after installation, the `dlimcfgmgr` command is used as a configuration manager. This configuration manager configures only the HDLM drivers.

Note: The `dlimcfgmgr` command does not have any parameters. If you specify any parameters, they will be ignored.

This section explains the notes on configuring an HDLM driver by executing `cfgmgr` or `dlimcfgmgr`.

Changing the PVID of a secondary volume: To execute `cfgmgr` or `dlimcfgmgr` to configure an HDLM driver, each volume (disk) must have a different **PVID**.

When you use a function such as `ShadowImage` to copy a volume, the created copy may have the same **PVID** as the original volume. In this case, configuring an HDLM driver may cause an error. If an error occurs, change the **PVID** of the secondary volume and then configure the HDLM driver.

To change the **PVID** of the secondary volume:

1. Execute the following command to deactivate the volume group. If multiple hosts share the target volume group (called a shared volume group hereafter), deactivate the shared volume group for all the sharing hosts.

```
# varyoffvg volume-group-name
```

2. Change the **PVID**. To let the hosts share an LU, perform the following on one of these hosts:

If there is no volume group:

Execute the following command for one of the disks:

```
# chdev -l hdiskn -a pv=clear -a pv=yes
```

Then, execute the following command for all the remaining disks:

```
# chdev -l hdiskn -a pv=yes
```

If there is a volume group or if the volume group extends over more than one LU:

Execute the following command. If the volume group extends over more than one LU, execute the following command for each LU.

```
# exportvg volume-group-name
# recreatevg -y volume-group-name ...
# varyoffvg volume-group-name
# chdev -l hdiskn -a pv=yes
```

Note: Execute this for all the disks in the volume group.

3. To let the hosts share the LU, perform the following on all those hosts except for the host for which you changed the PVID in step (b).

If there is no shared volume group, execute the following command:

```
# chdev -l hdiskn -a pv=yes (Execute this for all the disks in the secondary volume.)
```

If there is a shared volume group, execute the following commands:

```
# exportvg shared-volume-group-name
# exportvg shared-volume-group-name
# chdev -l hdiskn -a pv=yes (Execute this for all the disks in the shared volume
group.)
# importvg shared-volume-group-name
# varyoffvg shared-volume-group-name
```

Configuring an HDLM driver when different volumes (disks) have the same PVID: If you configured an HDLM driver when different volumes (disks) had the same PVID, an error may occur during execution of the **dlnmrecreatevg** command. If the error occurs, change the PVID according to the following procedure:

1. Execute the following command to deactivate the volume group. If the target is the shared volume group, deactivate the shared volume group for all the sharing hosts.


```
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name
```
2. Change the PVID. To let the hosts share an LU, perform the following on one of these hosts.
 - If there is no volume group, execute the following command for the HDLM driver in the secondary volume:


```
# chdev -l secondary-volume's-dlmfdvsn -a pv=clear -a pv=yes
```
 - If the secondary volume has a volume group or if the volume group extends over more than one LU, execute the following command. If the volume group extends over more than one LU, execute the following commands for each LU:


```
# /usr/DynamicLinkManager/bin/dlmexportvg volume-group-name-of-secondary-volume
# /usr/DynamicLinkManager/bin/dlmrecreatevg -y volume-group-name-of-secondary-
volume ...
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name-of-secondary-volume
```
3. To let the hosts share the LU, perform the following on all those hosts except for the host for which you changed the PVID in step (b).
 - If there is no shared volume group, execute the following command for the HDLM driver in the secondary volume. If the volume group extends over more than one LU, execute the following command for each LU:


```
# chdev -l secondary-volume's-dlmfdvsn -a pv=yes
```
 - If the secondary volume has the shared volume group, execute the following command:


```
# /usr/DynamicLinkManager/bin/dlmexportvg volume-group-name-of-secondary-volume
# /usr/DynamicLinkManager/bin/dlmimportvg volume-group-name-of-secondary-volume
# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name-of-secondary-volume
```


A.6 Settings for the Operating System Upgrade

When upgrading the operating system, use the **d1mchenv** utility to adjust HDLM to the environment for the upgraded operating system.

To set up HDLM for the operating system upgrade:

1. Log in to AIX as a user with root privileges.
2. Stop all the processes and services using the HDLM management-target paths.
3. Stop any process or service for an application such as DBMS that is using the HDLM management-target paths.
4. Execute the following command to unmount the file system used in HDLM:
`# umount file-system-mount-point`
5. Deactivate the volume group used in HDLM:
`# /usr/DynamicLinkManager/bin/d1mvaryoffvg volume-group-name`
6. Execute the following command to remove the HDLM driver and the HDLM alert driver from the running kernel, and then stop the HDLM manager:
`# /usr/DynamicLinkManager/bin/d1mrmddev`
7. Execute the following command to adjust HDLM to the environment for the operating system version you want to change:
`# /usr/DynamicLinkManager/bin/d1mchenv -v OS-mode`

Table lists the available OS modes, and their corresponding OS versions and kernel modes.

The following shows an example of upgrading AIX V4.3.3 to AIX 5L V5.1 64-bit version:

```
# /usr/DynamicLinkManager/bin/d1mchenv -s -l -v 3
```

1. Upgrade the operating system.
2. Restart the host.
3. Execute the following command to start the HDLM configuration manager, and then configure the HDLM driver:
`# /usr/DynamicLinkManager/bin/d1mcfmgr`

Table A.1 OS Modes

OS Modes	OS Versions and Kernel Modes
1	AIX V4.3.3
2	AIX 5L V5.1 (32-bit version)
3	AIX 5L V5.1 (64-bit version)
4	AIX 5L V5.2 (32-bit version)
5	AIX 5L V5.2 (64-bit version)

To set up HDLM when the kernel mode is changed:

1. Log in to AIX® as a user with root privileges.
2. Stop all the processes and services using the HDLM management-target paths.
3. Stop any process or service for an application such as DBMS that is using the HDLM management-target paths.
4. Execute the following command to unmount the file system used in HDLM:
`# umount file-system-mount-point`
5. Deactivate the volume group used in HDLM:
`# /usr/DynamicLinkManager/bin/dlmvaryoffvg volume-group-name`
6. Execute the following command to remove the HDLM driver and the HDLM alert driver from the running kernel, and then stop the HDLM manager:
`# /usr/DynamicLinkManager/bin/dlmrmdev`
7. Execute the following command to adjust HDLM to the environment for the kernel mode you want to change:
`# /usr/DynamicLinkManager/bin/dlmchenv -l -v OS-mode`

Please refer to Table for the available OS modes, and their corresponding OS versions and kernel modes.

Appendix B Working with the HiCommand Common Maintenance Command

At the Device Manager server on which the HDLM Web GUI is installed, you can use the HiCommand common maintenance command to perform the following operations:

- Collect HDML Log Files
- Back up the HDLM Web GUI setting files

B.1 Using the Log File Collection Command

- **Format**

When the Device Manager is running on Windows®:

```
Device-Manager-installation-location\Bin\hcmdsgetlogs /dir folder-name [/type application-name] [/arc archive-file-name]
```

- When the Device Manager is running on Solaris™:

```
/opt/HiCommand/Base/bin/hcmdsgetlogs -dir directory-name  
[-type application-name] [-arc archive-file-name]
```

- **Description**

The log file collection command collects log files. Following are the log files that are collected.

When Windows® is installed on the Device Manager server:

```
installation-folder/log/dlmservlet [1-n] .log
```

Note: You can specify the installation folder when installing the HDLM Web GUI.

When Solaris™ is installed on the Device Manager server:

```
/var/opt/DynamicLinkManagerWebGUI/log/dlmservlet [1-n] .log
```

Note: The value *n* depends on the setting in the dlmservlet. properties file. The default is 8.

- **Parameters**

-dir: *directory-name*. Use this parameter to specify the directory name for collecting log files.

-type: *application-name*. Use this parameter to specify the application name for collecting log files. To collect HDLM log files, specify DynamicLinkManager for the application name.

Note: When the application name is not specified, all the Web applications that are registered in HiCommand Common Component are applied.

-arc: *archive-file-name*. Use this parameter to specify the name of the archive file to be created. When the archive file name is not specified, the HiCommand_log is used, and the HiCommand_log.jar is output.

Note: The extension jar is appended to the output archive file name.

- **Returned Value**

- 0: Normal termination
- 1: Parameter error
- 2: Abnormal termination

- **Examples**

Example 1: To collect only the HDLM Web GUI logs in the dlmwebgui_log.jar file.

When the Device Manager server is running on Windows®:

```
>Device-Manager-installation-location\Base\bin\hcmdsgetlogs /dir folder-that-you-specify /type DynamicLinkManager /arc dlmwebgui_log
```

When the Device Manager server is running on Solaris™:

```
# /opt/HiCommand/Base/bin/hcmdsgetlogs -dir directory-that-you-specify -type DynamicLinkManager -arc dlmwebgui_log
```

Example 2: To collect all logs for every HiCommand program product in the default archive file.

When the Device Manager server is running on Windows®:

```
>Device-Manager-installation-location\Base\bin\hcmdsgetlogs /dir folder-that-you-specify
```

When the Device Manager server is running on Solaris™:

```
# /opt/HiCommand/Base/bin/hcmdsgetlogs -dir directory-that-you-specify
```

B.2 Setting the File Backup Command

- **Format**

When the Device Manager server is running on Windows®:

```
Device-Manager-installation-location\Bin\hcmdsbackups /dir folder-name [/type application-name]
```

- When the Device Manager server is running on Solaris™:

```
/opt/HiCommand/Base/bin/hcmdsgetlogs -dir directory-name  
[-type application-name] [-arc archive-file-name]
```

- **Description**

The setting file command backs up the HDLM setting file. Following are the setting files that are backed up.

When Windows® is installed on the Device Manager server:

```
installation-folder/config/dlmservlet.properties
```

Note: You can specify the installation folder when installing the HDLM Web GUI.

When Solaris™ is installed on the Device Manager server:

```
/opt/DynamicLinkManagerWebGUI/config/dlmservlet.properties
```

- **Parameters**

-dir: *directory-name*. Use this parameter to specify the directory name for collecting backup data.

-type: *application-name*. Use this parameter to specify the name of the application that performs the backup. To back up the HDLM log files, specify DynamicLinkManager for the application name.

Note: When the application name is not specified, all the Web applications that are registered in the HiCommand Common Component are applied.

- **Returned Value**

0: Normal termination

1: Parameter error

2: Abnormal termination

- **Examples**

Example 1: To back up only the HDLM Web GUI settings.

When the Device Manager is running on Windows®:

```
>Device-Manager-installation-location\Base\bin\hcmdsbackups /dir folder-that-you-specify /type DynamicLinkManager
```

When the Device Manager is running on Solaris™:

```
# /opt/HiCommand/Base/Bin/hcmdsbackups -dir directory-that-you-specify -type DynamicLinkManager
```

Example 2: To back up all setting files for every HiCommand program product.

When the Device Manager is running on Windows®:

```
Device-Manager-installation-location/Base/Bin/hcmdsbackups /dir directory-that-you-specify
```

When the Device Manager is running on Solaris™:

```
>Device-Manager-installation-location\Base\bin\hcmdsbackups /dir folder-that-you-specify
```

B.3 Restoring The Setting Files Collected By Using The Setting File Backup Command

■ Format

The setting files for HDLM Web GUI collected by using the setting file backup command are stored in the following folder or directory:

When the Device Manager server is running on Windows®:
folder-specified-in-the-/dir-parameter/DynamicLinkManager

When the Device Manager server is running on Solaris™:
directory-specified-in-the-/dir-parameter/DynamicLinkManager

■ Procedure

The following explains the procedure for restoring the setting files for HDLM Web GUI collected by using the setting file backup command. When you restore the setting files for HiCommand products other than HDLM Web GUI, see the manual for each product.

To restore the setting files for HDLM Web GUI collected by using the setting file backup command:

1. Copy the setting file that was backed up to the following directory:

When the Device Manager server is running on Windows®:
installation-folder\config

When the Device Manager server is running on Solaris:
/opt/DynamicLinkManagerWebGUI/config

The following execution example shows that the setting file is restored when the Device Manager server is running on Solaris:

```
# cp /dir/DynamicLinkManager/dlmservlet.properties /opt/DynamicLinkManagerWebGUI/config
```

2. Restart the HiCommand Suite Single Sign On service.

Acronyms and Abbreviations

AL	arbitrated loop
API	application program interface
CCI	Command Control Interface (also called RAID Manager)
Cha, CHA	channel adapter
CL	cluster
CLPR	Cache Logical Partition
CS	cluster support
CSV	comma-separated value
FC	fibre channel
FD	floppy disk
FO	failover
GB	gigabyte (1 GB = 1024 MB)
GUI	graphical user interface
HACMP	High Availability Cluster Multi-Processing
HBA	host bus adapter
HDev	host device
HDLM	Hitachi Dynamic Link Manager
HDLM GUI	Window application GUI
HDLM Web GUI	Web browser GUI
HLU	host LU
HMDE	Hitachi Multiplatform Data Exchange (also called HRX)
HRX	Hitachi RapidXchange (also called HMDE)
I/F	interface
JRE	Java™ Runtime Environment
KB, kB	kilobyte (1 kB = 1024 bytes)
LDEV	logical device
LU	logical unit
LUN	logical unit number
MB	megabyte (1 MB = 1024 kB)
MSCS	A cluster service contained in Microsoft® Windows NT® Server, Enterprise Edition Version 4.0; Microsoft® Windows® 2000 Advanced Server Operating System; Microsoft® Windows® 2000 Datacenter Server Operating System; Microsoft® Windows Server™ 2003, Enterprise Edition; Microsoft® Windows Server™ 2003, Datacenter Edition.
ODM	Object Data Manager
OPEN-x	standard LU type, e.g., OPEN-3, OPEN-9
OS	operating system

RAC	Real Application Clusters
SAN	storage-area network
SCSI	small computer system interface
SLPR	Storage Logical Partition
SMIT	System Management Interface Tool
TB	terabyte (1 TB = 1024 GB)
TID	target ID
VCS	VERITAS Cluster Server™
Windows NT	A generic term for: Microsoft® Windows NT® Workstation Operating System, Version 4.0; Microsoft® Windows NT® Server Network Operating System, Version 4.0; Microsoft® Windows NT® Server, Enterprise Edition Version 4.0; Microsoft® Windows NT® Server, Version 4.0, Terminal Server Edition; Microsoft® BackOffice® Small Business Server, Version 4.0.
Windows Server 2003	A generic term for: Microsoft® Windows Server™ 2003, Standard Edition; Microsoft® Windows Server™ 2003, Enterprise Edition; Microsoft® Windows Server™ 2003, Datacenter Edition; Microsoft® Windows Server™ 2003, Web Edition.
Windows XP	Microsoft® Windows® XP Operating System