

Hitachi Dynamic Link Manager (for Solaris) 8.7.6-03 Release Notes

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About this document

This document (RN-00HS273-59, May 2021) provides late-breaking information about Hitachi Dynamic Link Manager for Solaris 8.7.6-03. It includes information that was not available at the time the technical documentation for this product was published, as well as a list of known problems and solutions.

Intended audience

This document is intended for customers and Hitachi Vantara partners who license and use Hitachi Dynamic Link Manager (for Solaris).

Getting help

Hitachi Vantara Support Connect is the destination for technical support of products and solutions sold by Hitachi Vantara. To contact technical support, log on to Hitachi Vantara Support Connect for contact information:

https://support.hitachivantara.com/en_us/contact-us.html.

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

Accessing product downloads

Product software, drivers, and firmware downloads are available on Hitachi Vantara Support Connect: <https://support.hitachivantara.com/>.

Log in and select Product Downloads to access the most current downloads, including important updates that may have been made after the release of the product.

About this release

This release is a major release that adds new features and resolves multiple known problems.

Product package contents

Medium	CD-ROM	Revision	Release Type
Software	Hitachi Dynamic Link Manager (for Solaris) User Guide	8.7.6-03	Full Package

New features and important enhancements

8.7.6-03 Additional Functions and Modifications

None.

8.7.6-02 Additional Functions and Modifications

None.

8.7.6-00 Additional Functions and Modifications

- The deletion of paths in the Offline(C) status by the delete -path command is now supported.
- Configuration changes in a SAN boot environment are now supported.
- Hitachi Virtual Storage Platform E590 and E790 are now supported.

System requirements

Refer to Chapter 3. Creating an HDLM Environment of the Hitachi Dynamic Link Manager (for Solaris) User Guide.

Host

For details on supported hosts, refer to the following manual:

- Hitachi Dynamic Link Manager (for Solaris) User Guide Chapter 3. Creating an HDLM Environment - HDLM System Requirements - Hosts and OSs Supported by HDLM.

Host Bus Adapter (HBA)

For information on supported HBAs and drivers, refer to Appendix A - Host Bus Adapter (HBA) Support Matrix.

Storage

For details on supported storage systems, refer to the following manual:

- Hitachi Dynamic Link Manager (for Solaris) User Guide Chapter 3. Creating an HDLM Environment - HDLM System Requirements - Storage Systems Supported by HDLM

When the Dynamic I/O Path Control function is enabled on Hitachi AMS 2000 series, use a microprogram version 08B8/D or later.

Requirements to use a HAM environment are as follows:

- HDLM supports the HAM functionality of the following storage system:
- Hitachi Universal Storage Platform V/VM
- Hitachi Virtual Storage Platform
- HPE XP24000/XP20000
- HPE P9500
- Hitachi Unified Storage VM

The required microprogram versions are listed below:

Storage system	Interface	Microprogram version	Remark
Universal Storage Platform V/VM	FC I/F	60-06-10-XX/XX or later	X: voluntary number
Virtual Storage Platform	FC I/F	70-01-42-XX/XX or later (*1)	X: voluntary number
XP24000/XP20000	FC I/F	60-06-10-XX/XX or later	X: voluntary number
P9500	FC I/F	70-01-42-XX/XX or later (*1)	X: voluntary number
Hitachi Unified Storage VM	FC I/F	73-03-0X-XX/XX or later	X: voluntary number

*1: If you use the HAM functionality with USP V or XP24000, apply 70-03-00-XX/XX or later.

- When using HAM in a Solaris environment, set up a Host Mode Option 48. For details, see "Preventing Unnecessary Failover" in High Availability Manager User's Guide.

Operating system requirements

For details on supported operating system, refer to the following manual:

- Hitachi Dynamic Link Manager (for Solaris) User Guide Chapter 3. Creating an HDLM Environment - HDLM System Requirements - Hosts and OSs Supported by HDLM

- When using HAM in a Solaris environment, HDLM supports only Solaris 10.

The versions of JDK listed below are now supported.

To link with Global Link Manager, make sure that one of the following JDK Solaris packages is already installed on the host.

-JDK 8.0 (64-bit edition)

Prerequisite programs

[8.7.6-03 Modifications]

The following problem has been corrected:

If HDLM for Solaris is used to configure the device for controller number c10, the creation of the OS device fails.

[8.7.6-02 Modifications]

The following problem has been corrected:

(1) In HDLM for Solaris, if dynamic reconfiguration is performed during GAD configuration, the `dlnmcmgr` utility or the `dlnkmgr add` command might not end.

(2) In HDLM 8.7.6-00, when a volume of VSP G1500, VSP F1500, VSP F400, F600, or F800 is virtualized as a volume of a different storage system model, an incorrect model ID might be displayed for the physical volume that corresponds to the virtual volume.

- For VSP G1500, "VSP_G1000" might be displayed instead of "VSP_G1500".

- For VSP F1500, "VSP_G1000" might be displayed instead of "VSP_F1500".

- For VSP F400, F600, or F800, "VSP_Gx00" might be displayed instead of "VSP_Fx00".

[8.7.6-00 Modifications]

None.

Related Programs

For details on related programs, refer to the following manual:

- Hitachi Dynamic Link Manager (for Solaris) User Guide Chapter 3. Creating an HDLM Environment - HDLM System Requirements - Cluster Software Supported by HDLM, Volume Manager Supported by HDLM, and Combinations of Cluster Software and Volume Managers Supported by HDLM

The following tables list the number of LUs and number of paths supported by HDLM, and the supported configuration.

This table lists the supported number of LUs and number of paths in a configuration where cluster software and virtualization software are not used:

OS	Number of LUs	Total number of paths	Supported configuration
Solaris10	4096LUs	8192paths	Boot disk environment
Solaris11			

This table lists the number of LUs supported and number of paths supported in a configuration where cluster software and virtualization software are used:

OS	Number of LUs	Total number of paths	Supported configuration
Solaris10	4096LUs	8192paths	- Configurations using VCS cluster software - Configurations using Oracle VM Server for SPARC#1
	256LUs	4096paths	- Configurations using cluster software other than VCS - Configurations using virtualization software other

			than Oracle VM Server for SPARC
Solaris11	256LUs	4096paths	- Configurations using cluster software - Configurations using virtualization software

#1: The system limits the number of LUs that can be exported from control domains to guest domains.

Memory and disk space requirements

For details on memory and disk capacity requirements, refer to the following manual:

- Hitachi Dynamic Link Manager (for Solaris) User Guide Chapter 3. Creating an HDLM Environment - HDLM System Requirements - Memory and disk capacity requirements

HDLM Supported Configurations

For details on the condition that HDLM can manage capacity requirements, refer to the following manual:

- Hitachi Dynamic Link Manager (for Solaris) User Guide Chapter 3. Creating an HDLM Environment - HDLM System Requirements - The Number of Paths Supported in HDLM

Resolved problems

[8.7.0-02 Modifications]

The following problem has been corrected:

(1) In HDLM for Solaris, if dynamic reconfiguration is performed during GAD configuration, the `dlmcfmgr` utility or the `dlnmgr add` command might not end.

(2) In HDLM 8.7.6-00, when a volume of VSP G1500, VSP F1500, VSP F400, F600, or F800 is virtualized as a volume of a different storage system model, an incorrect model ID might be displayed for the physical volume that corresponds to the virtual volume.

- For VSP G1500, "VSP_G1000" might be displayed instead of "VSP_G1500".

- For VSP F1500, "VSP_G1000" might be displayed instead of "VSP_F1500".

- For VSP F400, F600, or F800, "VSP_Gx00" might be displayed instead of "VSP_Fx00".

Known problems

- During a license update, if there is an error in the already installed license information, the messages below (which indicate a problem with the license key file) might be displayed even when you are using a correct license key file. If these messages are displayed and there is no problem in the license key file being used, execute the utility for collecting HDLM error information (DLMgetras) to acquire error information, and contact your HDLM vendor or the maintenance company if there is a maintenance contract for HDLM.

KAPL09113-E There is no installable license key in the license key file. File name = /var/tmp/hdlm_license

KAPL01082-E There is no installable license key in the license key file. File name = /var/tmp/hdlm_license

- About operation when all paths are disconnected during intermittent error monitoring:

When I/Os are performed continuously for an LU whose paths are all Offline(E), Online(E), or Offline(C) (because, for example, all paths have been disconnected), the number of times that an error occurs (the IEP value when "dlnkgr view -path -iem" is executed) during intermittent error monitoring might increase even though the automatic failback function did not recover all paths. In such a case, even though an intermittent error did not occur, HDLM often assumes an intermittent error, and excludes paths from the automatic failback function. In such a case, after recovery from the failure, to change the status of a path excluded from automatic failback to online, manually change the status to online.

- When installing HDLM to the Solaris server, the installation is terminated and the following messages are output if a user named "install" is defined in the /etc/passwd file. When installing HDLM to the Solaris server, make sure that there is no user named "install" defined in the /etc/passwd file.

When performing installation of HDLM, the following messages are output:

- When Solaris 8 is used and EZ Fibre 2.2.2 is installed:

```
showrev: get_env_var(IS8e8546a, SUNW_PATCHID)
```

```
:
```

```
KAPL09133-E The following patch(es) required for HDLM has not been applied:
```

- When Solaris 8 is used and EZ Fibre 2.2.2 is not installed, or Solaris 9 or Solaris 10 is used:

mkdir: Failed to make directory "/var/opt/DynamicLinkManager"; Permission denied

mkdir: Failed to make directory "/var/opt/DynamicLinkManager/log"; No such file or directory

KAPL09091-E A fatal error occurred in HDLM. The system environment is invalid.

There are some notes as follows on an SVM shared diskset function in the configuration where HBA driver other than that of Oracle (other than qlc or emlxs driver) is used in Solaris 10 environment:

- When Solaris Cluster is used:

If an HDLM management-target device is used in SVM shared diskset function, use Solaris Cluster device ID (the logical device file under /dev/did/dsk). The HDLM logical device file name cannot be used in SVM shared diskset function.

- When Solaris Cluster is not used:

An HDLM management-target device cannot be used in SVM shared diskset function.

- If I/O Fencing function is used and any of the following operations is performed, the following pattern messages may be output to a console and syslog. Ignore these messages:
 - Online VCS disk group resource, or import a disk group of VxVM.
 - Execute vxfcntlsthaw command without specifying -r option.
 - Issue I/O after removing a registration key or a reservation key from a disk by vxfenadm command.

scsi: [ID 107833 kern.warning] WARNING:

/pci@1f,2000/SUNW,emlxs@1/fp@0,0/ssd@w50060e8005271760,6 (ssd40):

Error for Command: read(10) Error Level: Retryable

scsi: [ID 107833 kern.notice] Requested Block: 304 Error Block: 304

scsi: [ID 107833 kern.notice] Vendor: HITACHI Serial Number: 50 02717006B

scsi: [ID 107833 kern.notice] Sense Key: Unit Attention

scsi: [ID 107833 kern.notice] ASC: 0x2a (registrations preempted), ASCQ: 0x5, FRU: 0x0

- Notes for executing DLMgetras utility

If you specify a directory under an NFS mount point as an output destination and then execute DLMgetras utility, an empty directory named "DLMgetras_tmpdir.xxxx/the_specified_directory_name" may be created for the output destination directory ("xxx" is an optional numeric value).

When the empty directory exists after executing DLMgetras utility, delete the directory.

The dynamic LU deletion function cannot be used in a configuration that uses Solaris Cluster.

- Notes on environments in which SCSI-2 Reserve is issued:

In an environment in which SCSI-2 Reserve is issued, if the path status is changed and owner and non-owner paths are switched, an I/O is issued to a non-owner path even though the status of the owner path is Online. By performing Offline processing, an I/O for an owner path can be issued to a non-owner path.

Closing known problems

When a volume of VSP G1500, VSP F1500, VSP F400, F600, or F800 is virtualized as a volume of a different storage system model, an incorrect model ID might be displayed for the physical volume that corresponds to the virtual volume.

- For VSP G1500, "VSP_G1000" might be displayed instead of "VSP_G1500".
- For VSP F1500, "VSP_G1000" might be displayed instead of "VSP_F1500".
- For VSP F400, F600, or F800, "VSP_Gx00" might be displayed instead of "VSP_Fx00".

The model ID of a physical volume is displayed by the following operations:

Function	Operation	Displayed item
HDLM Command (dlnkmgr)	dlnkmgr view -path -item phys -vstv	Physical-LDEV
	dlnkmgr view -lu -item phys -vstv	
	dlnkmgr view -path -stname -pstv	DskName
	dlnkmgr view -lu -pstv	Product
HGLM	Displaying the Paths tabbed-page in the host-name subwindow	Storage

	Displaying the Multipath LUs tabbed-page in the host-name subwindow	system name of Physical Information
	Displaying the Storage systems subwindow (physical storage information)	Name

Installation precautions

For details on HDLM installation, refer to the following:

- "Installing HDLM" in "Chapter 3. Creating an HDLM Environment" in the manual Hitachi Dynamic Link Manager (for Solaris) User Guide

Usage precautions

For details on usage precautions when using HDLM, refer to the following:

- "Notes on Creating an HDLM Environment" in "Chapter 3. Creating an HDLM Environment" in the manual Hitachi Dynamic Link Manager (for Solaris) User Guide
- "Notes on Using the Hitachi Network Objectplaza Trace Library" in "Setting up Integrated Traces" in "Chapter 3. Creating an HDLM Environment" in the manual Hitachi Dynamic Link Manager (for Solaris) User Guide
- "Notes on Using HDLM" in "Chapter 4. HDLM Operation" in the manual Hitachi Dynamic Link Manager (for Solaris) User Guide
- "Notes on Using Commands" in "HDLM Operations Using Commands" in "Chapter 4. HDLM Operation" in the manual Hitachi Dynamic Link Manager (for Solaris) User Guide
- "Precautions Regarding Changes to the Configuration of an HDLM Operating Environment" in "Changing the Configuration of the HDLM Operating Environment" in "Chapter 4. HDLM Operation" in the manual Hitachi Dynamic Link Manager (for Solaris) User Guide

Additional Usage Precautions

If you use Oracle RAC 12c, specify the following settings so that the sum of the HBA timeout values is 70 or less. After setting the parameter, restart the host.

- Add the following line to the /kernel/drv/fp.conf file:

```
fp_offline_ticker=<timeout-value-of-the-fp-driver>;
```

Example of the setting:

```
fp_offline_ticker=50;
```

- Add the following line to the /kernel/drv/fcp.conf file:

```
fcp_offline_delay=<timeout-value-of-the-fcp-driver>;
```

Example of the setting:

```
fcp_offline_delay=20;
```

Verified Boot, supported by Solaris 11.2, is not supported. If you enable Verified Boot, when loading the HDLM driver, the system will output a Warning message or the HDLM driver will fail to load. Do not enable Verified Boot.

Configurations that use boot pools supported by Solaris 11.3 are not supported in boot disk environments where HDLM devices are used.

Version numbers are displayed as follows after this version of HDLM is installed.

Function	Item	Version number
HDLM command (dlnkmgr)	HDLM Version	8.7.6-03
	HDLM Manager	8.7.6-03
	HDLM Alert Driver	8.7.6-03
	HDLM Driver	8.7.6-03
"pkginfo -l" command (Solaris 10 or earlier)	HDLM Version	08.7.6.0003
"pkg info" command (Solaris 11)	HDLM Version	8.7.6.3

The following example shows the text displayed when `dlnkmgr view -sys` is executed.

```
# /opt/DynamicLinkManager/bin/dlnkmgr view -sys
```

```
HDLM Version          : 8.7.6-03
```

```
Service Pack Version  :
```

```
Load Balance          : on(extended lio)
```

```
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
```

```
Intermittent Error Monitor : off
```

```
Dynamic I/O Path Control : off(10)
```

```
HDLM Manager Ver      WakeupTime
```

```
Alive      8.7.6-03 2021/04/26 15:53:29
```

```
HDLM Alert Driver Ver  WakeupTime      ElogMem Size
```

```
Alive      8.7.6-03 2021/04/26 15:53:24 4096
```

```
HDLM Driver Ver       WakeupTime
```

```
Alive      8.7.6-03 2021/04/26 15:53:24
```

```
License Type Expiration
```

```
Permanent -
```

```
KAPL01001-I The HDLM command completed normally. Operation name = view,  
completion time = 2021/04/26 15:54:12
```

And the following example shows the displayed text when pkginfo command is executed for Solaris 10 or earlier.

```
# pkginfo -l

PKGINST: DLManager

  NAME: Dynamic Link Manager

CATEGORY: system

  ARCH: sparc

VERSION: 08.7.6.0003

BASEDIR: /

VENDOR:

... ..
```

The following example shows the displayed text when pkg info command is executed for Solaris 11.

```
# pkg info DLManager

Name: DLManager

Summary: Dynamic Link Manager

State: Installed

Publisher: Hitachi

Version: 8.7.6.3

Build Release: 5.11

Branch: 0

Packaging Date: Mon Apr 26 07:20:24 2021

Size: 23.24 MB

FMRI: pkg://Hitachi/DLManager@8.7.6.3,5.11-0:20210426T072024Z
```

The default value of load balancing algorithm

- In HDLM 8.7.6-03, the load balancing function is on and algorithm is Extended Least I/Os.

If an upgrade installation of HDLM is not performed during the upgrade of Solaris 11.3 to Solaris 11.4, when the OS starts, the HDLM device will not be correctly configured. In such cases, the following pattern messages are output to a console and syslog, indicating that a problem has occurred.

```
/kernel/drv/sparcv9/dlmdrv: use of symbol '_depends_on[]' is deprecated: "misc/scsi"
```

```
devfsadm: dlopen failed: /usr/lib/devfsadm/linkmod/HIT_hdlm_link.so: ld.so.1: devfsadm: /usr/lib/devfsadm/linkmod/HIT_hdlm_link.so: wrong ELF class: ELFCLASS32
```

When this problem occurs, the HDLM device might have been configured with an incorrect name, in which case the HDLM device name output by the `dlnmgr view` command differs from the HDLM device name output by the `format` command. Even if the HDLM device names output by the `dlnmgr view` command and the `format` command are the same, this does not indicate that the HDLM device is correctly configured.

To resolve this problem, reboot the OS in the boot environment of Solaris 11.3, and then refer to Performing an upgrade installation of HDLM when upgrading from Solaris 11.3 to Solaris 11.4 in the Hitachi Command Suite Dynamic Link Manager (for Solaris) User Guide (MK-92DLM114-44).

Because you will need to perform the upgrade of Solaris again, be sure to first perform the procedure described in Note in (2) Upgrade installation of HDLM in the User Guide.

If a boot disk is created in an environment where an HDLM physical device is specified, an attempt to perform an installation or upgrade installation of OS packages, or to activate the boot environment (BE) will fail.

Migrate the boot device from a physical device to a logical device.

For details, see "Migrating from an environment where a physical device is specified, to an environment where a logical device is specified" in the Hitachi Command Suite Dynamic Link Manager (for Solaris) User Guide (MK-92DLM114-49), or the SD-EN-HDLM-234 documentation.

If an upgrade installation of HDLM 8.6.5 or later is performed in a SAN boot environment, and then the SAN boot environment is configured in a problematic configuration, the following messages might be output to the syslog. For details on the messages, see "Messages" in the User Guide.

KAPL13296-E The boot disk environment was configured on a physical device. Refer to the HDLM User's Guide and migrate the boot disk environment to a logical device.

KAPL13297-E The boot disk environment was not configured according to the correct procedures. Refer to the HDLM User's Guide and reconfigure the boot disk environment.

KAPL13298-E The boot disk is not managed by HDLM. To use the boot disk as a SCSI device (single path) as is, remove the boot disk from the HDLM management targets. To configure the boot disk on an HDLM device (multipath), refer to the HDLM User's Guide and reconfigure the boot disk environment.

In a SAN boot environment, the configuration of paths cannot be changed (paths cannot be added or deleted) for the boot disk.

Execution time of the dlmcfmgr utility

The execution time of the dlmcfmgr utility depends on the number of LUs and paths that are already configured.

This table lists the approximate execution time using the following environment as an example:

Number of LUs that are already configured	Execution time of dlmcfmgr (*1)
512 LUs	5 minutes
1024 LUs	10 minutes
2048 LUs	20 minutes
4096 LUs	40 minutes

*1: The execution time differs depending on the performance and load of the server.

This table lists the execution time to be measured in the following environment:

Item	Details
Server name	SPARC T5-2
CPU	16-core 3.6GHz SPARC T5 processor (2 CPU)
Memory	256 GB

The effect of uninstalling JDK

- If the KAPL09142-E message is output with the ErrorCode=31,2 during uninstallation or re-installation of HDLM, perform the following operations.

Then, if the result of the ls command is "No such file or directory", install JDK, and then uninstall or re-install HDLM.

```
#cat /opt/HDVM/HBaseAgent/agent/config/server.properties | grep JRE
```

```
server.agent.JRE.location=<JDK-installation-destination-directory>
```

```
#ls -l <JDK-installation-destination-directory>
```

<JDK-installation-destination-directory>: No such file or directory If the result of the ls command is "No such file or directory", JDK is not installed.

Notes on HAM environments

- HAM does not support cluster software.

- In the case of displaying the LU information, the HAM information is not output by specifying the "all" parameter-value for the HDLM command. Specify the "ha" and "hastat" parameter-value instead of it.

- An online operation is performed on an owner path, a non-owner path's status may change to Offline(E). After performing an online operation on an owner path, use the HDLM command to make sure that the non-owner path's status is Online. If the non-owner path's status is Offline(E), change the status of HAM pairs to PAIR, and then perform an online operation on the Offline(E) path again.

- When you set up a HAM pair to be managed by HDLM, make sure that the host recognizes paths to the MCU (Primary VOL) and RCU (Secondary VOL) after the HAM pair is created.

Execute the `dlmkmgr view -lu -item hastat` operation. If `ha` is not displayed in the `HaStat` column, then the corresponding LU is not recognized as being in a HAM configuration.

If the host recognizes the paths to the MCU and RCU before the HAM pair is created, restart the host after the HAM pair is created. Execute the `dlmsetconf` utility after the HAM pair is created, and then restart the host with the reconfiguration option specified.

- If you release a HAM pair to recover the system after a HAM volume failure, do not restart a host that is connected to the MCU and RCU while the HAM pair is released.

If you need to restart the host while the HAM pair is released, disconnect all paths to the MCU and RCU, restart the host, re-create the HAM pair, and then reconnect the paths.

If you restart a host that is connected to the MCU and RCU while the HAM pair is released, the RCU volume will be recognized as a volume other than an MCU volume. If this occurs, restart the host after the HAM pair is re-created.

Execute the `dlkmgr view -lu -item hastat` operation, and then confirm that `ha` is displayed in the `HaStat` column.

- When HDLM installed and operated, the server must have 2GiB or more physical memory.

- When a HAM environment, if HDLM is configured, a HAM pair is released, and then the system is restarted, the path status of the S-VOL will change to `Offline(E)`.

If you want to continue using the LUs that made up the HAM pair, reconfigure the HAM pair, and then execute the `online` command to change the S-VOL status to `Online`.

If you do not want to continue using the LUs that made up the HAM pair, execute the `dlnmsetconf` command, and then restart the affected host.

- Follow the `Installing Software` section in the `High Availability Manager User's Guide` to install HDLM. For this procedure, use the `HDLM User's Guide` up to the section `Make sure that the logical device file of the sd or ssd device is backed up`. Also, make sure that the host OS (Solaris) can recognize the HAM pair before executing the `dlnmsetconf` utility (explained in the following section):

After the host OS recognizes the HAM pair, follow the section that starts with executing the `dlnmsetconf` utility.

- If all of the following conditions are met and the `dlkmgr online -hapath` command is executed, a path status will change to `Online(S)`, instead of `Online`:

- The status of the HAM P-VOL is `PSUS`.

- The status of the HAM S-VOL is `SSWS`.

- The path statuses are `Online(S)`, and a physical failure is recovered from.

- If you execute the `-zpool import` command to collect information about disks that can be imported into a ZFS file system, the secondary volume (S-VOL) in the HAM environment might enter the `Offline(E)` or the `Online(E)` status. In addition, if you mistakenly use a command such as the `dd` command or the `mount` command to assign a slice that has no allocated area, the secondary volume (S-VOL) in the HAM environment might enter the `Offline(E)` or the `Online(E)` status. If either of the above problems occurs, execute the `dlkmgr online` command to restore the path status to `Online`. If the primary volume (P-VOL) is suspended, I/O is processed even if the path is not restored to the `Online` status. However, if you continue operation in such conditions, the system cannot operate as a multipath environment.

Documentation

Available documents

Document name	Document number	Issue date
Hitachi Dynamic Link Manager (for Solaris) User Guide	MK-92DLM114-50	February, 2021

Documentation errata

Location to be corrected	Corrections	
Hitachi Dynamic Link Manager (for Solaris) User Guide Creating an HDLM environment Performing a new installation of HDLM	Before	<p>To perform a new installation of HDLM:</p> <p>1. When the license key file has been provided, store the license key file directly under the <code>/var/tmp/</code> directory by using the <code>hdlm_license</code> name.</p> <p><code>/var/tmp/hdlm_license</code></p> <p>If the <code>/var/tmp/hdlm_license</code> file does not exist, you will be required to enter a license key in step 8.</p> <p>Notes</p> <ul style="list-style-type: none">- The license key file can be saved as a user-specified directory or a file name. However, this license key file is not deleted after installation. <p>Delete this file manually after installation is completed if it is not necessary.</p>
	After	<p>To perform a new installation of HDLM:</p>

		<p>1. When the license key file has been provided, store the license key file directly under the <code>/var/tmp/</code> directory by using the <code>hdlm_license</code> name.</p> <p><code>/var/tmp/hdlm_license</code></p> <p>If the <code>/var/tmp/hdlm_license</code> file does not exist, you will be required to enter a license key in step 8.</p> <p>Notes</p> <ul style="list-style-type: none"> - The license is provided via a license key or license key file. Do not edit the provided license key file. <p>The license key file will not be valid even if the user stores the provided license key in a license key file.</p> <ul style="list-style-type: none"> - The license key file can be saved as a user-specified directory or a file name. However, this license key file is not deleted after installation. <p>Delete this file manually after installation is completed if it is not necessary.</p>
<p>Hitachi Dynamic Link Manager (for Solaris) User Guide</p> <p>Creating an HDLM environment</p> <p>Performing a new installation of HDLM</p>	<p>Before</p>	<p>3. For Solaris 11.4, disable the Solaris multipathing software MPxIO. When you perform a new installation of Solaris 11.4, the Solaris multipathing software MPxIO is enabled. In this state, devices to be managed by HDLM cannot be detected. For this reason, before you install HDLM, be sure to execute the following command to disable the Solaris multipathing software MPxIO on the devices to be managed by HDLM that connect Hitachi storage systems to hosts by using Fibre Channel connections.</p>

		<p>The following is an example of using the stmsboot command to disable the Solaris multipathing software MPxIO on the devices that use Fibre Channel connections.</p> <pre># stmsboot -D fp -d</pre>
	<p>After</p>	<p>3. For Solaris 11.4, disable the Solaris multipathing software MPxIO. When you perform a new installation of Solaris 11.4, the Solaris multipathing software MPxIO is enabled. In this state, devices to be managed by HDLM cannot be detected. For this reason, before you install HDLM, be sure to execute the following command to disable the Solaris multipathing software MPxIO on the devices to be managed by HDLM that connect Hitachi storage systems to hosts by using Fibre Channel connections.</p> <p>The following is an example of using the stmsboot command to disable the Solaris multipathing software MPxIO on the devices that use Fibre Channel connections.</p> <p>Execute the stmsboot command to disable the Solaris multipathing software MPxIO. The stmsboot command requires a reboot.</p> <p>The following is an example of executing the stmsboot command:</p> <pre># stmsboot -D fp -d</pre> <p>WARNING: This operation will require a reboot.</p> <p>Do you want to continue ? [y/n] (default: y) y</p>

		<p>The changes will come into effect after rebooting the system.</p> <p>Reboot the system now ? [y/n] (default: y) y</p>
<p>Hitachi Dynamic Link Manager (for Solaris) User Guide</p> <p>Creating an HDLM environment</p>	<p>Before</p>	<p>To perform a new installation of HDLM:</p> <p>1. When the license key file has been provided, store the license key file directly under the /var/tmp/ directory by using the hdlm_license name.</p> <p>/var/tmp/hdlm_license</p> <p>If the /var/tmp/hdlm_license file does not exist, you will be required to enter a license key in step 14.</p> <p>Notes</p> <ul style="list-style-type: none"> - The license key file can be saved as a user-specified directory or a file name. However, this license key file is not deleted after installation. <p>Delete this file manually after installation is completed if it is not necessary.</p> <ul style="list-style-type: none"> - Available characters for the absolute path of the license key file are as follows: <p>Upper case and lower case characters, numbers, and some special characters (/ , ! , # , + , - , . , = , @ , _ , ~)</p>
<p>Performing a new installation of HDLM (when Solaris Cluster is being used)</p>	<p>After</p>	<p>To perform a new installation of HDLM:</p> <p>1. When the license key file has been provided, store the license key file directly under the /var/tmp/ directory by using the hdlm_license name.</p> <p>/var/tmp/hdlm_license</p> <p>If the /var/tmp/hdlm_license file does not exist, you will be required to enter a license key in step 14.</p> <p>Notes</p> <ul style="list-style-type: none"> - The license is provided via a license key or license key file. Do not edit the provided license key file. <p>The license key file will not be valid even if the user stores the provided license key in a license key file.</p> <ul style="list-style-type: none"> - The license key file can be saved as a user-specified directory or a file name. However, this license key file is not deleted after installation. <p>Delete this file manually after installation is completed if it is not</p>

		<p>necessary.</p> <p>- Available characters for the absolute path of the license key file are as follows:</p> <p>Upper case and lower case characters, numbers, and some special characters (/, !, #, +, -, ., =, @, _, ~)</p>
<p>Hitachi Dynamic Link Manager (for Solaris) User Guide</p> <p>Creating an HDLM environment</p> <p>Performing a new installation of HDLM (when Solaris Cluster is being used)</p>	Before	<p>3. For Solaris 11.4, disable the Solaris multipathing software MPxIO. When you perform a new installation of Solaris 11.4, the Solaris multipathing software MPxIO is enabled. In this state, devices to be managed by HDLM cannot be detected. For this reason, before you install HDLM, be sure to execute the following command to disable the Solaris multipathing software MPxIO on the devices to be managed by HDLM that connect Hitachi storage systems to hosts by using Fibre Channel connections.</p> <p>The following is an example of using the stmsboot command to disable the Solaris multipathing software MPxIO on the devices that use Fibre Channel connections.</p> <pre># stmsboot -D fp -d</pre>
	After	<p>3. For Solaris 11.4, disable the Solaris multipathing software MPxIO. When you perform a new installation of Solaris 11.4, the Solaris multipathing software MPxIO is enabled. In this state, devices to be managed by HDLM cannot be detected. For this reason, before you install HDLM, be sure to execute the following command to disable the Solaris multipathing software MPxIO on the devices to be managed by HDLM that connect Hitachi storage systems to hosts by using Fibre Channel connections. The following is an example of using the stmsboot command to disable the</p>

		<p>Solaris multipathing software MPxIO on the devices that use Fibre Channel connections.</p> <p>Execute the stmsboot command to disable the Solaris multipathing software MPxIO. The stmsboot command requires a reboot.</p> <p>The following is an example of executing the stmsboot command:</p> <pre># stmsboot -D fp -d</pre> <p>WARNING: This operation will require a reboot.</p> <p>Do you want to continue ? [y/n] (default: y) y</p> <p>The changes will come into effect after rebooting the system.</p> <p>Reboot the system now ? [y/n] (default: y) y</p>
<p>Hitachi Dynamic Link Manager (for Solaris) User Guide</p> <p>Creating an HDLM environment</p> <p>Performing an upgrade installation or re-installation of HDLM</p>	<p>Before</p>	<p>1. When the license key file has been provided, Store the license key file directly under the /var/tmp/ directory by using the hdlm_license name.</p> <pre>/var/tmp/hdlm_license</pre> <p>If the license needs to be upgraded and the /var/tmp/hdlm_license file does not exist, you will be required to enter a license key in step 5.</p> <p>Notes</p> <ul style="list-style-type: none"> - The license key file can be saved as a user-specified directory or a file name. However, this license key file is not deleted after installation. Delete this file manually after installation is completed if it is not necessary. - Available characters for the absolute path of the license key file are as follows: <p>Upper case and lower case characters, numbers, and some special characters (/, !, #, +, -, ., =, @, _, ~)</p>
	<p>After</p>	<p>1. When the license key file has been provided, Store the license key file</p>

		<p>directly under the /var/tmp/ directory by using the hdlm_license name.</p> <p>/var/tmp/hdlm_license</p> <p>If the license needs to be upgraded and the /var/tmp/hdlm_license file does not exist, you will be required to enter a license key in step 5.</p> <p>Notes</p> <ul style="list-style-type: none"> - The license is provided via a license key or license key file. Do not edit the provided license key file. <p>The license key file will not be valid even if the user stores the provided license key in a license key file.</p> <ul style="list-style-type: none"> - The license key file can be saved as a user-specified directory or a file name. However, this license key file is not deleted after installation. <p>Delete this file manually after installation is completed if it is not necessary.</p> <ul style="list-style-type: none"> - Available characters for the absolute path of the license key file are as follows: <p>Upper case and lower case characters, numbers, and some special characters (/, !, #, +, -, ., =, @, _, ~)</p>
<p>Hitachi Dynamic Link Manager (for Solaris) User Guide Command reference</p> <p>set (sets up the operating environment) Parameters</p>	<p>Before</p>	<p>-lic</p> <p>Specify this option for when a license is updated. The HDLM license is provided via a license key or license key file. A license key file is a file that stores the HDLM license key</p> <p>If you use a license key file:</p> <p>Store the license key file named hdlm_license directly under /var/tmp, and then execute the set -lic operation.</p>
<p>To set up the HDLM operating environment</p>	<p>After</p>	<p>-lic</p> <p>Specify this option for when a license is updated. The HDLM license is provided via a license key or license key file. A license key file is a file that stores the HDLM license</p> <p>If you use a license key file:</p> <p>Store the license key file named hdlm_license directly under /var/tmp, and then execute the set -lic operation.</p>

Appendix A

HBA Driver Support Matrix

Use the HBA drivers listed below. When HDLM manages the path of a boot disk, use HBA driver indicated by [bootable].

Note the following points in constitution or setting of HBA.

- When using two or more HBA adapters in one server, use the same type of HBA adapter.
- When using a cluster system or an SDS (SVM) shared diskset function, use the same type of adapter in all the nodes. If you combine different types of HBA, HDLM may not be able to switch a path when an error occurs and a failover of operating program may not be able to be performed between nodes.
- Before installation of HDLM, you must set the binding between the target ID and storage port in HBA where such settings are possible (e.g. TID-WWPN, TID-WWNN, etc.). This is to prevent HDLM from incorrectly detecting a target ID value of an sd or ssd device, for the target ID value change when booting a server or host. In HBA documentation, this is called the "Binding" or "Persistent Binding" feature.
- When HDLM manages the path of a boot disk, refer to the following documents for how to acquire the name of a boot device that is specified in the setting of HBA and boot command.
- When using HBA of Oracle:

Refer to the manual "Hitachi Dynamic Link Manager User's Guide for Solaris™ Systems Chapter 3. Creating an HDLM Environment - Configuring a Boot Disk Environment".

- When using HBA other than that of Oracle:

Refer to the manual of used HBA.

- When the constitution change related to HBA is performed, the constitution change of HDLM may be required. For details, refer to the manual "Hitachi Dynamic Link Manager User's Guide for Solaris™ Systems Chapter4. HDLM Operation - Changing the configuration of the HDLM operating environment".

Vendor (Driver)	Applicable OS and HBA driver	
	Solaris 10	Solaris 11

Vendor (Driver)	Applicable OS and HBA driver	
Oracle (FC/IF) (*1)	Solaris attachment driver [bootable] (*4)(*7)	Solaris attachment driver [bootable] (*4)
Oracle (FCoE IF) (*1)	Solaris attachment driver [bootable] (*4)(*7)(*8)	-
Emulex (FC I/F) (*2)	6.02f 6.02h [bootable] 6.11c [bootable] 6.11cx2 [bootable] 6.21g [bootable]	-
QLogic (FC I/F)	5.03 [bootable] (*3) 5.04 [bootable] (*3)	-
Fujitsu (FC I/F)	3.0 Update1 4.0 [bootable] (*6) 4.0 Update1 [bootable] (*6) 4.0 Update2 [bootable] (*6)	-
Brocade (FC I/F)	bfa 1.1.0.4 (*1) (*5) bfa 2.1.0.1 (*1) (*5)	-
Brocade (FCoE IF)	bfa 2.3.0.6(*1)(*5)	-

Note:

*1: If the server is started with a disconnected path, and then the path is connected and recovered, execute "cfgadm -c configure" command before entering the "dlnkmgr online" command in order for Solaris to recognize the storage. In a Solaris 10 environment, even when "cfgadm -c configure" command is executed, there are cases when the host cannot recognize the storage. If this happens, after the path is recovered, reboot the host so that it recognizes the storage.

*2: Edit and set the "/kernel/drv/lpfc.conf" file as follows:

- no-device-delay=0
- nodev-holdio=0
- nodev-tmo: Set the default value (30) or more.

- When connecting to storages either directly or via an FC HUB (Loop mode only):
topology=4

- When connecting to storages via an FC Switching HUB (point-to-point mode only):
topology=2

Use an optional value for the other parameters.

*3: Edit and set the "/kernel/drv/qla2200.conf" file or the "/kernel/drv/qla2300.conf" file as follows:

- hbaX-link-down-error=1

- hbaX-fast-error-reporting=1 (Set only for HBA driver version supported this parameter)

"X" is the instance number of the HBA driver.

*4: HBA driver is bundled in Solaris installation media.

*5: Apply the following patches:

119130-33 or later, SunOS 5.10: Sun Fibre Channel Device Drivers

119974-09 or later, SunOS 5.10: fp plug-in for cfgadm

120346-09 or later, SunOS 5.10: Common Fibre Channel HBA API and Host Bus Adapter Libraries

*6: Edit and set the "/kernel/drv/fjpfca.conf" file as follows:

- failover_function=1

*7: Apply the following patches:

HBA models	Applicable patches The latest revisions of successor patches are recommended.
following Sun HBAs: - X6727A, X6748A, X6757A, X6799A, SG-XPCI1FC-QF2<X6767A>, SG-XPCI2FC-QF2<X6768A>, SG-XPCI2FC-QF2-Z, SG-XPCI1FC-QL2, SG-XPCI1FC-QF4, SG-XPCI2FC-QF4,	119130-22 or later, SunOS 5.10: Sun Fibre Channel Device Drivers 119974-04 or later, SunOS 5.10: fp plug-in for cfgadm 120182-02 or later, SunOS 5.10: Sun Fibre Channel Host Bus Adapter Library 120346-04 or later, SunOS 5.10: Common Fibre Channel HBA API Library

<p>SG-XPCIE1FC-QF4, SG-XPCIE2FC-QF4</p> <p>following QLogic HBAs</p> <ul style="list-style-type: none"> - QLA2300F, QLA2310F, QLA2332, QLA2340, QLA2342, QLA2344, QLA2460, QLA2462, QLE2460, QLE2462, QLE2464, QCP2332, QCP2330, QCP2340, QCP2342 	<p>If patch 119130-22 or later is not applied, the following problems may occur:</p> <ul style="list-style-type: none"> - I/O process stops without a failover of a path, when a path error occurs. - The problem that is indicated in Sun Alert ID 102130.
<p>following Sun HBAs:</p> <ul style="list-style-type: none"> - SG-XPCI1FC-EM2, SG-XPCI2FC-EM2, SG-XPCI1FC-EM4-Z, SG-XPCI2FC-EM4-Z, SG-XPCIE1FC-EM4, SG-XPCIE2FC-EM4 <p>following Emulex HBAs</p> <ul style="list-style-type: none"> - LP9002, LP9802, LP10000, LP10000DC, LP11000, LP11002, LPe11000, LPe11002 	<p>119130-22 or later, SunOS 5.10: Sun Fibre Channel Device Drivers</p> <p>119974-04 or later, SunOS 5.10: fp plug-in for cfgadm</p> <p>120182-02 or later, SunOS 5.10: Sun Fibre Channel Host Bus Adapter Library</p> <p>120222-11 or later, SunOS 5.10: Emulex-Sun LightPulse Fibre Channel Adapter driver</p> <p>120346-04 or later, SunOS 5.10: Common Fibre Channel HBA API Library</p> <p>If patch 119130-22 or later is not applied, the following problems may occur:</p> <ul style="list-style-type: none"> - I/O process stops without a failover of a path, when a path error occurs. - The problem that is indicated in Sun Alert ID 102130.
<p>following Sun HBAs:</p> <ul style="list-style-type: none"> - SG-XPCIE1FC-QF8-Z, SG-XPCIE2FC-QF8-Z, SG-XPCIE2FC-QB4-Z <p>following QLogic HBAs</p> <ul style="list-style-type: none"> - QLE2560, QLE2562, QEM2462 	<p>119130-33 or later, SunOS 5.10: Sun Fibre Channel Device Drivers</p> <p>119974-09 or later, SunOS 5.10: fp plug-in for cfgadm</p> <p>120346-09 or later, SunOS 5.10: Common Fibre Channel HBA API and Host Bus Adapter Libraries</p> <p>125166-10 or later, SunOS 5.10: Qlogic ISP Fibre Channel Device Driver</p>
<p>following Sun HBAs:</p> <ul style="list-style-type: none"> - SG-XPCIE1FC-EM8-Z, SG-XPCIE2FC-EM8-Z, SG-XPCIE2FC-EB4-Z 	<p>119130-33 or later, SunOS 5.10: Sun Fibre Channel Device Drivers</p> <p>119974-09 or later, SunOS 5.10: fp plug-in for cfgadm</p>

<p>following Emulex HBAs</p> <ul style="list-style-type: none"> - LPe12000, LPe12002 	<p>120222-27 or later, SunOS 5.10: Emulex-Sun LightPulse Fibre Channel Adapter driver</p> <p>120346-09 or later, SunOS 5.10: Common Fibre Channel HBA API and Host Bus Adapter Libraries</p>
<p>following Sun HBAs:</p> <ul style="list-style-type: none"> - SG-XPCIE2FCGBE-Q-Z 	<p>119130-33 or later, SunOS 5.10: Sun Fibre Channel Device Drivers</p> <p>119974-09 or later, SunOS 5.10: fp plug-in for cfgadm</p> <p>120346-09 or later, SunOS 5.10: Common Fibre Channel HBA API and Host Bus Adapter Libraries</p> <p>125166-12 or later, SunOS 5.10: Qlogic ISP Fibre Channel Device Driver</p>
<p>following Sun HBAs:</p> <ul style="list-style-type: none"> - SG-XPCIE2FCGBE-E-Z 	<p>119130-33 or later, SunOS 5.10: Sun Fibre Channel Device Drivers</p> <p>119974-09 or later, SunOS 5.10: fp plug-in for cfgadm</p> <p>120222-29 or later, SunOS 5.10: Emulex-Sun LightPulse Fibre Channel Adapter driver</p> <p>120346-09 or later, SunOS 5.10: Common Fibre Channel HBA API and Host Bus Adapter Libraries</p>
<p>following Emulex CNAs:</p> <ul style="list-style-type: none"> - LP21000 - LP21002 - OCe10102-F - OCe11102 	<p>145096-03 (or later) SunOS 5.10: oce driver patch</p> <p>145098-04 (or later) SunOS 5.10: emlxs driver patch</p>
<p>following Qlogic CNAs:</p> <ul style="list-style-type: none"> - QLE8140 - QLE8142 	<p>143957-05 (or later) SunOS 5.10: qlc patch</p>

*8: Boot disk environment configured with Emulex-CNAs is not supported.

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