

# HP MPIO Full Featured DSM for EVA4x00/ 6x00/8x00 family of Disk Arrays 4.01.00 installation and reference guide

This document provides information about managing, installing, upgrading, and removing HP MPIO Full Featured Device Specific Module (DSM) for EVA4x00/6x00/8x00 family of Disk Arrays (called the HP MPIO EVA DSM throughout this document). This document also includes information on support for load balancing in Microsoft Cluster Server (MSCS)/Failover Cluster environments.

This document is intended for customers who use the HP MPIO EVA DSM software and users with the knowledge of HP MPIO Full Featured DSM for EVA4x00/6x00/8x00 family of Disk Arrays and Microsoft Cluster Server (MSCS)/Failover Cluster environments.



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# 1 Installing the HP MPIO Full Featured DSM for EVA4x00/6x00/8x00 family of Disk Arrays

HP MPIO EVA DSM provides multipathing support for HP StorageWorks disk arrays on Windows platforms using the Microsoft Multipath Input-Output (MPIO) framework. This chapter describes the following:

- Preparing for installation
- Installing HP MPIO EVA DSM
- Upgrading HP MPIO EVA DSM
- Migrating HP MPIO EVA DSM from Windows Server 2003 to Windows Server 2008
- Removing HP MPIO EVA DSM
- Using silent installation
- Setting up boot from SAN

## Preparing for installation

Before installing HP MPIO EVA DSM, verify that your system components support the software and determine whether you need to upgrade the system's hardware or software.

To prepare your system before installing HP MPIO EVA DSM:

1. Complete the pre-installation checklist ([Table 1](#)).
2. Install all the hardware components, as described in the hardware installation and configuration documentation.
3. Install any required operating system service packs.
4. Back up all user data.
5. Log on to the system 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.

---

### △ CAUTION:

Installing HP MPIO EVA DSM when the Terminal Server is in execution mode may have adverse effects on other software products. For detailed information, see the Microsoft website:

<http://support.microsoft.com/default.aspx?scid=kb;en-us;186612>

---

Table 1 lists the information you need before installing the HP MPIO EVA DSM.

**Table 1 Snapshot of pre-installation checklist**

Task	
Check the contents of the HP MPIO EVA DSM kit and the Fibre Channel hardware to ensure nothing is missing. If you are missing any component, contact your account representative, or call the HP Customer Service hotline at (800) 354-9000.	<input type="checkbox"/>
Obtain and review the most current versions of the following documents: <ul style="list-style-type: none"><li>• <i>HP MPIO Full Featured DSM for EVA4x00/6x00/8x00 family of Disk Arrays release notes</i></li><li>• Installation and configuration information for your system, available at the following website: <a href="http://www.hp.com/country/us/eng/prodserve/storage.html">http://www.hp.com/country/us/eng/prodserve/storage.html</a></li><li>• Supported SAN topologies for HP MPIO EVA DSM, as defined and described in the <i>HP StorageWorks SAN design reference guide</i> available at the following website: <a href="http://h18006.www1.hp.com/products/storage-works/san/documentation.html">http://h18006.www1.hp.com/products/storage-works/san/documentation.html</a></li></ul>	<input type="checkbox"/>

## Installing HP MPIO EVA DSM

You can install HP MPIO EVA DSM on a stand-alone system or on a clustered system. The installation procedure depends on the current configuration of your system.

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

- [Installing HP MPIO EVA DSM on a stand-alone system](#)
- [Installing HP MPIO EVA DSM on a clustered system](#)

### Installing HP MPIO EVA DSM on a stand-alone system

You can install the HP MPIO EVA DSM software prior to connecting to the hardware. To install on a stand-alone system, complete the following steps:

1. Complete the pre-installation checklist (Table 1) and the pre-installation procedure, see [Preparing for installation](#).
2. Ensure that only a single path is connected to the storage devices.
3. Run `Launch.exe` from the installation location.
4. In the launch window, click **Install HP MPIO Full Featured DSM for EVA4x00/6x00/8x00 family of Disk Arrays**.
5. Follow the on-screen instructions to complete the installation.
6. Reboot the system.
7. Add the redundant paths to the storage devices.

---

 **NOTE:**

For Microsoft Windows Server 2008 – Server Core (x86 and x64) and Microsoft Windows Server 2008 R2 – Server Core (IA64 and x64), you can run `Launch.exe` from the installation location, using the command prompt.

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## Installing HP MPIO EVA DSM on a clustered system

To install HP MPIO EVA DSM on a clustered system, complete the following steps:

---

 **NOTE:**

On a clustered system, you must install HP MPIO EVA DSM on one node at a time. Repeat this on all the nodes in a cluster.

---

1. Complete the pre-installation checklist ([Table 1](#)) and the pre-installation procedure, see [Preparing for installation](#).
2. Using the 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. Disable failback for all the groups containing resources managed by the current node.
3. Install HP MPIO EVA DSM on the current node by following the steps 2–7 from the procedure provided for [Installing HP MPIO EVA DSM on a stand-alone system](#).
4. Using Cluster Administrator, resume the current cluster node.

---

 **NOTE:**

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

---

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

## Upgrading HP MPIO EVA DSM

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

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

- [Upgrading HP MPIO EVA DSM on a stand-alone system](#)
- [Upgrading HP MPIO EVA DSM on a clustered system](#)

### Upgrading HP MPIO EVA DSM on a stand-alone system

To upgrade HP MPIO EVA DSM from a previous version on a stand-alone system, complete the following steps:

1. Complete the pre-installation checklist ([Table 1](#)) and the pre-installation procedure, see [Preparing for installation](#).
2. Run `Launch.exe` from the installation location.
3. In the launch window, click **Install HP MPIO Full Featured DSM for EVA4x00/6x00/8x00 family of Disk Arrays**.
4. Select the upgrade option.
5. Follow the on-screen instructions to complete the upgrade.
6. Reboot the system.

## Upgrading HP MPIO EVA DSM on a clustered system

To upgrade HP MPIO EVA DSM from a previous version to the current version on a clustered system, complete the following steps:



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### NOTE:

On a clustered system, HP MPIO EVA DSM must be upgraded on one node at a time for all nodes in the cluster.

---

1. Complete the pre-installation checklist ([Table 1](#)) and the pre-installation procedure, see [Preparing for installation](#).
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. Disable failback for all groups containing resources managed by the current node.
3. Upgrade HP MPIO EVA DSM on the current node by following steps 2–6 from the procedure provided for [Upgrading HP MPIO EVA DSM on a stand-alone system](#).
4. Using Cluster Administrator, resume the current cluster node.



---

### NOTE:

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

---

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

## Migrating HP MPIO EVA DSM from Windows Server 2003 to Windows Server 2008

To migrate HP MPIO EVA DSM from Windows Server 2003 to Windows Server 2008, complete the following steps:

1. Back up all user data.
2. Install or upgrade to HP MPIO EVA DSM 4.01.00. For more information, see [Chapter 1](#).

3. Upgrade to Windows Server 2008.
4. Double-click the batch file (depending on your operating system):
  - For Windows Server 2008 x86:  
<Target\_Dir>\x86\Win2k8Upgrade.bat
  - For Windows Server 2008 IA64:  
<Target\_Dir>\ia64\Win2k8Upgrade.bat
  - For Windows Server 2008 x64:  
<Target\_Dir>\amd64\Win2k8Upgrade.bat

---

 **NOTE:**

For more information on upgrading the operating system of a clustered system from Windows Server 2003 to Windows Server 2008, see <http://support.microsoft.com/kb/935197>.

---

## Removing HP MPIO EVA DSM

To remove HP MPIO EVA DSM, you must re-configure the SAN and reboot your system.

---

 **CAUTION:**

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

---

To remove HP MPIO EVA DSM, 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 or one-storage array, HP recommends removing redundant cable connections.
  - If the storage continues to be accessed by multiple paths, use switch zoning to establish single path connection.

---

 **NOTE:**

Ensure you perform steps 1 and 2 before proceeding further.

---

3. Select **Start > Settings > Control Panel > Add or Remove Programs**.
4. Select **HP MPIO Full Featured DSM for EVA4x00/6x00/8x00 family of Disk Arrays** from the Remove Program drop-down list.
5. Click **Remove** and follow the on-screen instructions.

The system displays a cautionary statement advising of the potential data loss or corruption that may 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.

---

 **NOTE:**

For Windows Server 2008 – Server Core and Microsoft Windows Server 2008 R2 – Server Core, go to the installation location from the command prompt and run `Launch.exe`. Select **Remove > Remove all installed components**, to remove HP MPIO EVA DSM.

---

## Using silent installation

You can execute the silent installation from the installation location on your computer or from a network drive. It installs the HP MPIO EVA 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 the following:

- [Installing HP MPIO EVA DSM](#)
- [Upgrading HP MPIO EVA DSM](#)
- [Removing HP MPIO EVA DSM](#)
- [Creating response files for silent mode operations](#)

Syntax:

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

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

Following is 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 <code>setup.iss</code> 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 which is used to obtain the response file and write the `MPSInstallLog.txt` (provided the directory has the write permission enabled).

- For 32 bit systems: `<Default_Target_Dir> = C:\Program Files\Hewlett-Packard\HP MPIO DSM\EVA DSM`
- For 64 bit systems: `<Default_Target_Dir> = C:\Program Files (x86)\Hewlett-Packard\HP MPIO DSM\EVA DSM`

`<User_Target_Dir>`= a directory on the system on which the new installation is to be done or the 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 EVA DSM

To perform a silent installation of HP MPIO EVA DSM, complete the following steps:

1. Make a copy of the `new.iss` file in the installation location with the name `setup.iss`.
2. Choose one of the following options:
  - To install into the default directory for 64 bit systems, in lines 27 and 32 of the `setup.iss` file, replace `C:\Program Files\Hewlett-Packard\HP MPIO DSM\EVA DSM` with `C:\Program Files (x86)\Hewlett-Packard\HP MPIO DSM\EVA DSM`.
  - To install into the user specified directory for both 32 and 64 bit systems, in lines 27 and 32 of the `setup.iss` file, replace `szDir = <Default_Target_Dir>` with `szDir = <User_Target_Dir>`.
3. Choose one of the following options:
  - To install the Microsoft MPIO Framework component along with the DSM component, use the renamed default `setup.iss` file.
  - To install only the DSM component (when the Microsoft MPIO Framework already exists on your system), edit the renamed default `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`.
4. If you want to avoid the automatic reboot feature, edit the `setup.iss` file as follows:
  - a. In line 50, replace `Result=6` with `Result=1`.
  - b. In line 51, replace `BootOption=3` with `BootOption=0`.

## Upgrading HP MPIO EVA DSM

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

1. Make a copy of the `setup.iss` file in the installation location with the name `setup.iss`.
2. 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 default `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`.
3. If you want to avoid the automatic reboot feature, edit the `setup.iss` file as follows:
  - a. In line 39, replace `Result=6` with `Result=1`.
  - b. In line 40, replace `BootOption=3` with `BootOption=0`.

## Removing HP MPIO EVA DSM

To remove HP MPIO EVA DSM, complete the following steps:

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

## Creating response files for silent mode operations

The installation kit contains the following response files (`.iss` files): `new.iss`, `uninstall.iss` and `update.iss` that are used to install, remove, and upgrade the software. In addition to these, you can create your own customized response files for operations such as modify or repair, by selecting or unselecting the different combination of the components.

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 to perform the same silent mode operation across multiple systems.

To create the 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. This invokes the GUI installation in the record mode.
2. Select the responses in each screen and run through the installation. The response file is created at the following location: `%WINDDIR%\setup.iss`, where, `%WINDIR%` is the Windows installation directory.

---

 **NOTE:**

When selecting the response on each screen, do not click **BACK** and modify the selection. In such a case, the response file needs to be generated again. Use this `setup.iss` file to perform the same silent mode operation on multiple systems across the same platform.

---

## Setting up boot from SAN

You can set up HP MPIO EVA DSM to boot externally from a SAN that uses HP StorageWorks HBAs and RAID arrays. Booting the system from an external device offers the following advantages:

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

Booting from a SAN requires specific setup procedures based on the specific software solutions, HBA firmware, and boot BIOS versions. See the following document for detailed information about booting from a SAN:

- *Booting HP ProLiant servers from a storage area network application notes*, available at:  
<http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00580093/c00580093.pdf>



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# 2 Support for load balancing in Failover Cluster Server environment for Windows Server 2008 and Windows Server 2008 R2

Load balancing for the cluster devices is enabled by default and cannot be turned OFF.

This section describes the following:

- [Recovering inaccessible disk devices](#)

## Recovering inaccessible disk devices

If there is a stray reservation on a disk device, the device becomes inaccessible to the host systems connected to it. This is because the strong reservation type (persistent reservations) supports load balancing in clusters.

You can use the persistent reservations clear utility that comes with HP MPIO EVA DSM package to remove the stray reservations. For more information on how to use this utility, see [HP MPIO EVA DSM persistent reservations clear utility](#).

---

### NOTE:

For Microsoft Windows Server 2008 and Microsoft Windows Server 2008 R2 Failover cluster to work properly, set the array host mode on the HP CommandView EVA to "Microsoft Windows LH" or set custom host mode to "00000004198009A8".

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# 3 Load balancing

Load Balancing is used to distribute I/O request across multiple paths to a logic unit for optimal usage of paths and improve I/O performance. Depending on the load balancing policy set for a logic unit, an appropriate path is selected based on the statistics over that path. The DSM currently supports the following five load balance policies.

**Table 2 Load balancing policies**

Round Robin (RR)	This policy assigns equal priority to all the paths available for a device and routes I/O request to each path in order.
Shortest Queue Service Time (SQST)	This policy selects the path based on the service time for the outstanding I/O requests and chooses the path with the least outstanding I/O service time for the incoming I/O request. This is the default policy set by the DSM.
Shortest Queue Requests (SQR)	This policy selects the path with least outstanding I/O requests.
Shortest Queue Bytes (SQB)	This policy selects the path with least outstanding I/O bytes.
No Load Balance (NLB)	This policy does not implement any I/O load balancing. However, the DSM selects a path to service all the I/O requests if preferred path is not set.

---

 **NOTE:**

- All devices that are part of the logical unit group have the same load balancing policy.
- Unique preferred path can be set for the devices that are part of the Logical Unit Group; that is, different preferred paths can be set for members of a logical unit group as long as they are set on the same controller.
- The load balancing policy for a given LUN is persistent across host system reboots.

You can modify the load balancing policy for a given LUN either through the HP MPIO DSM Manager or HP DSM CLI. See [Chapter 4](#) for more information.

---

## Subset based load balancing

The HP MPIO DSM implements subset based load balancing algorithms that allows only a selected set of paths to be used for I/O requests. The subset setting is supported on a per logical unit basis and works in conjunction with the load balancing policies supported by the DSM.

By default, subset setting is disabled for the newly discovered LUN. If the newly discovered LUN is part of any logical unit group, the subset setting of the existing group prevails.

---

 **NOTE:**

- All devices that are part of the logical unit group, have the same subset setting.
- The subset setting is not applicable for devices that have the `No Load Balancing` policy enabled.
- The subset setting for a given LUN is persistent across Load Balance policies and host system re-boots.
- The paths that are part of the subset are reported as "Active" and other paths are reported as "Available".

You can modify (enable or disable and add or remove paths) the subset setting for a given LUN through the HP DSM CLI. The current version of HPDSM Manager does not support subset setting operations. For more information, see [Chapter 4](#).

---

## Use case scenarios

Following are some scenarios where subset based load balance settings are used:

---

 **NOTE:**

In a host system, for the multipath solution to function properly, all the devices must be accessible through all the available paths.

---

1. Using subset setting to group paths for devices based on its usage— When a particular device has to use only a set of paths for I/O, enable subset for that device to include only the required paths. This could be used in the following cases:
  - When high performing paths are required by devices running critical applications. The other available paths can be used by non-critical applications.
  - When some paths needs to be exclusively used by a particular device, excluding these paths from the subset members of other devices.
2. Using subset setting during maintenance in a fabric— When a set of components in a fabric (like switches, and HBAs) are under maintenance and the paths leading through these components are not to be used for I/O, you can enable subset to exclude the paths for that device until maintenance is complete.

## Adaptive Load Balance

The HP MPIO EVA DSM implements array specific load balancing algorithms that utilize certain features supported by the disk arrays, to deliver better performance for host I/O requests. The Adaptive Load Balance (ALB) setting is supported on a per logical unit basis and works in conjunction with the load balancing policies supported by the DSM.

By default, ALB is disabled for the newly discovered LUN. If the newly discovered LUN is part of any logical unit group, the ALB setting of the existing group prevails.

---

 **NOTE:**

- All devices that are part of the Logical Unit Group, has the same ALB setting.
- The ALB setting is not applicable for devices that have the `No Load Balancing` policy enabled.
- The ALB setting for a given LUN is persistent across host system reboots.

You can modify (enable or disable) the ALB setting for a given LUN either through the HP MPIO DSM Manager or HP DSM CLI. For more information, see [Chapter 4](#).

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# 4 Managing storage arrays using the HP MPIO EVA DSM with the CLI utility

The command line interface utility (CLI) of HP MPIO EVA DSM enables you to monitor and manage multipathing devices. This chapter describes the following CLI commands:

- [hpdsm devices](#)
- [hpdsm devices all](#)
- [hpdsm paths device](#)
- [hpdsm set device policy](#)
- [hpdsm set device subset path](#)
- [hpdsm set device alb](#)
- [hpdsm set device path](#)
- [hpdsm cleanup device](#)
- [hpdsm notify](#)
- [hpdsm help](#)
- [Commands to manage the HP EVA DSM parameters](#)

## 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 **port, bus, target, and LUN.**

---

**Example:**

```
hpdsm devices
```

Device#	Device Name	Serial No.	Active Paths	Policy	Disk#	P.B.T.L
1	HP HSV210	600508B400101F6A000070001D950000	9	SQST	Disk 1	4.0.1.1
2	HP HSV210	600508B400101F6A000070001D9B0000	9	SQST-Subset	Disk 2	4.0.1.2

hpdsm devices

3	HP HSV210	600508B400101F6A000070001DA10000	9	RR- Sub- set	Disk 3	4.0.1.3
4	HP HSV210	600508B400101F6A000070001E160000	9	SQR	Disk 4	3.0.2.4
5	HP HSV210	600508B400101F6A000070001E1C0000	9	NLB	Disk 5	2.0.2.5
6	HP HSV210	600508B400101F6A000070001E220000	9	NLB	Disk 6	2.0.2.6
7	HP HSV210	600508B400101F6A000070001E280000	9	SQST- Subset	Disk 7	3.0.2.7
8	HP HSV210	600508B400101F6A000070001E2E0000	9	SQST	Disk 8	3.0.2.8

## hpdsm devices all

Syntax: `hpdsm devices all`

The `hpdsm devices all` command displays the information of the device, followed by their path information 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 port, bus, target, and LUN.

### Example:

```
hpdsm devices all
```

```
Total No. of Devices:2
```

```
Device#:1
```

```
Device Name:HP HSV210
```

```
Serial No:6005008B400101F6000170000
```

```
Active Paths: 2
```

```
Policy:NLB
```

```
Disk 1
```

```
P.B.T.L:2.0.3.1
```

```
ALB:N
```

Path#	Controller Port#	State	HBA Slot#	RTP	P.B.T.L	
1	P898DX- AAQQO101U-2	Active	7	00010002	3.0.2.3	*
2	P898DX- AAQQO101U-2	Available	6	00010002	4.0.2.3	

```

Device#:2                               Device Name:HP HSV210
Serial No:6005008B400101F600018000    Active Paths: 2
Policy:SQST-Subset                       Disk 2
P.B.T.L:3.0.2.4                          ALB:N

```

Path#	Controller Port#	State	HBA Slot#	RTP	P.B.T.L
1	P898DXAAQQ0101U-2	Active	7	00010002	3.0.2.4
2	P898DXAAQQ0101U-2	Available	6	00010002	4.0.2.4

## 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 **port**, **bus**, **target**, and **LUN**.
- 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.
- The HBA Slot # is displayed as "0" for iSCSI devices.

```
hpdsm paths device=1
```

Path#	Controller Port#	State	HBA Slot#	RTP	P.B.T.L
1	P8398DXAAQQ013-4	Active	4	00020008	2.0.2.1
2	P8398DXAAQQ013-3	Active	4	00020007	2.0.5.1
3	P8398DXAAQQ010-1	Active	4	00010001	2.0.6.1
4	P8398DXAAQQ010-1	Active	4	00010001	3.0.0.1
5	P8398DXAAQQ013-3	Available	4	00020007	3.0.1.1
6	P8398DXAAQQ013-4	Available	4	00020008	3.0.2.1
7	P8398DXAAQQ010-1	Available	3	00010001	4.0.0.1

## hpdsm set device policy

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

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

The `hpdsm set device policy` command sets the load-balancing policy for device `x` or for `all` device, depending on the input parameter specified.

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



---

**NOTE:**

You cannot change the load balance policy for the devices using SCSI-2 reservations in an MSCS environment.

---

**Example:**

```
hpdsm set device=1 policy=rr

Device Name: HP HSV210

Device Serial No.:600508B400101F6A000070001D950000

Change Load Balance policy (y/n)? y
```

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

**Example:**

```
hpdsm set device=all policy=rr
```

Successful for all the devices. Verify by issuing "hpdsm devices" command.

## hpdsm set device subset path

**Syntax:** `hpdsm set device=x subset=add/remove path=all`

**Syntax:** `hpdsm set device=x subset=add/remove path=y,z`

**Syntax:** `hpdsm set device=all subset=add/remove path=all`

**Syntax:** `hpdsm set device=all subset=add/remove path=y,z`

The `hpdsm set device=x subset=add/remove path=y,z` command enables or disables subset setting for device `x` and adds or removes `y, z` to or from the subset, as shown in the following example:

### Example:

```
hpdsm set device=1 subset=add path=all
```

```
Device Name:HP HSV210
```

```
Device Serial No.:600508B400101F6A000070001D950000
```

```
Change Subset setting (y/n)? y
```

```
Subset setting changed. Verify by using "hpdsm devices" command.
```

### Example:

```
hpdsm set device=all subset=remove path=1
```

```
Successful for all the devices. Verify by using "hpdsm devices" command.
```

---

#### NOTE:

- `device=all` changes the SUBSET STATE for all the devices
  - `path=all` enables or disables subset settings and adds or removes all the available paths to or from the subset
  - Paths in the failed state cannot be added or removed to or from the subset
  - `hpdsm set device=x subset=remove path=all` will cleanup the failed paths and disables the subset
- 

## hpdsm set device alb

**Syntax:** `hpdsm set device=x alb=y/n`

**Syntax:** `hpdsm set device=all alb=y/n`

The `hpdsm set device alb` command changes the Adaptive Load Balance setting for the device `x` or for all the devices depending on the input parameter specified.

### Example:

```
hpdsm set device=1 alb=y
```

```
Device Name:HP HSV210
```

```
Device Serial No.:600508B400101F6A000070001D950000
```

```
Change Adaptive Load Balance setting (y/n)? y
```

```
ALB settings changed. Verify by using "hpdsm devices" command.
```

Example:

```
hpdsm set device=all alb=y
```

Successful for all the devices. Verify by using "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 following example.

---

 **NOTE:**

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

---

```
hpdsm set device=1 path=1

Device Name:HP HSV210

Device Serial No.:600508B400101F6A000070001D950000

Controller Port No.:P8398DXAAQQ013

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`

Syntax: `hpdsm cleanup device=all`

The `hpdsm cleanup device` command allows you to clean up the failed path information for a specified device `x` or for all the devices, depending on the input parameters specified, as shown in the following example.

Example:

```
hpdsm cleanup device=1

Device Name:HP HSV210

Device Serial No.:600508B400101F6A000070001D950000

Cleanup the failed path information for this LUN (y/n)? y
```

Cleanup Succeeded. Verify by issuing "hpdsm devices" command.

**Example:**

```
hpdsm cleanup device=all
```

Successful for all the devices. 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 elapses 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 (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:
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_LAST_PATH_FAILURE	4	Detects that the last path to the device is 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 occurs.

The above notifications are sent by the HP MPIO EVA 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

```
TIME:7/4/2008,15:20:08:13)
Received HPDSM_PATH_FAILOVER:600508B400101F6A000070001D950000;from hpeaadsm
(TIME:7/4/2008,15:20:08:42)
Received HPDSM_PATH_FAILOVER:600508B400101F6A000070001D9B0000;from hpeaadsm
(TIME:7/4/2008,15:20:08:65)
Received HPDSM_PATH_FAILOVER:600508B400101F6A000070001DA10000;from hpeaadsm
(TIME:7/4/2008,15:20:08:88)
Received HPDSM_PATH_FAILOVER:600508B400101F6A000070001E160000;from hpeaadsm
(TIME:7/4/2008,15:20:08:114)
Received HPDSM_DEVICE_REMOVAL:600508B400101F6A000070001D950000;from hpeaadsm
(TIME:7/4/2008,15:20:09:21)
Received HPDSM_DEVICE_REMOVAL:600508B400101F6A000070001D9B0000;from hpeaadsm
(TIME:7/4/2008,15:20:09:48)
Received HPDSM_DEVICE_REMOVAL:600508B400101F6A000070001DA10000;from hpeaadsm
(TIME:7/4/2008,15:20:09:61)
Received HPDSM_DEVICE_REMOVAL:600508B400101F6A000070001E160000;from hpeaadsm
(TIME:7/4/2008,15:20:09:88)
Received HPDSM_NEW_DEVICE:600508B400101F6A000070001D950000;from hpeaadsm
(TIME:7/4/2008,15:20:09:97)
Received HPDSM_NEW_DEVICE:600508B400101F6A000070001D9B0000;from hpeaadsm
(TIME:7/4/2008,15:20:09:126)
Received HPDSM_ADDITIONAL_PATH:600508B400101F6A000070001D950000;from hpeaadsm
(TIME:7/4/2008,15:20:10:43)
Received HPDSM_ADDITIONAL_PATH:600508B400101F6A000070001D9B0000;from hpeaadsm
(TIME:7/4/2008,15:20:10:55)
Received HPDSM_ADDITIONAL_PATH:600508B400101F6A000070001DA10000;from hpeaadsm
(TIME:7/4/2008,15:20:10:99)
Received HPDSM_ADDITIONAL_PATH:600508B400101F6A000070001E160000;from hpeaadsm
(TIME:7/4/2008,15:20:11:127)
Received HPDSM_PREF_PATH_CHANGED:600508B4000149A200031000003C0000;from hpeaadsm
(TIME:7/4/2008,15:20:12:810)
Received HPDSM_LB_POLICY_CHANGED:600508B4000149A200031000003C0000;from hpeaadsm
(TIME:7/4/2008,15:20:13:554)
Received HPDSM_SUBSET_SETTING_CHANGED:600508B4000149A200031000003C0000;from hpeaadsm
```

## hpdsm help

Syntax: hpdsm help

The hpdsm help command displays help information for the CLI.

## Commands to manage the HP EVA DSM parameters

Following are some of the commands to manage the HP EVA DSM parameters:

- HPDSM SetDefaultLBPolicy device
- HPDSM SetDefaultALBSetting device
- HPDSM SetDefaultUsePR device
- HPDSM SetDefaultDsmLoadOrder device

- HPDSM GetDefaultLBPolicy device
- HPDSM GetDefaultALBSetting device
- HPDSM GetDefaultUsePR device
- HPDSM GetDefaultDsmLoadOrder device
- HPDSM ReStoreFactoryDefaults device

For more information on using these commands run the `hpdsm help` command.

---

# 5 Support and other resources

## Contacting HP

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support/>

Before contacting HP, collect the following information

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

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

HP recommends that customers sign up online using the Subscriber's choice website:

<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.

## Related information

### Documents

In addition to this guide, see *HP MPIO Full Featured DSM for EVA4x00/6x00/8x00 family of Disk Arrays 4.01.00 release notes*.

You can find this document from the Manuals page of the HP Business Support Center website:

<http://www.hp.com/support/manuals>

In the Storage section, click **Storage Software** and then select **Other Multi-Path Software-Windows** under **Storage Infrastructure Software** list.

### Websites

For additional information, see the following HP websites:

- <http://www.hp.com>
- <http://www.hp.com/go/storage>

- <http://www.hp.com/support/>
- <http://www.docs.hp.com>

## Documentation feedback

HP welcomes your feedback.

To make comments and suggestions about product documentation, please send a message to [storagedocsFeedback@hp.com](mailto:storagedocsFeedback@hp.com). All submissions become the property of HP.

## Product feedback

To make comments and suggestions about HP MPIO Full Featured DSM for EVA4x00/6x00/8x00 family of Disk Arrays 4.01.00, please send a message to [multipathfeedback@hp.com](mailto:multipathfeedback@hp.com).

## Document conventions and symbols

**Table 4 Document conventions**

Convention	Element
Blue text: <a href="#">Table 4</a>	Cross-reference links and e-mail addresses
Blue, underlined text: <a href="http://www.hp.com">http://www.hp.com</a>	Website addresses
<b>Bold text</b>	<ul style="list-style-type: none"> <li>• Key that are pressed</li> <li>• Text typed into a GUI element, such as a box</li> <li>• GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes</li> </ul>
<i>Italic text</i>	Text emphasis
Monospace text	<ul style="list-style-type: none"> <li>• File and directory names</li> <li>• System output</li> <li>• Code</li> <li>• Commands, their arguments, and argument values</li> </ul>
<i>Monospace, italic text</i>	<ul style="list-style-type: none"> <li>• Code variables</li> <li>• Command variables</li> </ul>
Monospace, bold text	Emphasized monospace text

---

△ **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.

---



---

# A Software components

This appendix describes the following components of HP MPIO EVA DSM:

- [Drivers](#)
- [User mode components](#)

## Drivers

The HP MPIO EVA DSM components include the following multipath drivers:

- [Microsoft MPIO 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 DSM driver](#)
  - `HPEAADM.SYS` is the HP DSM driver for EVA 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 include:

- [HP MPIO DSM manager GUI](#)
- [HP MPIO EVA DSM command line interface \(CLI\)](#)
- [HP MPIO EVA DSM performance monitoring provider](#)
- [HP MPIO EVA DSM persistent reservations clear utility](#)

## 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.

---

 **NOTE:**

To manage HP MPIO EVA DSM 4.01.00 and later, use HP MPIO DSM Manager 4.01.01 or later.

---

## HP MPIO EVA DSM command line interface (CLI)

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

## HP MPIO EVA DSM performance monitoring provider

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

To start the performance monitoring, complete the following steps:

1. Select **Start > Programs > Hewlett-Packard > EVA DSM > Path Performance**.  
Alternatively, you can select **Start > Run** and execute the command `perfmon /wmi`.
2. Select **HP DSM High Performance Provider** performance object and add the appropriate counters.

## HP MPIO EVA DSM persistent reservations clear utility

The HP MPIO EVA DSM persistent reservations clear utility enables you to view and clear reservations on the disk(s) that are left behind due to incorrect installation or removal of the HP MPIO EVA DSM or an unsuccessful cluster node failover.

---

### △ CAUTION:

Using this utility incorrectly may result in loss of data and/or incorrect operation of MSCS/Failover Cluster. HP shall not be liable for problems resulting from the incorrect use of this utility or for solving them.

---

The persistent reservations clear utility is located on the HP MPIO EVA DSM installation media, and gets copied to the HP MPIO EVA DSM installation directory during the installation. You can run this utility either on a system that has HP MPIO EVA DSM installed or on a system where HP MPIO EVA DSM is not installed.

To run this utility on a system where the HP MPIO EVA DSM is installed, complete the following steps:

1. Select **Start > Programs > Hewlett-Packard > EVA DSM > HPDSM PR Utility**.
2. Enter the command `hprutil /?` at the command prompt to display the instructions for using this utility.

The `hprutil` utility supports the following commands:

- `hprutil devices`
- `hprutil clear device`
- `hprutil help`

## hprutil devices

Syntax: `hprutil devices`

The `hprutil devices` command displays details of reservations on the devices as shown in the following example. If there are no devices present, the following message is displayed: `No Devices Found`.

### Example:

```
hpprutil devices
```

Device#	Device Name	SCSI Address	Reservation	NT Disk#
1	COMPAQ HSV210	3.0.2.1	PR	Disk1
2	COMPAQ HSV210	3.0.2.2	PR	Disk2

## hpprutil clear device

**Syntax:** `hpprutil clear device=x`

**Syntax:** `hpprutil clear device=m n`

The `hpprutil clear device` command clears the reservation present on device `x`, or clears the reservation present on devices starting from `m` to `n` (both inclusive), depending on the input parameter specified.

### Example:

```
hpprutil clear device=1
```

```
The requested operation is in progress. Please wait.
```

```
HPPRUTIL will attempt to clear the reservation on device 1.
```

```
Are you sure you want to continue (y/n)? y
```

```
Attempting to clear the reservation on device 1... Successfully cleared the reservation on device.
```

```
hpprutil clear device=1 2
```

```
The requested operation is in progress. Please wait.
```

```
HPPRUTIL will attempt to clear the reservation on device 1 to 2.
```

```
Are you sure you want to continue (y/n)? y
```

```
Attempting to clear the reservation on device 1... Successfully cleared the reservation on device.
```

```
Attempting to clear the reservation on device 2... Successfully cleared the reservation on device.
```

## hpprutil help

**Syntax:** `hpprutil help`

The `hpprutil help` command displays help information for `hpprutil`.



# B Multipathing driver event log messages

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

This appendix describes the following event log messages:

- [MPIO.SYS event log messages](#)
- [HP MPIO EVA 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	<i>Pseudo-LUN</i> created.	MPIO created a new pseudo-LUN (a new disk physical device object).	N/A
2	Added device to <i>pseudo-LUN</i> .	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 <i>DSM_name</i> claimed support for it.	N/A
16	A fail-over on <i>pseudo-LUN</i> 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	<i>Pseudo-LUN</i> 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

Event ID	Message	Description	Contents of the data dump
18	A Single Path Fail-Over is being attempted on <i>pseudo-LUN</i> .	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 <i>device</i> due to lack of memory.	Resource allocation failed during an attempted fail-over, and failover is not currently active.	The Path ID of the failing device
20	A Path Verification request to a device on <i>pseudo-LUN</i> that is controlled by <i>DSM_name</i> 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 <i>device_object</i> 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 <i>pseudo-LUN</i> was attempted, however the attempt failed. The devices will be removed.	A failover attempt on a pseudo-LUN has failed. This indicates that the DSM did not return a valid path after the call to <i>InvalidatePath</i> .	N/A
23	All paths have failed. <i>Pseudo-LUN</i> 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 <i>device</i> 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 <i>pseudo-LUN</i> 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

Event ID	Message	Description	Contents of the data dump
32	<i>DSM_name</i> failed to return a Path to <i>pseudo-LUN</i> .	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	<i>DSM_name</i> 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	<i>DSM_names</i> supplied an invalid ID for an operation on <i>notification_type</i> .	MPIO received a DSMNotification call, but is unable to map the DSM ID to a device.	DSM ID
36	An unknown DSM supplied an invalid ID for an operation on <i>pseudo-LUN</i> .	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	<i>DSM_name</i> is attempting an operation on <i>pseudo-LUN</i> . The Type is noted in the dump data.	<i>DSM_name</i> has called DSMNotification on a pseudo-LUN.	The type of notification called by DSM
38	A device under <i>pseudo-LUN</i> , being controlled by <i>DSM_name</i> 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 EVA DSM event log messages

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

**Table 6 HP MPIO EVA 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.
107	The preferred path (SCSI address Y) for multipath capable disk X has been restored.	A previously selected path has been restored as the preferred path for I/O operation. X represents the serial number of the disk. Y is the SCSI address of the preferred path that has been restored.
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 a 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 is the version of the DSM.
110	The previously failed multipath capable disk X has recovered.	This message is logged when the DSM detects that a previously failed (inoperative) multipath capable disk with serial number X has recovered and become operational again.
111	The removal event notifications for multipath capable disk X have been disabled upon request.	This event is logged when generation of removal event notifications (Event IDs 304, 302 and 108) for the multipath capable disk with serial number X has been disabled upon request in the DSM.

Event ID	Message	Description
112	The removal event notifications for multipath capable disk X have been enabled upon request.	This event is logged when generation of removal event notifications (Event IDs 304, 302 and 108) for the multipath capable disk with serial number X has been enabled upon request in the DSM.
113	The multipath capable disk X has been disconnected from the system.	This event is logged when the last path to a multipath capable disk with serial number X (for which the generation of removal event notifications have been disabled) is disconnected from the system.
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.
305	The DSM timed out on the I/O throttle operation for multipath capable disk X.	The DSM was unable to successfully throttle I/O activity within the time-out period, for the specified multipath disk. X represents the serial number of the disk.
307	An unrecoverable failure has occurred on multipath capable disk X. This disk will henceforth not be accessible.	This event is logged when the DSM detects an unrecoverable failure of a multipath capable disk, and requests MPIO not to support this disk going forward. Please check the status of the multipath capable disk at the array end. X represents the serial number of the disk.

Event ID	Message	Description
308	An unrecoverable failure has occurred on multipath capable disk X. The data on this disk may be inaccessible.	This event is logged when the DSM detects an unrecoverable failure of a multipath capable disk. Although the disk may be visible to the system, the data on the disk may not be accessible. Please check the status of the multipath capable disk at the array end. X represents the serial number of the disk.
309	The DSM cannot manage multipath capable disk X (SCSI address Y) due to an internal error.	The DSM cannot manage multipath capable disk X (SCSI address Y) due to an internal error.
310	The DSM detected an inconsistency in the path (SCSI address Y) to the multipath capable disk X. This path has been marked as failed.	This event is logged when DSM detects that the path with SCSI address Y is inconsistent and is moved to failed state. X represents the serial number of the disk. A reboot of the system is recommended to overcome this inconsistent state.

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# C Troubleshooting

This appendix discusses some of the common problems that you may encounter while using the HP MPIO DSM. It also describes how to troubleshoot these problems.

**Problem:** HP MPIO DSM fails to load and displays a yellow-bang in the Device Manager screen.

**Solution:** To troubleshoot this problem, complete one of the following:

- Verify if the Multi-path I/O feature is enabled. If not, enable the Multi-path I/O feature. To do this, go to **Server Manager** and select **Features > Add Features > Multipath I/O**.

**Problem:** HP MPIO DSM fails to manage the disk devices.

**Solution:** To troubleshoot this problem, complete the following steps:

1. Verify if the device is currently under multipath support. To do this, go to **Control Panel**, and select **MPIO**. Verify the existence of the corresponding device hardware ID in the MPIO-ed devices tab.
2. If the hardware ID is not present, do one of the following:
  - Add the corresponding hardware ID.
  - Reinstall the HP MPIO DSM.

**Problem:** HP DSM CLI and HP MPIO DSM Manager fail to list devices after upgrade from Windows Server 2003 to Windows Server 2008.

**Solution:** Double-click one of the following batch files (depending on your operating system):

- For Windows Server 2008 x86:  
<Target\_Dir>\x86\Win2k8Upgrade.bat
- For Windows Server 2008 IA64:  
<Target\_Dir>\ia64\Win2k8Upgrade.bat
- For Windows Server 2008 x64:  
<Target\_Dir>\amd64\Win2k8Upgrade.bat  
where <Target\_Dir> is the location where the DSM is installed.

**Problem:** HPDSM CLI or HP MPIO DSM Manager does not display the output.

**Solution:** Run the following commands from the command prompt pointed to the folder "C:\Program Files\Common Files\Hewlett-Packard\HP MPIO DSM\COMMON FILES\mof" and register the following mof files:

- mofcomp hpwmi.mof
- mofcomp HPDSMHighPerfProvider.mof
- mofcomp -N:root\wmi LBPolicy.mof
- mofcomp -N:root\wmi mpdisk.mof
- mofcomp -N:root\wmi mpio.mof
- mofcomp -N:root\wmi pdo.mof

**Problem:** Host does not display devices when you change the configurations of a LUN and/or HBA from the management application. The configuration changes include adding or removing LUN(s) to or from the host, or changing the HBA relation.

**Solution:** Re-scan the host by performing the following steps:

1. Go to **Device Manager>Disk drives**.
2. Right-click and select **Scan for hardware changes**.

**Problem:** The vendor specific load balance policy (Shortest Queue Service Time) may not be displayed in the MPIO property sheet.

**Solution:** Use HP DSM CLI or HP MPIO DSM Manager to set the vendor specific load balance policy.

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# Glossary

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

<b>ALB</b>	Adaptive Load Balance (ALB) is a feature provided by the EVA DSM that utilizes certain features supported by the array, to deliver better performance for host I/O requests.
<b>controller</b>	A hardware device that facilitates communication between a host and one or more LUNs organized as an array.
<b>DSM</b>	Device Specific Module
<b>fabric</b>	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.
<b>failover</b>	The automatic substitution of a functionally equivalent system component for a component that has failed.
<b>HBA</b>	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)
<b>host</b>	The computer system on which the Multipath software is running.
<b>LUN</b>	Logical Unit Number. The actual unit number assigned to a device by the RAID system controller.
<b>mode</b>	<p>A user-selectable parameter that specifies path behavior during normal and failure conditions. Paths can be set to one of the following modes:</p> <ul style="list-style-type: none"><li>• <b>Preferred</b> — 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 <code>none</code>.</li><li>• <b>Alternate</b> — Indicates a path that is used for device access and I/O activities when the preferred path fails.</li></ul>
<b>MPIO</b>	Multipathing Input/Output.
<b>path</b>	A virtual communication route that enables data and commands to pass between a host server and a storage device.
<b>path state</b>	<p>An attribute that describes the operational condition of a path. A path can exist in one of the following states:</p> <ul style="list-style-type: none"><li>• <b>Active</b> — Path is currently used for the I/O stream or is available for load balancing.</li></ul>

- **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 states 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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