installation and reference guide

HP MPIO Full Featured DSM for MSA1000/1500 Disk Arrays 1.00.02

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About this guide

This guide provides information about HP MPIO Full Featured DSM for MSA1000/1500 Disk Arrays (called the "HP MPIO MSA DSM" throughout this guide), including:

- Installing HP MPIO MSA DSM software
- Managing HP MPIO MSA DSM

Intended audience

This document is intended for customers who have purchased the HP MPIO MSA DSM and who are experienced with the following:

- Microsoft Windows 2000 and Windows Server 2003 (32-bit or 64-bit systems)
- MSA1000/1500 Disk Array
- Microsoft Cluster Server (MSCS)

Related documentation

In addition to this guide, please refer to the following document for this product:

- *HP MPIO Full Featured DSM for MSA1000/1500 Disk Arrays release notes*.

Additional documentation, including whitepapers and best-practices documents, is available at: http://www.hp.com.

Document conventions and symbols

Table 1 Document conventions

Convention	Element
Medium blue text: Related documentation	Cross-reference links and email addresses
Medium blue, underlined text (http://www.hp.com)	Web site addresses
Bold font	• Key names • Text typed into a GUI element, such as into a box • GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes
Italic font	Text emphasis
`Monospace font`	• File and directory names • System output • Code • Text typed at the command line
`Monospace, italic font`	• Code variables • Command-line variables
`Monospace, bold font`	Emphasis of file and directory names, system output, code, and text typed at the command line

⚠ **WARNING!**

Indicates that failure to follow directions could result in bodily harm or death.

△ **CAUTION:**

Indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT:

Provides clarifying information or specific instructions.

NOTE:

Provides additional information.

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support web site: http://www.hp.com/support/.

Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP recommends that customers sign up online using the Subscriber's choice web site: http://www.hp.com/go/e-updates.

- Subscribing to this service provides you with e-mail updates on the latest product enhancements, newer versions of drivers, and firmware documentation updates as well as instant access to other product resources.
- After signing up, you can quickly locate your products by selecting **Business support** and then **Storage** under Product Category.

HP-authorized reseller

For the name of your nearest HP-authorized reseller:

- In the United States, call 1-800-282-6672.
- Elsewhere, visit the HP web site: http://www.hp.com. Then click **Contact HP** to find locations and telephone numbers.

Helpful web sites

For other product information, see the following HP web sites:

- http://www.hp.com
- http://www.hp.com/go/storage
- http://www.hp.com/support/
- http://www.docs.hp.com

1 Installing the HP MPIO Full Featured Device Specific Module (DSM) for MSA1000/1500 Disk Arrays software

HP MPIO Full Featured DSM for MSA1000/1500 Disk Arrays (HP MPIO MSA DSM) provides multipathing support for HP StorageWorks disk arrays on Windows platforms using the Microsoft Multipath Input-Output (MPIO) framework. This chapter provides instructions for installing and removing the HP MPIO MSA DSM, including:

- Preparing for installation
- Installing HP MPIO MSA DSM software
- Upgrading HP MPIO MSA DSM software
- Removing HP MPIO MSA DSM software
- Using silent installation
- Setting up boot from a SAN

Preparing for installation

Before installing HP MPIO MSA DSM, verify that your system components supports the HP MPIO MSA DSM and whether or not you need to upgrade hardware or software before installation.

NOTE:

Some of the tasks or procedure steps may not apply to your configuration.

To prepare your system for the installation of HP MPIO MSA DSM:

1. Complete the Pre-Installation checklist (Table 2).
2. Install all hardware components, as described in the hardware installation and configuration documentation.
3. Install the required operating system service packs, if applicable.
4. Back up your computer.
5. Log in with Administrator privileges.
6. Ensure that no other installation program is in progress (for example, the Found New Hardware wizard).
7. If your system is running Microsoft Terminal Server, change the Terminal Server from Execution mode to Installation mode.

Table 2 lists the information you need before installing the HP MPIO MSA DSM software.

Table 2 Pre-installation checklist

Task	
Check the contents of the HP MPIO MSA DSM kit and the Fibre Channel hardware to make sure nothing is missing. If you are missing any component, contact your account representative, or call the HP Customer Service hotline at (800) 354-9000.	☐
Obtain and review the most current versions of the following documents: • *HP MPIO Full Featured DSM for Windows for MSA Disk Arrays release notes* • Installation and configuration information for your system, available at the following web site: http://www.hp.com/country/us/eng/prodserv/storage.html • Supported SAN topologies for HP MPIO MSA DSM, as defined and described in the *HP StorageWorks SAN design reference guide* available at the following web site: http://h18006.www1.hp.com/products/storageworks/san/documentation.html	☐
Refer to the *HP MPIO Full Featured DSM for Windows for MSA Disk Arrays release notes* to verify that your Host Bus Adapter (HBA) drivers and MSA1500 firmware are of the required version(s).	☐
Check your HP MPIO MSA DSM's license to determine on which systems you can install the software: • Full license (part number ending in AA)—No installation restrictions • Upgrade license (part number ending in CA)—Requires previously installed HP MPIO MSA DSM software.	☐

△ CAUTION:

Installing HP MPIO MSA DSM software when the Terminal Server is in execution mode may have adverse effects on other software products. For detailed information, refer to the Microsoft web site: http://support.microsoft.com/default.aspx?scid=kb;en-us;186612.

Installing HP MPIO MSA DSM software

You can install HP MPIO MSA DSM on a stand-alone system or cluster configuration. The procedure that you follow depends on your current system configuration.

This section describes how to install HP MPIO MSA DSM on the following configurations:

- Installing HP MPIO MSA DSM on stand-alone systems
- Installing HP MPIO MSA DSM on cluster configurations

Installing HP MPIO MSA DSM on stand-alone systems

You can install this software prior to attaching the hardware. To install the HP MPIO MSA DSM on a stand-alone system:

1. Complete the pre-installation checklist (Table 2) and the pre-installation procedure.
2. Ensure that only a single path is connected to the storage devices.
3. Configure the storage sets.
4. Insert the HP MPIO MSA DSM software CD-ROM on your server or a network drive.
5. Choose one of the following options to access the CD-ROM:
   - From your server: If you have `AutoRun` enabled on your server, the setup program starts automatically. Otherwise, select **Start > Run**, then browse to the `Launch.exe` program on the CD-ROM drive.
   - From your Network drive: If you are accessing the CD-ROM on a Network drive, select **Start > Run**, then browse to the `Launch.exe` program on the network drive.
6. In the launch window, click **HP MPIO Full Featured DSM for MSA1000/1500 Disk Arrays.**.

7. Read the information displayed on your screen to complete the installation.
8. Add the redundant paths to the storage devices.

Installing HP MPIO MSA DSM on cluster configurations

To install HP MPIO MSA DSM on each member of a cluster configuration:

NOTE:

In a cluster configuration, HP MPIO MSA DSM must be installed on one cluster at a time.

1. Complete the pre-installation checklist (Table 2) and the pre-installation procedure.
2. Using Cluster Administrator:
   - Move all cluster shared storage to one server.
   - Pause cluster node A.
   - Select **Resource Attributes > Disable failback** for all groups containing resources managed by MSCS.
3. Install HP MPIO MSA DSM on node A by following step 2–8 from the procedure Installing HP MPIO MSA DSM on stand-alone systems.
4. Using Cluster Administrator:
   - Unpause cluster node A.
   - Pause cluster node B.
5. Install HP MPIO MSA DSM on node B, following step 2–8 from the procedure Installing HP MPIO MSA DSM on stand-alone systems.
6. Using Cluster Administrator:
   - Unpause cluster node B.
   - Restore failback as needed.
   - Redistribute LUNs.

Upgrading HP MPIO MSA DSM software

You can upgrade HP MPIO MSA DSM from an existing version to the current version on a stand-alone system or cluster configuration..

This section describes how to upgrade HP MPIO MSA DSM on the following configurations:

- Upgrading HP MPIO MSA DSM on stand-alone systems
- Upgrading HP MPIO MSA DSM on cluster configurations

Upgrading HP MPIO MSA DSM on stand-alone systems

To upgrade HP MPIO MSA DSM from a previous version on stand-alone systems, complete the steps below:

1. Complete the pre-installation checklist (Table 2) and the pre-installation procedure.
2. Insert the HP MPIO MSA DSM CD-ROM on your server or a network drive.
3. Choose one of the following options to access the CD-ROM:
   - From your server: If you have `Auto Run` enabled on your server, the setup program starts automatically. Otherwise, select **Start** > **Run**, then locate the `Launch.exe` program on the CD-ROM drive.
   - From your network drive: If you are accessing the CD-ROM on a network drive, select **Start** > **Run**, then locate the `Launch.exe` program on the network drive.
4. In the launch window, click **HP MPIO Full Featured DSM for MSA1000/1500 Disk Arrays**.
5. Select the upgrade option.
6. Follow the on-screen instructions to complete the upgrade.
7. Restart the server.

Upgrading HP MPIO MSA DSM on cluster configurations

To upgrade HP MPIO MSA DSM from a previous version on each member of a cluster configuration, complete the steps below:

NOTE:

In a cluster configuration, HP MPIO MSA DSM must be upgraded on one node at a time for all the nodes in the cluster.

1. Complete the pre-installation checklist (Table 2) and the pre-installation procedure.
2. Using Cluster Administrator:
   a. Move all cluster resources owned by the current node to another node in the cluster.
   b. Pause the current cluster node.
   c. Select **Resource Attributes > Disable failback** for all groups containing resources managed by the current node.
3. Upgrade HP MPIO MSA DSM on the current node by following step 2–6 from the procedure Upgrading HP MPIO MSA DSM on stand-alone systems.
4. Using Cluster Administrator, resume the current cluster node.

NOTE:

Repeat steps 2–4 for all nodes in the cluster.

5. Using Cluster Administrator:
   a. Restore failback for all groups containing resources as needed.
   b. Redistribute cluster resources as desired.

Removing HP MPIO MSA DSM software

To remove the HP MPIO MSA DSM software you must re-configure the SAN and reboot your server.

△ CAUTION:

Removing multipathing software from a multipath hardware configuration can cause data loss or corruption. Be sure to disconnect the server from multipath storage or eliminate all but one path to that storage from the server prior to removing the HP MPIO MSA DSM software.

NOTE:

Do not start this procedure unless you can complete all of the following steps without interruption.

To remove HP MPIO MSA DSM software, complete the following steps:

1. Back up all user data on multipath storage.
2. If possible, disconnect the storage from the server. If it is necessary to maintain single-path connections from the server to the storage (as in the case of servers that boot from a SAN device), use the following guidelines:
   - If it is a one-host/one-storage array, HP recommends removing redundant cable connections.
   - If the storage continues to be accessed by other servers still in multipath mode and by this server in single-path mode and it is on an MSA systems, use switch zoning to establish the single connection (path) from the server.
3. Select **Start > Settings > Control Panel > Add or Remove Programs**.
4. Select **HP MPIO Full Featured DSM for MSA1000/1500 Disk Arrays** from the Remove Program drop-down list.
5. Click **Remove** and follow the prompts.

   The system displays a cautionary statement advising of the potential data loss or corruption that could result from removing this software.
6. Close the **Add/Remove Programs** window.

   NOTE:

   The LUNs may be inaccessible at this time.
7. Reboot the system.

Using silent installation

Silent installation can be run from the CD-ROM on your computer or from a network drive. It installs the HP MPIO MSA DSM with little intervention. Silent installation is useful if you are installing the software on a large number of servers that require software installation.

This section describes how to use silent installation to perform a new installation or to remove an existing installation, including:

- Installing HP MPIO MSA DSM
- Upgrading HP MPIO MSA DSM
- Removing HP MPIO MSA DSM

- Creating response files for silent mode operations

Syntax

```
<install drive>:\MPInstall\setup.exe /s /f1"C:\setup.iss" /f2"C:\MPSInstallLog.txt"
```

The `<install drive>` refers to the drive which contains the installation media.

The `setup.iss` is the response file from which information is taken for silent installation.

The `MPSInstallLog.txt` file records information about the silent installation. The installation completes in a few minutes.

The `ResponseResult` section of the `MPSInstallLog.txt` log file displays the result code, indicating whether or not the silent installation succeeded. An integer value is assigned to the `ResultCode` keyname in the `ResponseResult` section.

Following are the list of common return values along with their descriptions in the `ResultCode` key:

Result Code	Description
0	Success
–1	General error
–3	Required data not found in the `setup.iss` file
–4	Not enough memory available
–5	File does not exist
–6	Cannot write to the response file
–7	Unable to write to the log file
–8	Invalid path to the InstallShield Silent response (`.iss`) file
–51	Cannot create the specified folder
–52	Cannot access the specified file or folder

NOTE:

The `C:` in `/f1C:` and `/f2C:` refers to a local drive on the system or a network drive on which the response file is created and `MPSInstallLog.txt` is written (provided there is write permission in the directory).

For 32 bit systems:

```
<Default_Target_Dir> = C:\Program Files\Hewlett-Packard\HP MPIO DSM\MSA DSM
```

For 64 bit systems:

```
<Default_Target_Dir> = C:\Program Files (x86)\Hewlett-Packard\HP MPIO DSM\MSA DSM
```

`<User_Target_Dir>` = a directory on the system on which the new installation is to be done or directory of an existing installation.

You must enclose the paths to the response file and the log file, which records the information about the silent installation, in quotes (`"`).

Installing HP MPIO MSA DSM

To perform a silent installation of HP MPIO MSA DSM:

1. Make a copy of the `new.iss` file in the installation kit.
2. Rename this copy of the file as `setup.iss`
3. Choose one of the following options:

- To install into the default directory for 64 bit systems, in lines 28 and 33 of the `setup.iss` file, replace `C:\Program Files\Hewlett-Packard\HP MPIO DSM\MSA DSM` with `C:\Program Files (x86)\Hewlett-Packard\HP MPIO DSM\MSA DSM`.
- To install into the user specified directory for both 32 and 64 bit systems, in lines 28 and 33 of the `setup.iss` file, replace `szDir = <Default_Target_Dir>` with `szDir = <User_Target_Dir>`.

4. Choose one of the following options:
   - To install the Microsoft MPIO Framework component along with the DSM component, use the default `setup.iss` file.
   - To install only the DSM component (when the Microsoft MPIO Framework already exists on your system), edit the `setup.iss` file as follows:
     a. In line 34, replace `Component-count=2` with `Component-count=1.`
     b. Remove line 35.
     c. In line 36, replace `Component-1=DSM` with `Component-0=DSM`.
5. If you want to avoid the automatic reboot feature, edit the `setup.iss` file as follows:
   - In line 50, replace `Result=6` with `Result=1`.
   - In line 51, replace `BootOption =3` with `BootOption=0`.

Upgrading HP MPIO MSA DSM

To upgrade from a previous version of HP MPIO MSA DSM to the current version, complete the following steps:

1. Make a copy of the `update.iss` file in the installation kit.
2. Rename this copy of the file as `setup.iss`
3. Choose one of the following options:
   - To upgrade the Microsoft MPIO Framework component along with the DSM component, use the renamed default `setup.iss` file.
   - To upgrade only the DSM component (when the Microsoft MPIO Framework already exists on your system), edit the renamed `setup.iss` file as follows:
     a. In line 23, replace `Component-count=2` with `Component-count=1.`
     b. Remove line 24.
     c. In line 25, replace `Component-1=DSM` with `Component-0=DSM`.
4. If you want to avoid the automatic reboot feature, edit the renamed `setup.iss` file as follows:
   - In line 39, replace `Result=6` with `Result=1`.
   - In line 40, replace `BootOption =3` with `BootOption=0`.

Removing HP MPIO MSA DSM

To remove HP MPIO MSA DSM:

1. Make a copy of the `uninstall.iss` file in the installation kit.
2. Rename this copy of the file as `setup.iss`
3. If you want to avoid the automatic reboot feature, edit the `setup.iss` file as follows:
   - In line 28, replace `Result=6` with `Result=1`.
   - In line 29, replace `BootOption=3` with `BootOption=0`.

Creating response files for silent mode operations

The package contains the following response files (`.iss` files): `new.iss`, `uninstall.iss` and `update.iss` that are used for silent mode installation and uninstallation respectively. In addition to these, you can create your own customized response files for operations (such as modify/repair) with different combinations of the components selected/unselected.

Customized response files can be created by running the `setup.exe` in the record mode on one of the systems. This response file can then be used for doing the same silent mode operation across multiple systems.

To create response file, complete the following steps:

1. At the command prompt, type the following command: `<CMD> setup.exe /r`, where `/r` option enables the record mode.
2. This will result in the GUI installation to run in the record mode. Select the responses in each screen and run through the installation.

> **NOTE:**
>
> When selecting the response on each screen, do not click the **BACK** button, and modify the selection. The response file will have to be generated again in such a case.

3. The response file is created at the following location: `%WINDDIR%\setup.iss`, where, `%WINDIR%` is the Windows installation directory.
4. Use this `setup.iss` file to perform the same silent mode operation across multiple systems.

Setting up boot from a SAN

HP MPIO MSA DSM can be set up to boot externally from a SAN that uses HP StorageWorks HBAs and RAID arrays. Booting externally offers the following advantages:

- Optional elimination of server-based internal boot devices.
- Decreased downtime in the event of a server failure.

However, booting from a SAN requires specific setup procedures based on the specific software solutions, HBA firmware, and boot BIOS versions. Refer to the following documents for detailed information about booting from a SAN:

- *HP StorageWorks Booting 32-bit Windows systems and Windows Server x64 Edition systems from a Storage Area Network application notes* available at this web site: http://h18006.www1.hp.com/products/storageworks/san/documentation.html.
- *HP StorageWorks Booting Itanium 64-bit Windows Systems from a Storage Area Network Application Notes* available at this web site: http://h18006.www1.hp.com/products/storageworks/san/documentation.html.

2 Managing storage arrays using the HP MPIO MSA DSM with the CLI utility

The Command Line Interface utility (CLI) for HP MPIO MSA DSM provides the ability to monitor and manage multipathing devices. This chapter describes the user interface for the CLI, including:

- CLI commands

CLI commands

This section describes the CLI commands:

- hpdsm devices
- hpdsm path device
- hpdsm set device policy
- hpdsm set device path
- hpdsm cleanup device
- hpdsm notify
- hpdsm help

hpdsm devices

Syntax: `hpdsm devices`

The `hpdsm devices` command displays information about the HP MPIO devices as shown in the following example. If there are no devices present, the following message is displayed: `No devices found.`

NOTE:

See hpdsm set device policy for a definition of the policies. The P.B.T.L. column shows the device **p**ort, **b**us, **t**arget, and **L**UN.

Example:

```
hpdsm devices
```

De-vice#	Device Name	Serial No.	Active Paths	Pol-icy	Disk#	P.B.T.L	ALB
1 HP	MSA_VOLUME	600508B300912160AF87D3596705001B	2	NLB	Disk 7	4.1.3.1	N/A
2 HP	MSA_VOLUME	600508B300912160A6C7C35E4FA2001A	2	RR	Disk 8	4.1.3.2	N/A
3 HP	MSA_VOLUME	600508B300912160ACA7F3631676001C	2	SQB	Disk 9	3.1.3.3	N/A
4 HP	MSA_VOLUME	600508B300912160AAA7E3672638001B	2	SQR	Disk 10	3.1.3.4	N/A
5 HP	MSA_VOLUME	600508B300912160A0C7936B297F001D	2	SQST	Disk 11	3.1.3.5	N/A
6 HP	MSA_VOLUME	600508B300912160AD87836F3945001C	2	SQST	Disk 12	3.1.3.6	N/A

hpdsm paths device

Syntax: `hpdsm paths device=`*x*

The `hpdsm paths device` command displays information about the paths available for device *x*, as shown in the following example.

NOTE:

- The P.B.T.L. column shows the device **p**ort, **b**us, **t**arget, and **L**UN.
- The RTP column shows the target port information as defined by SCSI-3 specification.
- The Controller Port# column shows the controller serial number followed by target port number.

```
hpdsm paths device=1
Path#     Controller Port#   State       HBA Slot#     RTP          P.B.T.L
1         P56350FX3Q5006-1   Available   4             00010001     3.1.3.1
2         P56350GX3RI0F6-1   Available   4             00020002     4.1.3.1
```

hpdsm set device policy

Syntax: `hpdsm set device=`*x* policy=*policy*

The `hpdsm set device policy` command sets the load balancing policy for device *x* to one of the following:

- No_Load_Balance (NLB)
- Round_Robin (RR)
- Shortest_Queue_Requests (SQR)
- Shortest_Queue_Bytes (SQB)
- Shortest_Queue_ServiceTime (SQST)

The example below demonstrates the information displayed by the `hpdsm set device policy` command.

NOTE:

You can not change the load balance policy in an MSCS environment.

Example:

```
hpdsm set device=1 policy=sqst
Device Name                 : HP MSA_VOLUME
Device Serial No.           : 600508B300912160AF87D3596705001B
Change Load Balance policy (y/n) ?  y

Load Balance policy changed.  Verify by issuing "hpdsm devices" command.
```

hpdsm set device path

Syntax: `hpdsm set device=`*x* path=*y*

The `hpdsm set device path` command changes the preferred path for device *x*, as shown in the example below.

NOTE:

Use the `hpdsm paths device` command to view the available paths for the device.

```
hpdsm set device=1 path=1
Device Name                 : HP MSA_VOLUME
Device Serial No.           : 600508B300912160AF87D3596705001B
Controller Port No.         : P56350FX3Q5006
Change Load Balance policy (y/n) ?  y

Preferred Path changed.  Verify by issuing "hpdsm paths device=<number>" command.
```

hpdsm cleanup device

Syntax: `hpdsm cleanup device=`*x*

The `hpdsm cleanup device` command allows you to clean up the failed path information for specified device *x*, as shown in the example below:

Example:

```
hpdsm cleanup device=1
Device Name                 : HP MSA_VOLUME
Device Serial No.           : 600508B300912160AF87D3596705001B
Cleanup the failed path information for this LUN (y/n) ?  y
Cleanup Succeeded.  Verify by issuing "hpdsm devices" command.
```

hpdsm notify

Syntax: `hpdsm notify event =` *notification_event_number* time=*number_of_minutes*

The `hpdsm notify` command defines user notification of events. The time attribute defines the number of minutes that will elapse from the time the event occurs until the user is notified. The maximum value that can be entered is 35000 minutes.

NOTE:

Syntax: `hpdsm notify event = notification_event_number`

The above command will make the notification to wait indefinitely until the user terminates the wait (eg: with Ctrl-C)

Table 3 defines the selections for the notification command string.

Table 3 Notification strings

Notification string	Notification_ event_ number	Notifies the user when DSM Manager:
HPDSM_NEW_DEVICE	1	Detects a new device.
HPDSM_ADDITIONAL_PATH	2	Detects a redundant path to an existing device.
HPDSM_MAX_PATH_REACHED	3	Determines that a device configuration contains the maximum number of supported paths.
HPDSM_DEVICE_REMOVAL	4	Detects that a device was removed.
HPDSM_PATH_FAILOVER	5	Detects an existing path to a device has failed and an alternate path is being used.
HPDSM_MAX_LUNS_REACHED	6	Determines that the configuration contains the maximum number of supported LUNs.
HPDSM_ALL_NOTIFICATIONS	7	Detects any event related to MPIO framework and DSM Manager occurs.

These notifications are sent by the HP MPIO MSA DSM and MPIO framework to the CLI. The CLI displays the event in the command window as shown in the following example:.

Example:

HPDSM NOTIFY EVENT=7 TIME=5

```
Received HPDSM_PATH_FAILOVER from HPMSADSM
Received HPDSM_PATH_FAILOVER from HPMSADSM
Received HPDSM_PATH_FAILOVER from HPMSADSM
Received HPDSM_PATH_FAILOVER from HPMSADSM
Received HPDSM_PATH_FAILOVER from HPMSADSM
Received HPDSM_PATH_FAILOVER from HPMSADSM
Received HPDSM_DEVICE_FAILURE from HPMSADSM
Received HPDSM_DEVICE_FAILURE from HPMSADSM
Received HPDSM_DEVICE_FAILURE from HPMSADSM
Received HPDSM_DEVICE_FAILURE from HPMSADSM
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Received HPDSM_DEVICE_FAILURE from HPMSADSM
```

hpdsm help

Syntax: `hpdsm help`

The `hpdsm help` command displays help information for the CLI.

A Software components

This appendix describes the HP MPIO MSA DSM software components, including:

- Drivers
- User mode components

Drivers

Multipathing drivers are a critical element of the operating system. The HP MPIO MSA DSM software components include the following multipath drivers:

- Microsoft Framework Drivers
  - `MPIO.SYS` is the Multipathing bus driver.
  - `MPDEV.SYS` is the replacement class driver. It communicates with `MPIO.SYS`.
  - `MPSPFLTR.SYS` is a port driver filter (HBA upper filter).
- HP Device Specific Module (DSM) driver
  - `HPMAADSM.SYS` is the HP DSM driver for MSA disk arrays. It interacts with `MPIO.SYS` to provide device-specific functions.

HP recommends that you do not remove, delete, or disable these drivers while multipath hardware is attached to your system.

User mode components

The user mode components includes: -

- HP MPIO DSM manager GUI
- HP MPIO MSA DSM command line interface
- HP MPIO MSA DSM performance monitoring provider

HP MPIO DSM manager GUI

The HP MPIO DSM manager GUI monitors and manages the HP DSMs. It also enables administrator to receive e-mail notifications on path or device failure events. The HP MPIO DSM Manager is provided as a separate installation package. HP MPIO DSM Manager contains files described in Table 4:

Table 4 HP MPIO DSM manager GUI files

File	Description
SecurePathMgr.dll	This is the Microsoft Management Console snap-in DLL used to manage the HP DSMs.
VolInfoDLL.dll	Gathers information about the drive letter, mount points, and volume labels from the system.
SpWmiInfo.dll	Handles the communication with the HP DSMs using WMI interfaces.
SpNotifier.dll	Used by the SpMonitor.exe to send E-mail notifications.
SpEditCfg.exe	Creates and modifies the configuration file for E-mail notifications.
SpMonitor.exe	Sends E-mail notifications using the configuration information specified in the file SPNotificationConfig.xml.
BlankSPNotificationConfig.xml	Used as a blank template file used by the SpEditCfg.exe to create the actual configuration file for E-mail notifications.
SPNotificationConfig.xml	Generated by SpEditCfg.exe and stores the configuration information for E-mail notifications.

HP MPIO MSA DSM command line interface (CLI)

The HP MPIO MSA DSM command line interface (HPDSM.EXE) enables you to monitor and manage HP DSMs in an MPIO environment.

HP MPIO MSA DSM performance monitoring provider

The HP MPIO MSA DSM performance monitoring provider (HpPerfProv.DLL) allows you to monitor the Input-Output (I/O) performance of a path using the system monitor.

To start the performance monitoring, complete the steps below:

1. Select **Start > Programs > Hewlett-Packard > MSA DSM > Path Performance**.

   Alternatively, you can select **Start > Run** and run the command `perfmon /wmi`.
2. Select **HP DSM High Performance Provider** performance object and add the appropriate counters.

B Multipathing driver event log messages

This appendix lists event log messages for HP MPIO MSA DSM drivers and provides a description of each message. The error log messages are written to the SYSTEM log file.

This appendix provides information about the following event log messages:

- MPIO.SYS event log messages
- HP MPIO MSA DSM event log messages

MPIO.SYS event log messages

Table 5 lists MPIO driver event log messages, an explanation of each message, and a description of the data that accompanies the message.

Table 5 MPIO.SYS event log messages

Event ID	Message	Description	Contents of the data dump
1	*Pseudo-LUN* created.	MPIO created a new pseudo-LUN (a new disk physical device object).	N/A
2	Added device to *pseudo-LUN.*	A new instance of an existing pseudo-LUN device object is seen through a different path.	The current number of paths to the device
3	There was an error creating a device claimed by the DSM.	MPIO failed to create a new (or update an existing) pseudo-LUN device object, even though *DSM_name* claimed support for it.	N/A
16	A fail-over on *pseudo-LUN* occurred.	A pseudo-LUN handled a failover. This message does not indicate whether the failover was successful.	The Path ID of the failed device
17	*Pseudo-LUN* is currently in a degraded state. One or more paths have failed, though the process is now complete.	At least one path to a pseudo-LUN has failed. This signals the end of failover handling for the pseudo-LUN and that the device is now operating with at least one less path.	N/A
18	A Single Path Fail-Over is being attempted on *pseudo-LUN*	A pseudo-LUN has just one path, and DSM has requested a failover.	The Path ID of the failing device
19	An operation failed on *device* due to lack of memory.	Resource allocation failed during an attempted failover, and failover is not currently active.	The Path ID of the failing device

Event ID	Message	Description	Contents of the data dump
20	A Path Verification request to a device on *pseudo-LUN* that is controlled by *DSM_name* has failed. This may indicate a path failure.	A call to a DSM's PathVerify routine to a pseudo-LUN has failed. This event occurs during final initialization after PathVerify has checked whether the device can be reached through a newly found path.	N/A
21	The internal state of *device_object* is inconsistent. This indicates potential failures in this support.	MPIO is unable to run through its maintained list of pseudo-LUNs.	N/A
22	A fail-over on *pseudo-LUN* was attempted, however the attempt failed. The devices will be removed.	A failover attempt on a pseudo-LUN has failed. This could indicate that the DSM did not return a valid path after the call to InvalidatePath.	N/A
23	All paths have failed. *Pseudo-LUN* will be removed.	There are no available paths to the pseudo-LUN. The device has gone into total failure and will be removed.	N/A
24	A PnP Operation rejected, as*device* is not in a state where the request can be honored.	A PnP request for QueryRemove was rejected because the device is in the paging, hiber, or crash dump path state.	N/A
25	Requests that were queued to *pseudo-LUN* have failed during resubmission.	An issued request from the pseudo-LUN's queue failed. This always occurs when the device is in the process of being removed.	Path ID used for resubmission
32	*DSM_name* failed to return a Path to *pseudo-LUN*.	One of the following events occurred during failover: MPIO's call to the DSMs InvalidatePath failed; DSM did not return a new path; DSM did not return a path when MPIO called the LBGetPath routine.	N/A
33	*DSM_name* returned a bogus path to *device*.	MPIO is unable to find an operational device-path pair representation (device info) for the path that the DSM wants to use for the I/O to the device	Bogus Path ID returned by DSM; If the Path ID = NULL, the DSM has failed to return a path.
35	*DSM_name* supplied an invalid ID for an operation on *notification_type*.	MPIO received a DSMNotification call, but is unable to map the DSMID to a device.	DSM ID

Event ID	Message	Description	Contents of the data dump
36	An unknown DSM supplied an invalid ID for an operation on *pseudo-LUN*.	DSM called DSMSendRequest to have MPIO send a request on its behalf, but MPIO is unable to find the pseudo-LUN requested.	DSM ID
37	*DSM_name* is attempting an operation on *pseudo-LUN*. The Type is noted in the dump data.	DSM_name has called DSMNotification on a pseudo-LUN.	The type of notification called by DSM
38	A device under *pseudo-LUN*, being controlled by *DSM_name* was removed, but the DSM failed the operation.	An MPIO call to DSM's RemoveDevice operation failed.	DSM ID of the failed attempt

HP MPIO MSA DSM event log messages

Table 6 lists the HP MPIO MSA DSM event log messages and provides a description of each message.

Table 6 HP MPIO MSA DSM event log messages

Event ID	Message	Description
101	`Discovered a new multipath capable disk with serial number X; first path SCSI address Y.`	A new multipath disk has been discovered. X represents the serial number of the new disk. Y is the SCSI address of the first path to this disk.
102	`A new path (SCSI address Y) was added to existing multipath capable disk X.`	A new path to an existing multipath disk has been discovered. X represents the serial number of the disk. Y is the SCSI address of the new path that was found.
103	`The path (SCSI address Y) to multipath capable disk X has recovered.`	A failed path to an existing multipath disk has recovered. X represents the serial number of the disk. Y is the SCSI address of the path that has been recovered.
108	`The DSM has completed remove processing for path (SCSI address Y) to multipath capable disk X.`	The DSM has completed processing the removal notification for a path to the given multipath disk. X represents the serial number of the disk. Y is the SCSI address of the path for which the removal notification has been processed.
109	`The DSM (version X) has been started successfully.`	The DSM has successfully completed the initialization during startup. X represents the version of the DSM.
301	`The DSM failed to initialize during startup.`	The DSM did not initialize successfully during startup.
302	`An unrecoverable path failure occurred on SCSI address Y. Disk X failed due to no redundant paths available.`	All paths to an existing multipath disk have failed. X represents the serial number of the disk. Y is the SCSI address of the last path that failed.
303	`Too many paths for disk with serial number X. Path (SCSI address Y) not added.`	A new path in excess of the supported number of paths for an existing multipath disk has been discovered. X represents the serial number of the disk. Y is the SCSI address of the newly found path.
304	`An unrecoverable path failure occurred on SCSI address Y. Disk X is still accessible over redundant path(s).`	A redundant path to an existing multipath disk has failed. X represents the serial number of the disk. Y is the SCSI address of the path that failed.

Glossary

This glossary defines the terms used in this guide or related to this product. It is not a comprehensive glossary of computer terms.

controller — A hardware device that facilitates communication between a host and one or more LUNs organized as an array.

DSM — Device Specific Module

fabric — A network that contains high-speed fiber connections resulting from the interconnection of switches and devices. A fabric is an active and intelligent non-shared interconnect scheme for nodes.

failover — The automatic substitution of a functionally equivalent system component for a component that has failed.

HBA — Host Bus Adapter. An I/O device that serves as the interface connecting a host system to the SCSI bus or SAN (Storage Area Network)

host — The computer system on which the Multipath software is running.

LUN — Logical Unit Number. The actual unit number assigned to a device by the RAID system controller.

mode — A user-selectable parameter that specifies path behavior during normal and failure conditions. Paths can be set to one of the following modes:

- **Preferred** — Indicates the path you choose for the desired I/O paths. When a path is in preferred mode, load balance is not enabled and the Load Balance Type displays as none.
- **Alternate** — Indicates a path that is used for device access and I/O activities when the preferred path fails..

MPIO — Multipathing Input/Output.

path — A virtual communication route that enables data and commands to pass between a host server and a storage device.

path state — An attribute that describes the operational condition of a path. A path can exist in one of the following states:

- **Active** — Path is currently used for the I/O stream or is available for load balancing.
- **Available** — Path is currently available, but not used for device access. The path is only in this state when no load balancing policy has been selected for the LUN.
- **Standby** — Intermediate state of the path before it is initialized (made ready for device access), normally will not be seen.
- **Failed** — Path is currently unusable for the I/O stream.

port A — The relative number of an HBA. A specific port number is determined according to its order of discovery by the Windows operating system. HBA's include SCSI, Fibre Channel, and IDE adapter types.

SAN — Storage Area Network. A configuration of networked devices for storage.

state

An attribute that describes the current operational condition of an object. The possible state include:

- **Good**: The multipathing device can be accessed on at least one path.
- **Degraded**: One or more paths are failed to the storage unit.

target

The definition of **target** depends on the environment:

- For parallel SCSI configurations, the target is the actual target number assigned to a device.
- For Fibre Channel configurations, a target number is assigned by a mapping function at the miniport-driver level and is derived from AL_PA (Arbitrated Loop Physical Addresses) in an FC-AL topology.
- For SAN switched fabric, a target is assigned to a WWPN. This target can have values between 16 and 125.
- For a fabric topology, target is a mapping function derived from the order of discovery according to port connections at the SAN (Storage Area Network) switch.

topology

An interconnection scheme that allows multiple servers and storage devices to communicate. Arbitrated loop and switched fabric are examples of Fibre Channel topologies.

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