Abstract
This document describes the hardware and general operation of the P63x0/P65x0 EVA.
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- Is the enclosure rear fault LED amber?  
- Is the power on/standby button LED amber?  
- Is the power supply LED amber?  
- Is the I/O module fault LED amber?  
- Is the fan LED amber?  

### Effects of a disk drive failure

- Compromised fault tolerance

### Factors to consider before replacing disk drives

### Automatic data recovery (rebuild)

- Time required for a rebuild  
- Failure of another drive during rebuild  
- Handling disk drive failures

### iSCSI module diagnostics and troubleshooting

### iSCSI and iSCSI/FCoE diagnostics

- Locate the iSCSI or iSCSI/FCoE module  
- iSCSI or iSCSI/FCoE module’s log data  
- iSCSI or iSCSI/FCoE module statistics  
- Troubleshoot using HP P6000 Command View  

### Issues and solutions

- Issue: HP P6000 Command View does not discover the iSCSI or iSCSI/FCoE modules
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1 P63x0/P65x0 EVA hardware

The P63x0/P65x0 EVA contains the following components:

- **EVA controller enclosure** — Contains HSV controllers, power supplies, cache batteries, and fans. Available in FC and iSCSI options

**NOTE:** Compared to older models, the HP P6350 and P6550 employ newer batteries and a performance enhanced management module. They require XCS Version 11000000 or later on the P6350 and P6550 and HP P6000 Command View Version 10.1 or later on the management module. The P6300 and P6350 use the HSV340 controller while the P6500 and P6550 use the HSV360 controller.

- **SAS disk enclosure** — Contains disk drives, power supplies, fans, midplane, and I/O modules.
- **Y-cables** — Provides dual-port connectivity to the EVA controller.
- **Rack** — Several free standing racks are available.

**SAS disk enclosures**

6 Gb SAS disk enclosures are available in two models:

- **Small Form Factor (SFF):** Supports 25 SFF (2.5 inch) disk drives
- **Large Form Factor (LFF):** Supports 12 LFF (3.5 inch) disk drives
- **The SFF model is M6625; the LFF model is M6612.**

**Small Form Factor disk enclosure chassis**

**Front view**

1. Rack-mounting thumbscrew
2. Disk drive in bay 9
3. UID push button and LED
4. Enclosure status LEDs
Rear view

1. Power supply 1
2. Power supply 2
3. Fan 1
4. I/O module A
5. I/O module B
6. Fan 2
7. UID push button and LED
8. Enclosure status LEDs
9. Power push button and LED

Drive bay numbering

Disk drives mount in bays on the front of the enclosure. Bays are numbered sequentially from top to bottom and left to right. Bay numbers are indicated on the left side of each drive bay.

Large Form Factor disk enclosure chassis

Front view

1. Rack-mounting thumbscrew
2. Disk drive in bay 6
3. UID push button and LED
4. Enclosure status LEDs
Rear view

![Rear view diagram]

1. Power supply 1  
2. Power supply 2  
3. Fan 1  
4. I/O module A  
5. I/O module B  
6. Fan 2  
7. UID push button and LED  
8. Enclosure status LEDs  
9. Power push button and LED

Drive bay numbering

Disk drives mount in bays on the front of the enclosure. Bays are numbered sequentially from top to bottom and left to right. A drive-bay legend is included on the left bezel.

![Drive bay numbering diagram]

Disk drives

Disk drives are hot-pluggable. A variety of disk drive models are supported for use.

Disk drive LEDs

Two LEDs indicate drive status.

**NOTE:** The following image shows a Small Form Factor (SFF) disk drive. LED patterns are the same for SFF and LFF disk drives.
16 P63x0/P65x0 EVA hardware

### Disk drive blanks

To maintain the proper enclosure air flow, a disk drive or a disk drive blank must be installed in each drive bay. The disk drive blank maintains proper airflow within the disk enclosure.

### Front status and UID module

The front status and UID module includes status LEDs and a unit identification (UID) button.

#### Front UID module LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>LED icon</th>
<th>LED color</th>
<th>LED status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Health</td>
<td>![Health Icon]</td>
<td>Green</td>
<td>Off</td>
<td>No power</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blinking</td>
<td>Enclosure is starting up and not ready, performing POST</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>Normal, power is on</td>
</tr>
<tr>
<td>2. Fault</td>
<td>![Fault Icon]</td>
<td>Amber</td>
<td>Off</td>
<td>Normal, no fault conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blinking</td>
<td>A fault of lesser importance was detected in the enclosure chassis or modules</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>A fault of greater importance was detected in the enclosure chassis or modules</td>
</tr>
<tr>
<td>3. UID</td>
<td>![UID Icon]</td>
<td>Blue</td>
<td>Off</td>
<td>Not being identified or power is off</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blinking</td>
<td>Unit is being identified from the management utility</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>Unit is being identified from the UID button being pushed</td>
</tr>
</tbody>
</table>
Unit identification (UID) button

The unit identification (UID) button helps locate an enclosure and its components. When the UID button is activated, the UID on the front and rear of the enclosure are illuminated.

**NOTE:** A remote session from the management utility can also illuminate the UID.

- **To turn on the UID light,** press the UID button. The UID light on the front and the rear of the enclosure will illuminate solid blue. (The UID on cascaded storage enclosures are not illuminated.)
- **To turn off an illuminated UID light,** press the UID button. The UID light on the front and the rear of the enclosure will turn off.

Power supply module

Two power supplies provide the necessary operating voltages to all controller enclosure components. If one power supply fails, the remaining power supply is capable of operating the enclosure. (Replace any failed component as soon as possible.)

**NOTE:** If one of the two power supply modules fails, it can be hot-replaced.

Power supply LED

One LED provides module status information.

<table>
<thead>
<tr>
<th>LED status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>No power</td>
</tr>
<tr>
<td>On</td>
<td>Normal, no fault conditions</td>
</tr>
</tbody>
</table>

Fan module

Fan modules provide cooling necessary to maintain proper operating temperature within the disk enclosure. If one fan fails, the remaining fan is capable of cooling the enclosure. (Replace any failed component as soon as possible.)

**NOTE:** If one of the two fan modules fail, it can be hot-replaced.
Fan module LED

One bi-color LED provides module status information.

<table>
<thead>
<tr>
<th>LED color</th>
<th>LED status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>No power</td>
</tr>
<tr>
<td>Green</td>
<td>Blinking</td>
<td>The module is being identified</td>
</tr>
<tr>
<td></td>
<td>Solid</td>
<td>Normal, no fault conditions</td>
</tr>
<tr>
<td>Amber</td>
<td>Blinking</td>
<td>Fault conditions detected</td>
</tr>
<tr>
<td></td>
<td>Solid</td>
<td>Problems detecting the module</td>
</tr>
</tbody>
</table>

I/O module

The I/O module provides the interface between the disk enclosure and the host. Each I/O module has two ports that can transmit and receive data for bidirectional operation.

1. Manufacturing diagnostic port
2. SAS Port 1
3. SAS Port 2
4. Double 7-segment display
5. I/O module LEDs
I/O module LEDs

LEDs on the I/O module provide status information about each I/O port and the entire module.

**NOTE:** The following image illustrates LEDs on the Small Form Factor I/O module.

<table>
<thead>
<tr>
<th>LED</th>
<th>LED icon</th>
<th>LED color</th>
<th>LED status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SAS Port Link</td>
<td>n/a</td>
<td>Green</td>
<td>Off</td>
<td>No cable, no power, or port not connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blinking</td>
<td>The port is being identified by an application client</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>Healthy, active link</td>
</tr>
<tr>
<td>2. SAS Port Error</td>
<td>n/a</td>
<td>Amber</td>
<td>Off</td>
<td>Normal, no errors detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blinking</td>
<td>Error detected by application client</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>Error, fault conditions detected on the port by the I/O module</td>
</tr>
<tr>
<td>3. 7–segment display</td>
<td>n/a</td>
<td>n/a</td>
<td>Off</td>
<td>No cable, no power, enclosure not detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Number</td>
<td>The enclosure box number</td>
</tr>
<tr>
<td>4. UID</td>
<td>UID</td>
<td>Blue</td>
<td>Off</td>
<td>Not being identified or no power</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>Module is being identified, from the management utility</td>
</tr>
<tr>
<td>5. Health</td>
<td></td>
<td>Green</td>
<td>Off</td>
<td>No power or firmware malfunction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blinking</td>
<td>Enclosure is starting up and not ready, performing POST</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>Normal, power is on</td>
</tr>
<tr>
<td>6. Fault</td>
<td></td>
<td>Amber</td>
<td>Off</td>
<td>Normal, no fault conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blinking</td>
<td>A fault of lesser importance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>A fault of greater importance, I/O failed to start</td>
</tr>
</tbody>
</table>

Rear power and UID module

The rear power and UID module includes status LEDs, a unit identification (UID) button, and the power on/standby button.
Rear power and UID module LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>LED icon</th>
<th>LED color</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. UID</td>
<td>UID</td>
<td>Blue</td>
<td>Off</td>
<td>Not being identified or no power</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>On</td>
<td>Unit is being identified, either from the UID button being pushed or from the management utility</td>
</tr>
<tr>
<td>2. Health</td>
<td></td>
<td>Green</td>
<td>Off</td>
<td>No power</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blinking</td>
<td>Enclosure is starting up and not ready, performing POST</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>Normal, power is on</td>
</tr>
<tr>
<td>3. Fault</td>
<td></td>
<td>Amber</td>
<td>Off</td>
<td>Normal, no fault conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blinking</td>
<td>A fault of lesser importance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solid</td>
<td>A fault of greater importance</td>
</tr>
<tr>
<td>4. On/Standby</td>
<td></td>
<td>Green</td>
<td>Solid</td>
<td>Power is on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Amber</td>
<td>Standby power</td>
</tr>
</tbody>
</table>

20 P63x0/P65x0 EVA hardware
Unit identification (UID) button

The unit identification (UID) button helps locate an enclosure and its components. When the UID button is activated, the UID on the front and rear of the enclosure are illuminated.

**NOTE:** A remote session from the management utility can also illuminate the UID.

- *To turn on the UID light,* press the UID button. The UID light on the front and the rear of the enclosure will illuminate solid blue. (The UID on cascaded storage enclosures are not illuminated.)
- *To turn off an illuminated UID light,* press the UID button. The UID light on the front and the rear of the enclosure will turn off.

Power on/standby button

The power on/standby button applies either full or partial power to the enclosure chassis.

- *To initially power on the enclosure,* press and hold the on/standby button for a few seconds, until the LEDs begin to illuminate.
- *To place an enclosure in standby,* press and hold the on standby button for a few seconds, until the on/standby LED changes to amber.

**NOTE:** System power to the disk enclosure does not completely shut off with the power on/standby button. The standby position removes power from most of the electronics and components, but portions of the power supply and some internal circuitry remain active. To completely remove power from the system, disconnect all power cords from the device.

SAS cables

These disk enclosures use cables with mini-SAS connectors for connections to the controller and cascaded disk enclosures.

Controller enclosure

For both the P63x0 EVA and P65x0 EVA, a single enclosure contains a management module and two controllers. Two interconnected controllers ensure that the failure of a controller component does not disable the system. One controller can fully support an entire system until the defective controller, or controller component, is repaired. The controllers have an 8 Gb host port capability. The P63x0 and P65x0 EVA controllers are available in FC, FC-iSCSI, and iSCSI/FCoE versions. The controller models are HSV340 (for the P63x0) and HSV360 (for the P65x0).

*Figure 1 (page 22)* shows the bezel of the controller enclosure. *Figure 2 (page 22)* shows the front of the controller enclosure with the bezel removed.
Each P63x0 controller contains two SAS data ports. Each P65x0 controller contains four SAS data ports (made possible using Y-cables—one cable with two outputs). For both the P63x0 and P65x0 EVA, the FC controller adds four 8 Gb FC ports (Figure 3 (page 23)); the FC-iSCSI controller adds two 8 Gb FC ports and four 1 GbE iSCSI ports (Figure 4 (page 23)); and the iSCSI/FCoE controller adds two 8 Gb FC ports and two 10 GbE iSCSI/FCoE ports (Figure 5 (page 24)).
Figure 3 P6000 EVA FC controller enclosure (rear view)

1. Power supply 1
2. Controller 1
3. Management module status LEDs
4. Ethernet port
5. Management module
6. Controller 2
7. Rear UID push button
8. Enclosure status LEDs
9. Enclosure power push button
10. Power supply 2
11. DP-A and DP-B, connection to back end (storage)
12. FP1 and FP2, connection to front end (host or SAN)
13. FP3 and FP4, connection to front end (host or SAN)
14. Manufacturing diagnostic port
15. Controller status and fault LEDs

Figure 4 P6000 EVA FC-iSCSI controller enclosure (rear view)

1. Power supply 1
2. Controller 1
3. Management module status LEDs
4. Ethernet port
5. Management module
6. Controller 2
7. Rear UID push button
8. Enclosure status LEDs
9. Enclosure power push button
10. Power supply 2
11. Serial port
12. SW Management port
13. DP-A and DP-B, connection to back end (storage)
14. 1GbE ports 1–4
15. FP3 and FP4, connection to front end (host or SAN)
16. Manufacturing diagnostic port
17. Controller status and fault LEDs
18. iSCSI module recessed maintenance button
Figure 5 P6000 EVA iSCSI/FCoE controller enclosure (rear view)

1. Power supply 1
2. Controller 1
3. Management module status LEDs
4. Ethernet port
5. Management module
6. Controller 2
7. Rear UID push button
8. Enclosure status LEDs
9. Enclosure power push button
10. Power supply 2
11. 10GbE ports 1–2
12. DP-A and DP-B, connection to back-end (storage)
13. Serial port
14. FP3 and FP4, connection to front end (host or SAN)
15. SW Management port
16. Manufacturing diagnostic port
17. Controller status and fault LEDs
18. iSCSI/FCoE recessed maintenance button

NOTE: The only difference between the P63x0 and P65x0 controllers is the number indicated below the SAS data ports (DP-A and DP-B). On the P63x0, 1 is displayed (Figure 6 (page 24)). On the P65x0, 1 | 2 is displayed (Figure 7 (page 24)).

Figure 6 P63x0 data port numbering

Figure 7 P65x0 data port numbering

Controller status indicators

The status indicators display the operational status of the controller. The function of each indicator is described in Table 3 (page 25). During initial setup, the status indicators might not be fully operational.

Each port on the rear of the controller has an associated status indicator located directly above it. Table 1 (page 25) lists the port and its status description for the HSV340. Table 2 (page 25) lists the port and its status descriptions for the HSV340 FC-iSCSI.
**Table 1 HSV340/360 controller port status indicators**

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre Channel host ports</td>
<td>• Green — Normal operation</td>
</tr>
<tr>
<td></td>
<td>• Amber — No signal detected</td>
</tr>
<tr>
<td></td>
<td>• Off — No SFP (^1) detected or the Direct Connect HP P6000 Control Panel setting is incorrect</td>
</tr>
<tr>
<td>Fibre Channel device ports</td>
<td>• Green — Normal operation</td>
</tr>
<tr>
<td></td>
<td>• Amber — No signal detected or the controller has failed the port</td>
</tr>
<tr>
<td></td>
<td>• Off — No SFP (^1) detected</td>
</tr>
</tbody>
</table>

\(^1\) On copper Fibre Channel cables, the SFP is integrated into the cable connector.

**Table 2 HSV340/360 FC-iSCSI controller port status indicators**

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre Channel switch ports</td>
<td>• Green on — Normal operation or loopback port</td>
</tr>
<tr>
<td></td>
<td>• Green flashing — Normal online I/O activity</td>
</tr>
<tr>
<td></td>
<td>• Amber on — Faulted port, disabled due to diagnostics or Portdisable command</td>
</tr>
<tr>
<td></td>
<td>• Amber flashing — Port with no synchronization, receiving light but not yet online or segmented port</td>
</tr>
<tr>
<td></td>
<td>• Off — No SFP (^1), no cable, no license detected.</td>
</tr>
<tr>
<td>Fibre Channel device ports</td>
<td>• Green — Normal operation</td>
</tr>
<tr>
<td></td>
<td>• Amber — No signal detected or the controller has failed the port</td>
</tr>
<tr>
<td></td>
<td>• Off — No SFP (^1) detected</td>
</tr>
</tbody>
</table>

\(^1\) On copper Fibre Channel cables, the SFP is integrated into the cable connector.

**Controller status LEDs**

Figure 8 (page 25) shows the location of the controller status LEDs; Table 3 (page 25) describes them.

**NOTE:** Figure 8 (page 25) shows an FC-iSCSI controller, however the LEDs for the FC, FC-iSCSI, and iSCSI/FCoE controllers are identical, unless specifically noted.

**Figure 8 Controller status LEDs**

![Controller status LEDs](image)

**Table 3 Controller status LEDs**

<table>
<thead>
<tr>
<th>Item</th>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UID</td>
<td>Blue LED identifies a specific controller within the enclosure or identifies the FC-iSCSI or iSCSI/FCoE module within the controller.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Green LED indicates controller health. LED flashes green during boot and becomes solid green after boot.</td>
</tr>
</tbody>
</table>
### Table 3 Controller status LEDs (continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>![Alert symbol]</td>
<td>Flashing amber indicates a controller termination, or the system is inoperative and attention is required. Solid amber indicates that the controller cannot reboot, and that the controller should be replaced. If both the solid amber and solid blue LEDs are lit, the controller has completed a warm removal procedure, and can be safely swapped.</td>
</tr>
<tr>
<td>4</td>
<td>MEZZ</td>
<td>Only used on the FC-iSCSI and iSCSI/FCoE controllers (not on the FC controller). Amber LED indicates the FC-iSCSI or iSCSI/FCoE module status that is communicated to the array controller. Slow flashing amber LED indicates an IP address conflict on the management port. Solid amber indicates an FC-iSCSI or iSCSI/FCoE module critical error, or shutdown.</td>
</tr>
<tr>
<td>5</td>
<td>![Green LED symbol]</td>
<td>Green LED indicates write-back cache status. Slow flashing green LED indicates standby power. Solid green LED indicates cache is good with normal AC power applied.</td>
</tr>
<tr>
<td>6</td>
<td>![Amber LED symbol]</td>
<td>Amber LED indicates DIMM status. The LED is off when DIMM status is good. Slow flashing amber indicates DIMMs are being powered by battery (during AC power loss). Flashing amber with the chassis powered up indicates a degraded battery. Solid amber with the chassis powered up indicates a failed battery.</td>
</tr>
</tbody>
</table>

### Power supply module

Two power supplies provide the necessary operating voltages to all controller enclosure components. If one power supply fails, the remaining power supply is capable of operating the enclosure. (Replace any failed component as soon as possible.)

**NOTE:** If one of the two power supply modules fails, it can be hot-replaced.

### Figure 9 Power supply

![Power supply diagram](image)

1. Power supply
2. AC input connector
3. Latch
4. Status indicator (dual-color: amber and green)
5. Handle
### Table 4 Power supply LED status

<table>
<thead>
<tr>
<th>LED color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amber</td>
<td>- The power supply is powered up but not providing output power.</td>
</tr>
<tr>
<td></td>
<td>- The power supply is plugged into a running chassis, but is not receiving AC input power (the fan and LED on the supply receive power from the other power supply in this situation).</td>
</tr>
<tr>
<td>Green</td>
<td>Normal, no fault conditions</td>
</tr>
</tbody>
</table>

**Battery module**

Battery modules provide power to the controllers in the enclosure.

**Figure 10 Battery module pulled out**


Each battery module provides power to the controller directly across from it in the enclosure.

### Table 5 Battery status indicators

<table>
<thead>
<tr>
<th>Status indicator</th>
<th>Fault indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On left—Green</td>
<td>Solid green</td>
<td>Normal operation.</td>
</tr>
<tr>
<td></td>
<td>Blinking</td>
<td>Maintenance in progress.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Amber is on or blinking, or the enclosure is powered down.</td>
</tr>
<tr>
<td>On right—Amber</td>
<td>Solid amber</td>
<td>Battery failure; no cache hold-up. Green will be off.</td>
</tr>
<tr>
<td></td>
<td>Blinking amber</td>
<td>Battery degraded; replace soon. Green will be off. (Green and amber are not on simultaneously except for a few seconds after power-up.)</td>
</tr>
</tbody>
</table>

**Fan module**

Fan modules provide the cooling necessary to maintain the proper operating temperature within the controller enclosure. If one fan fails, the remaining fan is capable of cooling the enclosure.
1. Green—Fan normal operation LED  
2. Amber—Fan fault LED

### Table 6 Fan status indicators

<table>
<thead>
<tr>
<th>Status indicator</th>
<th>Fault indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On left—Green</td>
<td>Solid green</td>
<td>Normal operation.</td>
</tr>
<tr>
<td></td>
<td>Blinking</td>
<td>Maintenance in progress.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Amber is on or blinking, or the enclosure is powered down.</td>
</tr>
<tr>
<td>On right—Amber</td>
<td>On</td>
<td>Fan failure. Green will be off. (Green and amber are not on simultaneously except for a few seconds after power-up.)</td>
</tr>
</tbody>
</table>

### Management module

The HP P6000 Control Panel provides a direct interface to the management module within each controller. From the HP P6000 Control Panel you can display storage system status and configuration information, shut down the storage system, and manage the password. For tasks to perform with the HP P6000 Control Panel, see the [HP P6000 Control Panel online help](#).

The HP P6000 Control Panel provides two levels of administrator access and an interface for software updates to the management module. For additional details about the HP P6000 Control Panel, see the [HP P6000 Control Panel online help](#).

**NOTE:** The HP P6350 and P6550 employ a performance-enhanced management module as well as new batteries. This requires HP P6000 Command View 10.1 or later on the management module and XCS 11000000 or later on the P6350 and P6550.

### iSCSI and iSCSI/FCoE recessed maintenance button

The iSCSI and iSCSI/FCoE recessed maintenance button is the only manual user-accessible control for the module. It is used to reset or to recover a module. This maintenance button is a multifunction momentary switch and provides the following functions, each of which causes a reboot that completes in less than one minute:

- Reset the iSCSI or iSCSI/FCoE module and boot the primary image
- Reset the iSCSI or iSCSI/FCoE MGMT port IP address
- Enable iSCSI or iSCSI/FCoE MGMT port DHCP address
- Reset the iSCSI or iSCSI/FCoE module to factory defaults
Reset the iSCSI or iSCSI/FCoE module and boot the primary image

Use a pointed nonmetallic tool to briefly press the maintenance button for a duration of two seconds and release it. The iSCSI or iSCSI/FCoE module responds as follows:

1. The amber MEZZ status LED illuminates once.

   **NOTE:** Holding the maintenance button for more than two seconds but less than six seconds or until the MEZZ status LED illuminates twice, boots a secondary image, and is not recommended for field use.

2. After approximately two seconds, the power-on self-test begins, and the MEZZ status LED is turned off.
3. When the power-on self test is complete, the MEZZ status LED illuminates and flashes once per second.

Reset iSCSI or iSCSI/FCoE MGMT port IP address

Reset and restore the MGMT port IP address to the default of 192.168.0.76 or 192.168.0.82 depending on the controller 1 or 2 position.

   **NOTE:** Setting the IP address by this method is not persistent. To make the change persistent, use the command line interface (CLI).

   1. Use a pointed nonmetallic tool to briefly press the maintenance button. Release the button after six seconds and observe six extended flashes of the MEZZ status LED.
2. The iSCSI or iSCSI/FCoE module boots and sets the MGMT port to IP address 192.168.0.76 or 192.168.0.82 depending on the controller 1 or 2 position.

Enable iSCSI or iSCSI/FCoE MGMT port DHCP address

Resets the iSCSI or iSCSI/FCoE module and configure the MGMT port to use DHCP to access its IP address. Enabling DHCP by this method is not persistent. To make the change persistent, use the CLI.

   1. Use a pointed nonmetallic tool to brief press the maintenance button. Release the button after seven seconds and observe seven extended flashes of the MEZZ status LED.
2. The iSCSI or iSCSI/FCoE module boots and configures the MGMT port for DHCP.

Reset the iSCSI or iSCSI/FCoE module to factory defaults

This resets the iSCSI or iSCSI/FCoE module and restores it to the factory default configuration, with reset passwords, MGMT port IP address set to either 192.168.0.76 or 192.168.0.82 depending on the controller 1 or 2 position, Disables iSCSI ports with no IP address, erases presentations, and erases discovered initiators and targets).

   1. Use a pointed nonmetallic tool to press the maintenance button. Release the button after twenty seconds and observe twenty extended flashes of the MEZZ status LED.
2. The iSCSI or iSCSI/FCoE module boots and is restored to factory defaults.

HSV controller cabling

All data cables and power cables attach to the rear of the controller. Adjacent to each data connector is a two-colored link status indicator. Table 1 (page 25) identifies the status conditions presented by these indicators.

   **NOTE:** These indicators do not indicate whether there is communication on the link, only whether the link can transmit and receive data.

The data connections are the interfaces to the disk drive enclosures, the other controller, and the fabric. Fiber optic cables link the controllers to the fabric, and, if an expansion cabinet is part of the configuration, link the expansion cabinet drive enclosures to the loops in the main cabinet.
Y-cables (Figure 12 (page 30)) are used to connect the P6500 EVA and enable each controller data port to act as two ports.

**Figure 12 P6500 Y-cable**

Storage system racks

All storage system components are mounted in a rack. Each configuration includes one controller enclosure holding both controllers (the controller pair) and the disk enclosures. Each controller pair and all associated disk enclosures form a single storage system. The rack provides the capability for mounting standard 483 mm (19 in) wide controller and disk enclosures.

**NOTE:** Racks and rack-mountable components are typically described using “U” measurements. “U” measurements are used to designate panel or enclosure heights. The “U” measurement is a standard of 41 mm (1.6 in).

The racks provide the following:

- Unique frame and rail design—Allows fast assembly, easy mounting, and outstanding structural integrity.
- Thermal integrity—Front-to-back natural convection cooling is greatly enhanced by the innovative multi-angled design of the front door.
- Security provisions—The front and rear door are lockable, which prevents unauthorized entry.
- Flexibility—Provides easy access to hardware components for operation monitoring.
- Custom expandability—Several options allow for quick and easy expansion of the racks to create a custom solution.

Rack configurations

The standard rack for the P63x0/P65x0 EVA is the 42U HP 10000 Intelligent Series rack. The P63x0/P65x0 EVA is also supported with 22U, 36U, 42U 5642, and 47U racks. The 42U 5642 is a field-installed option. The 47U rack must be assembled on site because the cabinet height creates shipping difficulties.

For more information on HP rack offerings for the P63x0/P65x0 EVA see:
Power distribution units

AC power is distributed to the rack through a dual Power Distribution Unit (PDU) assembly mounted at the bottom rear of the rack (modular PDU) or on the rack (monitored PDU). The modular PDU may be mounted back-to-back either vertically (AC receptacles facing down and circuit breaker switches facing up) or horizontally (AC receptacles facing front and circuit breaker switches facing rear). For information about PDU support with the P63x0/P65x0 EVA, see the HP P6300/P6500 Enterprise Virtual Arrays QuickSpecs. For details and specifications about specific PDU models, see the HP Power Distribution Units website:


The standard power configuration for any HP Enterprise Virtual Array rack is the fully redundant configuration. Implementing this configuration requires:

- Two separate circuit breaker-protected, 30-A site power sources with a compatible wall receptacle.
- One dual PDU assembly. Each PDU connects to a different wall receptacle.
- Four to eight (depending on the rack) Power Distribution Modules (PDMs) per rack. All PDMs are located (side by side in pairs) on the left side of the rack. Each set of PDMs connects to a different PDU.
  - Eight PDMs for 42U, 47 U, and 42U 5642 racks
  - Six PDMs for 36U racks
  - Four PDMs for 22U racks
- Each controller enclosure has two power supplies:
  - Controller PS 1 connects to the left PDM in a PDM pair with a black, 66 cm (26 inch) power cord.
  - Controller PS 2 connects to the right PDM in a PDM pair with a gray, 152 cm (60 inch) power cord.

NOTE: Drive enclosures, when purchased separately, include one 50 cm black cable and one 50 cm gray cable.

The configuration provides complete power redundancy and eliminates all single points of failure for both the AC and DC power distribution.

PDU 1

PDU 1 connects to AC PDM 1–1 to 1–4.

A PDU 1 failure:
- Disables the power distribution circuit
- Removes power from the left side of the PDM pairs
- Disables drive enclosures PS 1
- Disables the controller PS 1

PDU 2

PDU 2 connects to AC PDM 2–1 to 2–4.
A PDU 2 failure:
- Disables the power distribution circuit
- Removes power from the right side of the PDM pairs
- Disables drive enclosures PS 2
- Disables the controller PS 2

PDMs

Depending on the rack, there can be up to eight PDMs mounted in the rear of the rack:
- The PDMs on the left side of the PDM pairs connect to PDU 1.
- The PDMs on the right side of the PDM pairs connect to PDU 2.

Each PDM has seven AC receptacles. The PDMs distribute the AC power from the PDUs to the enclosures. Two power sources exist for each controller pair and disk enclosure. If a PDU fails, the system will remain operational.

⚠️ **CAUTION:** The AC power distribution within a rack ensures a balanced load to each PDU and reduces the possibility of an overload condition. Changing the cabling to or from a PDM could cause an overload condition. HP supports only the AC power distributions defined in this user guide.

**Figure 13 Rack PDM**

1. Power receptacles
2. AC power connector
Rack AC power distribution

The power distribution in a rack is the same for all variants. The site AC input voltage is routed to the dual PDU assembly mounted in the bottom rear of the rack. Each PDU distributes AC to a maximum of four PDMs mounted in pairs on the left vertical rail (see Figure 14 (page 33)).

- PDMs 1–1 through 1–4 connect to receptacles A through D on PDU A. Power cords connect these PDMs to the left power supplies on the disk enclosures (disk PS 1) and to the left power supply on the controller enclosure (controller PS 1).
- PDMs 2–1 through 2–4 connect to receptacles A through D on PDU B. Power cords connect these PDMs to the right power supplies on the disk enclosures (disk PS 2) and to the right power supply on the controller enclosure (controller PS 2).

**NOTE:** The locations of the PDUs and the PDMs are the same in all racks.

---

Moving and stabilizing a rack

⚠️ **WARNING!** The physical size and weight of the rack requires a minimum of two people to move. If one person tries to move the rack, injury may occur.

To ensure stability of the rack, always push on the lower half of the rack. Be especially careful when moving the rack over any bump (e.g., door sills, ramp edges, carpet edges, or elevator openings). When the rack is moved over a bump, there is a potential for it to tip over.
Moving the rack requires a clear, uncarpeted pathway that is at least 80 cm (31.5 in) wide for the 60.3 cm (23.7 in) wide, 42U rack. A vertical clearance of 203.2 cm (80 in) should ensure sufficient clearance for the 200 cm (78.7 in) high, 42U rack.

**CAUTION:** Ensure that no vertical or horizontal restrictions exist that would prevent rack movement without damaging the rack.

Make sure that all four leveler feet are in the fully raised position. This process will ensure that the casters support the rack weight and the feet do not impede movement.

Each rack requires an area 600 mm (23.62 in) wide and 1000 mm (39.37 in) deep (see Figure 15 (page 34)).

**Figure 15 Single rack configuration floor space requirements**

1. Front door
2. Rear door
3. Rack width 600 mm
4. Service area width 813 mm
5. Rear service area depth 300 mm
6. Rack depth 1000 mm
7. Front service area depth 406 mm
8. Total rack depth 1706 mm

If the feet are not fully raised, complete the following procedure:

1. Raise one foot by turning the leveler foot hex nut counterclockwise until the weight of the rack is fully on the caster (see Figure 16 (page 35)).
2. Repeat Step 1 for the other feet.
3. Carefully move the rack to the installation area and position it to provide the necessary service areas (see Figure 15 (page 34)).

To stabilize the rack when it is in the final installation location:
1. Use a wrench to lower the foot by turning the leveler foot hex nut clockwise until the caster does not touch the floor. Repeat for the other feet.
2. After lowering the feet, check the rack to ensure it is stable and level.
3. Adjust the feet as necessary to ensure the rack is stable and level.


2 P63x0/P65x0 EVA operation

Best practices

For useful information on managing and configuring your storage system, see the HP P6300/P6500 Enterprise Virtual Array configuration best practices white paper available at: http://h18006.www1.hp.com/storage/arraywhitepapers.html

Operating tips and information

Reserving adequate free space

To ensure efficient storage system operation, reserve some unallocated capacity, or free space, in each disk group. The recommended amount of free space is influenced by your system configuration. For guidance on how much free space to reserve, see the HP P6300/P6500 Enterprise Virtual Array configuration best practices white paper.

Using SAS-midline disk drives

SAS-midline drives are designed for lower duty cycle applications such as near online data replication for backup. Do not use these drives as a replacement for EVA’s high performance, standard duty cycle, Fibre Channel drives. This practice could shorten the life of the drive.

Failback preference setting for HSV controllers

Table 7 (page 36) describes the failback preference setting for the controllers.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Point in time</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>No preference</td>
<td>At initial presentation</td>
<td>The units are alternately brought online to Controller 1 or to Controller 2.</td>
</tr>
<tr>
<td></td>
<td>On dual boot or controller resynch</td>
<td>If cache data for a LUN exists on a particular controller, the unit will be brought online there. Otherwise, the units are alternately brought online to Controller 1 or to Controller 2.</td>
</tr>
<tr>
<td></td>
<td>On controller failover</td>
<td>All LUNs are brought online to the surviving controller.</td>
</tr>
<tr>
<td></td>
<td>On controller failback</td>
<td>All LUNs remain on the surviving controller. There is no failback except if a host moves the LUN using SCSI commands.</td>
</tr>
<tr>
<td>Path A - Failover Only</td>
<td>At initial presentation</td>
<td>The units are brought online to Controller 1.</td>
</tr>
<tr>
<td></td>
<td>On dual boot or controller resynch</td>
<td>If cache data for a LUN exists on a particular controller, the unit will be brought online there. Otherwise, the units are brought online to Controller 1.</td>
</tr>
<tr>
<td></td>
<td>On controller failover</td>
<td>All LUNs are brought online to the surviving controller.</td>
</tr>
<tr>
<td></td>
<td>On controller failback</td>
<td>All LUNs remain on the surviving controller. There is no failback except if a host moves the LUN using SCSI commands.</td>
</tr>
<tr>
<td>Path B - Failover Only</td>
<td>At initial presentation</td>
<td>The units are brought online to Controller 2.</td>
</tr>
<tr>
<td></td>
<td>On dual boot or controller resynch</td>
<td>If cache data for a LUN exists on a particular controller, the unit will be brought online there. Otherwise, the units are brought online to Controller 2.</td>
</tr>
</tbody>
</table>
### Table 7 Failback preference settings (continued)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Point in time</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>On controller failover</td>
<td>All LUNs are brought online to the surviving controller.</td>
<td>Otherwise, the units are brought online to Controller 2.</td>
</tr>
<tr>
<td>On controller failback</td>
<td>All LUNs remain on the surviving controller. There is no failback except if a host moves the LUN using SCSI commands.</td>
<td>All LUNs remain on the surviving controller. After controller restoration, the units that are online to Controller 2 and set to Path A are brought online to Controller 1. This is a one-time occurrence. If the host then moves the LUN using SCSI commands, the LUN will remain where moved.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Path A · Failover/Failback</th>
<th>At initial presentation</th>
<th>The units are brought online to Controller 1.</th>
<th>Otherwise, the units are brought online to Controller 2.</th>
</tr>
</thead>
<tbody>
<tr>
<td>On dual boot or controller resynch</td>
<td>If cache data for a LUN exists on a particular controller, the unit will be brought online there. Otherwise, the units are brought online to Controller 1.</td>
<td>All LUNs remain on the surviving controller. After controller restoration, the units that are online to Controller 2 and set to Path A are brought online to Controller 1. This is a one-time occurrence. If the host then moves the LUN using SCSI commands, the LUN will remain where moved.</td>
<td></td>
</tr>
<tr>
<td>On controller failover</td>
<td>All LUNs are brought online to the surviving controller.</td>
<td>All LUNs remain on the surviving controller. After controller restoration, the units that are online to Controller 1 and set to Path B are brought online to Controller 2. This is a one-time occurrence. If the host then moves the LUN using SCSI commands, the LUN will remain where moved.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Path B · Failover/Failback</th>
<th>At initial presentation</th>
<th>The units are brought online to Controller 2.</th>
<th>Otherwise, the units are brought online to Controller 2.</th>
</tr>
</thead>
<tbody>
<tr>
<td>On dual boot or controller resynch</td>
<td>If cache data for a LUN exists on a particular controller, the unit will be brought online there. Otherwise, the units are brought online to Controller 2.</td>
<td>All LUNs remain on the surviving controller. After controller restoration, the units that are online to Controller 1 and set to Path B are brought online to Controller 2. This is a one-time occurrence. If the host then moves the LUN using SCSI commands, the LUN will remain where moved.</td>
<td></td>
</tr>
<tr>
<td>On controller failover</td>
<td>All LUNs are brought online to the surviving controller.</td>
<td>All LUNs remain on the surviving controller. After controller restoration, the units that are online to Controller 1 and set to Path B are brought online to Controller 2. This is a one-time occurrence. If the host then moves the LUN using SCSI commands, the LUN will remain where moved.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 8 Failback settings by operating system

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Default behavior</th>
<th>Supported settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP-UX</td>
<td>Host follows the unit¹</td>
<td>No preference Path A/B – Failover only Path A/B – Failover/Failback</td>
</tr>
<tr>
<td>IBM AIX</td>
<td>Auto failback done by the host</td>
<td>No preference Path A/B – Failover only Path A/B – Failover/Failback</td>
</tr>
<tr>
<td>Linux</td>
<td>Auto failback done by the host</td>
<td>No preference</td>
</tr>
</tbody>
</table>

Table 8 (page 37) describes the failback default behavior and supported settings when ALUA-compliant multipath software is running with each operating system. Recommended settings may vary depending on your configuration or environment.
Table 8 Failback settings by operating system (continued)

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Default behavior</th>
<th>Supported settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Path A/B – Failover only</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Path A/B – Failover/Failback</td>
</tr>
</tbody>
</table>

OpenVMS
Host follows the unit

Oracle Solaris
Host follows the unit

VMware
Host follows the unit

Windows
Failback performed on the host

1 If preference has been configured to ensure a more balanced controller configuration, the Path A/B – Failover/Failback setting is required to maintain the configuration after a single controller reboot.

Changing virtual disk failover/failback setting

Changing the failover/failback setting of a virtual disk may impact which controller presents the disk. Table 9 (page 38) identifies the presentation behavior that results when the failover/failback setting for a virtual disk is changed.

NOTE: If the new setting moves the presentation of the virtual disk to a new controller, any snapshots or snapclones associated with the virtual disk are also moved.

Table 9 Impact on virtual disk presentation when changing failover/failback setting

<table>
<thead>
<tr>
<th>New setting</th>
<th>Impact on virtual disk presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Preference</td>
<td>None. The disk maintains its original presentation.</td>
</tr>
<tr>
<td>Path A Failover</td>
<td>If the disk is currently presented on Controller 2, it is moved to Controller 1. If the disk is on Controller 1, it remains there.</td>
</tr>
<tr>
<td>Path B Failover</td>
<td>If the disk is currently presented on Controller 1, it is moved to Controller 2. If the disk is on Controller 2, it remains there.</td>
</tr>
<tr>
<td>Path A Failover/Failback</td>
<td>If the disk is currently presented on Controller 2, it is moved to Controller 1. If the disk is on Controller 1, it remains there.</td>
</tr>
<tr>
<td>Path B Failover/Failback</td>
<td>If the disk is currently presented on Controller 1, it is moved to Controller 2. If the disk is on Controller 2, it remains there.</td>
</tr>
</tbody>
</table>

Implicit LUN transition

Implicit LUN transition automatically transfers management of a virtual disk to the array controller that receives the most read requests for that virtual disk. This improves performance by reducing the overhead incurred when servicing read I/Os on the non-managing controller. Implicit LUN transition is enabled in all versions of XCS.
When creating a virtual disk, one controller is selected to manage the virtual disk. Only this managing controller can issue I/Os to a virtual disk in response to a host read or write request. If a read I/O request arrives on the non-managing controller, the read request must be transferred to the managing controller for servicing. The managing controller issues the I/O request, caches the read data, and mirrors that data to the cache on the non-managing controller, which then transfers the read data to the host. Because this type of transaction, called a proxy read, requires additional overhead, it provides less than optimal performance. (There is little impact on a write request because all writes are mirrored in both controllers’ caches for fault protection.)

With implicit LUN transition, when the array detects that a majority of read requests for a virtual disk are proxy reads, the array transitions management of the virtual disk to the non-managing controller. This improves performance because the controller receiving most of the read requests becomes the managing controller, reducing proxy read overhead for subsequent I/Os.

Implicit LUN transition is disabled for all members of an HP P6000 Continuous Access DR group. Because HP P6000 Continuous Access requires that all members of a DR group be managed by the same controller, it would be necessary to move all members of the DR group if excessive proxy reads were detected on any virtual disk in the group. This would impact performance and create a proxy read situation for the other virtual disks in the DR group. Not implementing implicit LUN transition on a DR group may cause a virtual disk in the DR group to have excessive proxy reads.

Recovery CD

HP does not ship the recovery CD with the HP P6350/P6550 EVA. You can download the image from the HP Software Depot at the following URL and burn a CD, if needed:

http://www.software.hp.com

Adding disk drives to the storage system

As your storage requirements grow, you may be adding disk drives to your storage system. Adding new disk drives is the easiest way to increase the storage capacity of the storage system. Disk drives can be added online without impacting storage system operation.

Consider the following best practices to improve availability when adding disks to an array:

- Set the add disk option to manual.
- Add disks one at a time, waiting a minimum of 60 seconds between disks.
- Distribute disks vertically and as evenly as possible to all the disk enclosures.
- Unless otherwise indicated, use the `SET DISK_GROUP` command in the HP Storage System Scripting Utility to add new disks to existing disk groups.
- Add disks in groups of eight.
- For growing existing applications, if the operating system supports virtual disk growth, increase virtual disk size. Otherwise, use a software volume manager to add new virtual disks to applications.

See the HP Disk Drive Replacement Instructions for the steps to add a disk drive. See “Replacement instructions” (page 85) for a link to this document.

Handling fiber optic cables

This section provides protection methods for fiber optic connectors.

Contamination of the fiber optic connectors on either a transceiver or a cable connector can impede the transmission of data. Therefore, protecting the connector tips against contamination or damage is imperative. The tips can be contaminated by touching them, by dust, or by debris. They can be damaged when dropped. To protect the connectors against contamination or damage, use the dust covers or dust caps provided by the manufacturer. These covers are removed during installation, and should be installed whenever the transceivers or cables are disconnected.
The transceiver dust caps protect the transceivers from contamination. **Do not discard the dust covers.**

⚠️ **CAUTION:** To avoid damage to the connectors, always install the dust covers or dust caps whenever a transceiver or a fiber cable is disconnected. Remove the dust covers or dust caps from transceivers or fiber cable connectors only when they are connected. **Do not discard the dust covers.**

To minimize the risk of contamination or damage, do the following:

- **Dust covers**—Remove and set aside the dust covers and dust caps when installing an I/O module, a transceiver or a cable. Install the dust covers when disconnecting a transceiver or cable.

One of the many sources for cleaning equipment specifically designed for fiber optic connectors is:

Alcoa Fujikura Ltd.
1-888-385-4587 (North America)
011-1-770-956-7200 (International)

### Storage system shutdown and startup

You can shut down the array from HP P6000 Command View or from the array controller.

The shutdown process performs the following functions in the indicated order:

1. Flushes cache
2. Removes power from the controllers
3. Disables cache battery power
4. Removes power from the drive enclosures
5. Disconnects the system from HP P6000 Command View

**NOTE:** The storage system may take several minutes (up to 15) to complete the necessary cache flush during controller shutdown when snapshots are being used. The delay may be particularly long if multiple child snapshots are used, or if there has been a large amount of write activity to the snapshot source virtual disk.

### Powering on disk enclosures

**IMPORTANT:** Always power up disk enclosures before controllers and servers. This ensures that the servers, during their discovery, see the enclosure as an operational device. If you do not power up the disk enclosures before powering up the controllers and servers, you will need to power down the servers, ensure that the disk enclosures are powered up, and then power back up the servers.

1. Apply power to each UPS.
2. Apply power to the disk enclosures by pressing and holding the power on/standby button on the rear of the disk enclosures until the system power LED illuminates solid green.
   The LED on the power on/standby button changes from amber to solid green, indicating that the disk enclosure has transitioned from a standby state to fully powered.
3. Wait a few minutes for the disk enclosures to complete their startup routines.

⚠️ **CAUTION:** If power is applied to the controller before the disk enclosures complete their startup routine, the array might not start properly.

4. Power on (or restart) the controller and allow the array to complete startup.
5. Using P6000 Command View, verify that each component is operating properly.
Powering off disk enclosures

⚠️ **CAUTION:** Be sure that the server controller is the first unit to be powered down and the last to be powered back up. Taking this precaution ensures that the system does not erroneously mark the disk drives as failed when the server is later restarted. It is recommended to perform this action with P6000 Command View (see below).

⚠️ **IMPORTANT:** If installing a hot-plug device, it is not necessary to power down the enclosure.

To power off a disk enclosure:
1. Power down any attached servers. See the server documentation.
2. Perform an orderly shutdown of the array controllers.
3. Allow all components to enter standby power mode. Note that not all indicators may be off.
4. Disconnect the power cords

The system is now powered down.

Shutting down the storage system from HP P6000 Command View

1. Start HP P6000 Command View.
2. Select the appropriate storage system in the Navigation pane.
   The Initialized Storage System Properties window for the selected storage system opens.
3. Click **Shut down**.
   The Shutdown Options window opens.
4. Under System Shutdown click **Power Down**. If you want to delay the initiation of the shutdown, enter the number of minutes in the Shutdown delay field.
   The controllers complete an orderly shutdown and then power off. The disk enclosures then power off. Wait for the shutdown to complete.
5. Turn off the power to the rack power distribution units. Even though the disk enclosures are powered off in Step 4, unless the power on the rack distribution units are turned off, the I/O modules remain powered on in a standby state.

Shutting down the storage system from the array controller

⚠️ **CAUTION:** Use this power off method for emergency shutdown only. This is not an orderly shutdown and cached data could be lost.

1. Push and hold the power switch button on the back panel of the P63x0/P65x0 EVA (see callout 9 in Figure 3 (page 23)).
2. Wait 4 seconds. The power button and the green LED start to blink.

   **NOTE:** Use this power off method for emergency shutdown only. This is not an orderly shutdown and cached data could be lost.

3. After 10 seconds, the power shuts down.

Starting the storage system

To start a storage system, perform the following steps:
1. Turn on the SAN switches and wait for all switches to complete the power-on boot process. It may be necessary to wait several minutes for this to complete.

   **NOTE:** Before applying power to the rack PDUs, ensure that the power switch on the controller enclosure is off.
2. Ensure all power cords are connected to the controller enclosure and disk enclosures. Apply power to the rack PDUs.
3. Apply power to the controller enclosure (rear panel on the enclosure). The disk enclosures will power on automatically. Wait for a solid green status LED on the controller enclosure and disk enclosures (approximately five minutes).
4. Wait (up to five minutes) for the array to complete its startup routine.
5. Apply power to the servers in the SAN with access to the array, start the operating system, and log in as administrator.

⚠️ CAUTION:
- If power is applied to a server and it attempts to boot off of an array that has not been powered on properly, the server will not start.
- If a New Hardware Found message appears when you power on a server, cancel the message and ensure that supported drivers are installed on the server.

6. Start HP P6000 Command View and verify connection to the storage system. If the storage system is not visible, click EVA Storage Network in the navigation pane, and then click Discover in the content pane to discover the array.

**NOTE:** If the storage system is still not visible, reboot the management server or management module to re-establish the communication link.

7. Check the storage system status using HP P6000 Command View to ensure everything is operating properly. If any status indicator is not normal, check the log files or contact your HP-authorized service provider for assistance.

There is a feature in the HP P6000 Control Panel that enables the controllers to boot automatically when power is applied after a full shutdown. See the HP P6000 Control Panel online help or user guide for details about setting this feature. To further clarify the use of this feature:
- If this feature is disabled and you turn on power to the array from the rack power distribution unit (PDU), only the disk enclosures boot up. With this feature enabled, the controllers will also boot up, making the entire array ready for use.
- If, after setting this feature, you remove the management module from its slot and reinsert it to reset power or you restart the management module from the HP P6000 Control Panel, only the controllers will automatically boot up after a full shutdown. In this scenario, you must ensure that the disk enclosures are powered up first; otherwise, the controller boot up process may be interrupted.
- After setting this HP P6000 Control Panel feature, if you have to shut down the array, perform the following steps:
  1. Use HP P6000 Command View to shut down the controllers and disk enclosures.
  2. Turn off power from the rack power distribution unit (PDU).
  3. Turn on power from the rack PDU.

After startup of the management module, the controllers will automatically start.

**Restarting the iSCSI or iSCSI/FCoE module**

If you determine that the iSCSI or iSCSI/FCoE modules must be rebooted, you can use HP P6000 Command View to restart the modules. Shutting down the iSCSI or iSCSI/FCoE modules through HP P6000 Command View is not supported. You must use the CLI to shut down the modules and then power cycle the array to power on the modules after the shutdown.

To restart a module:
1. Select the iSCSI controller in the navigation pane.
2. Select Shutdown on the iSCSI Controller Properties window.
3. Select Restart on the iSCSI Controller Shutdown Options window (Figure 17 (page 46)).

**Figure 17 iSCSI Controller Shutdown Options**

The following is an example of the shutdown procedure using the CLI:

```bash
MEZ75 login: guest
Password:********

Welcome to MEZ75

******************************************************************
*                                                            *
*              HP StorageWorks MEZ75                          *
*                                                            *
******************************************************************

MEZ75 #> admin start -p config
MEZ75 (admin) #> shutdown

Are you sure you want to shutdown the System (y/n): y

Using the management module

Connecting to the management module

You can connect to the management module through a public or a private network.

**NOTE:** If you are using HP P6000 Command View on the management server to manage the P63x0/P65x0 EVAs, HP recommends that when accessing HP P6000 Command View on either the management server (server-based management) or the management module (array-based management), you use the same network. This is recommended until a multi-homed solution is available, which would allow the management module access to be configured on a separate network (private or different).

If you use a laptop to connect to the management module, configure the laptop to have an address in the same IP range as the management module (for example, 192.168.0.2 with a subnet mask of 255.255.255.0).

The management module has an MDI-X port that supports straight-through or crossover Ethernet cables. Use a Cat5e or greater cable to connect the management module from its Ethernet jack (2, Figure 18 (page 44)) to the management server.
Connecting through a public network

1. Initialize the P63x0 EVA or P65x0 EVA storage system using HP P6000 Command View.
2. If it is currently connected, disconnect the public network LAN cable from the back of the management module in the controller enclosure.
3. Press and hold the recessed Reset button (3, Figure 18 (page 44)) for 4 to 5 seconds. The green LED on the management module (1, Figure 18 (page 44)) blinks to indicate the configuration reset has started. The reset may take up to 2 minutes to complete. When the reset is completed, the green LED turns solid. This sets IP addresses of 192.168.0.1/24 (IPv4) and fd50:f2eb:a8a::7/48 (IPv6).

**IMPORTANT:** At initial setup, you cannot browse to the HP P6000 Control Panel until you perform this step.

4. Do one of the following:
   - Temporarily connect a LAN cable from a private network to the management module.
   - Temporarily connect a laptop computer directly to the management module using a LAN patch cable.
5. Browse to [https://192.168.0.1:2373/](https://192.168.0.1:2373/) or [https://[fd50:f2eb:a8a::7]:2373/](https://[fd50:f2eb:a8a::7]:2373/) and log in as an HP EVA administrator. HP recommends that you either change or delete the default IPv4 and IPv6 addresses to avoid duplicate address detection issues on your network. The default user name is `admin`. No password is required during the initial setup. The HP P6000 Control Panel GUI appears.

**IMPORTANT:** If you change the password for the administrator or user account for the HP P6000 Control Panel, be sure to record the new passwords since they cannot be cleared without resetting the management module.

HP recommends that you change the default passwords.

6. Select **Administrator Options > Configure Network Options**.
7. Enter an IP address and other network settings that apply.

**NOTE:** The reserved internal IP addresses are 10.253.251.230 through 10.253.251.249.

8. Click **Save Changes**. The IP address changes immediately, causing you to lose connectivity to the HP P6000 Control Panel. The new IP address is stored and remains in effect, even when the storage system is later shut down or restarted.

**IMPORTANT:** The new IP address will be lost if the storage system is later uninitialized or the management module is reset.
9. Remove the LAN cable to the private network or laptop and reconnect the cable to the public network.

10. From a computer on the public network, browse to https://new IP:2373 and log in. The HP P6000 Control Panel GUI appears.

Connecting through a private network

1. Press and hold the recessed Reset button (3, Figure 18 (page 44)) for 4 to 5 seconds. The green LED on the management module (1, Figure 18 (page 44)) blinks to indicate the configuration reset has started. The reset may take up to 2 minutes to complete. When the reset is completed, the green LED turns solid. This sets IP addresses of 192.168.0.1/24 (IPv4) and fd50:f2eb:a8a::7/48 (IPv6).

2. Browse to https://192.168.0.1:2373/ or https://[fd50:f2eb:a8a::7]:2373/ and log in as an HP EVA administrator. HP recommends that you either change or delete the default IPv4 and IPv6 addresses to avoid duplicate address detection issues on your network. The default user name is admin. No password is required during the initial setup. The HP P6000 Control Panel GUI appears.

1 IMPORTANT: At initial setup, you cannot browse to the HP P6000 Control Panel until you perform this step.

3. Select Administrator Options > Configure Network Options.
4. Enter an IP address and other network settings that apply.

NOTE: The reserved internal IP addresses are 10.253.251.230 through 10.253.251.249.

5. Click Save Changes. The IP address changes immediately, causing you to lose connectivity to the HP P6000 Control Panel. The new IP address is stored and remains in effect, even when the storage system is shut down or restarted.

1 IMPORTANT: The new IP address will be lost if the storage system is later uninitialized or the management module is reset.

6. From a computer on the private network, browse to https://newly configured ip address:2373 and log in. The HP P6000 Control Panel GUI appears.

Accessing HP P6000 Command View on the management module

To access HP P6000 Command View on the management module:
1. Login to P6000 Control Panel
2. From the left pane, select Launch HP P6000 Command View from the User Options
3. Click Launch HP P6000 Command View

Changing the host port default operating mode

NOTE: Fibre Channel host ports must be connected or have an optical loopback plug installed. When using the loopback plug, the host port must be configured for direct connect.

By default, a storage system is shipped to operate in a Fibre Channel switch environment and is configured in fabric mode. If you choose to connect the storage system directly to a server, you must change the host port operating mode to direct mode. If you do not change this mode, the storage system will be unable to communicate with your server. Use the HP P6000 Control Panel to change the default operating mode.
NOTE: Change your browser settings for the HP P6000 Control Panel as described in the HP P6000 Command View Installation Guide. You must have administrator privilege to change the settings in the HP P6000 Control Panel.

To change the default operating mode:

1. Connect to the management module using one of the methods described in “Connecting through a public network” (page 44) or “Connecting through a private network” (page 45).
2. Log into the HP P6000 Control Panel as an HP P6000 administrator. The HP P6000 Control Panel is displayed.
3. Select Administrator Options > Configure Controller Host Ports (Figure 17 (page 46)).
4. Select the controller.
5. In the Topology box, select Direct from the drop-down menu.
6. Click Save Changes.
7. Repeat steps through 6 for other ports where direct connect is desired.
8. Close the HP P6000 Control Panel and remove the Ethernet cable from the server, however, you may want to retain access to the ABM to initialize the storage cell, for example.

Saving storage system configuration data

As part of an overall data protection strategy, storage system configuration data should be saved during initial installation, and whenever major configuration changes are made to the storage system. This includes adding or removing disk drives, creating or deleting disk groups, and adding or deleting virtual disks. The saved configuration data can save substantial time if re-initializing the storage system becomes necessary. The configuration data is saved to a series of files, which should be stored in a location other than on the storage system.

You can perform this procedure from the management server where HP P6000 Command View is installed from any host running HP Storage System Scripting Utility (called the utility) and connected to the management server.
NOTE: For more information on using the utility, see the *HP Storage System Scripting Utility Reference*. See “Related documentation” (page 197).

1. Double-click the SSSU desktop icon to run the application. When prompted, enter Manager (management server name or IP address), User name, and Password.

2. Enter `LS SYSTEM` to display the storage systems managed by the management server.

3. Enter `SELECT SYSTEM system name`, where `system name` is the name of the storage system.
   
   The storage system name is case sensitive. If there are spaces the letters in the name, quotes must enclose the name: for example, `SELECT SYSTEM "Large EVA"`.

4. Enter `CAPTURE CONFIGURATION`, specifying the full path and filename of the output files for the configuration data.
   
   The configuration data is stored in a series of from one to five files, which are SSSU scripts. The file names begin with the name you select, with the restore step appended. For example, if you specify a file name of `LargeEVA.txt`, the resulting configuration files would be `LargeEVA_Step1A.txt`, `LargeEVA_Step1B`, etc.
   
   The contents of the configuration files can be viewed with a text editor.

NOTE: If the storage system contains disk drives of different capacities, the SSSU procedures used do not guarantee that disk drives of the same capacity will be exclusively added to the same disk group. If you need to restore an array configuration that contains disks of different sizes and types, you must manually recreate these disk groups. The controller software and the utility’s `CAPTURE CONFIGURATION` command are not designed to automatically restore this type of configuration. For more information, see the *HP Storage System Scripting Utility Reference*.

The following examples illustrate how to save and restore the storage system configuration data using SSSU on a Windows host.
Example 1 Saving configuration data on a Windows host

1. Double-click on the SSSU desktop icon to run the application. When prompted, enter Manager (management server name or IP address), User name, and Password.
2. Enter LS SYSTEM to display the storage systems managed by the management server.
3. Enter SELECT SYSTEM system name, where system name is the name of the storage system.
4. Enter CAPTURE CONFIGURATION pathname\filename, where pathname identifies the location where the configuration files will be saved, and filename is the name used as the prefix for the configurations files: for example, CAPTURE CONFIGURATION c:\EVAConfig\LargeEVA
5. Enter EXIT to close the SSSU command window.

Example 2 Restoring configuration data on a Windows host

If it is necessary to restore the storage system configuration, it can be done using the following procedure.

1. Double-click on the SSSU desktop icon to run the application.
2. Enter FILE pathname\filename, where pathname identifies the location where the configuration files are be saved and filename is the name of the first configuration file: for example, FILE c:\EVAConfig\LargeEVA_Sample1.txt
3. Repeat the preceding step for each configuration file. Use files in sequential order. For example, use Step1A before Step1B, and so on. Files that are not needed for configuration data are not created, so there is no need to restore them.

Saving or restoring the iSCSI or iSCSI/FCoE module configuration

After the initial setup of the iSCSI or iSCSI/FCoE modules, save the configuration for each module, in case a service action is required. The Save Configuration function (Figure 20 (page 49)) enables you to save the configuration from a selected module to a file on the management server. You can use this file as a restoration point. The Full Configuration Restore function enables the restoration of the configuration to the point when the configuration was last saved (such as during the LUN presentation to new initiators). If a new controller is installed, the full configuration can be restored and no reconfiguration is required. When using HP P6000 Command View to uninitialize a P6300 or P6500 array, the iSCSI or iSCSI/FCoE modules are issued reset mappings and are rebooted, to avoid stale persistent data, without clearing configured IP addresses.

To save or restore the configuration:
1. Select the iSCSI controller in the Navigation pane.
2. Select Set Options.
3. Select Save/Restore configuration.
4. Select the configuration method.
Figure 20 iSCSI Controller Configuration Selection window

iSCSI Controller Configuration Selection

Select | Cancel

Choose a configuration method and click Select to continue.

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save Configuration</td>
<td>This method provides the facility for reading your iSCSI controller configuration and save it to a file with a .TGZ extension which later can be restored using the “Restore Configuration” method. The information includes basic/advance iSCSI controller configuration, basic/advance FC and IP port settings, LUN masking etc.</td>
</tr>
<tr>
<td>Full Configuration Restore</td>
<td>This method provides the facility to fully restore your iSCSI controller configuration. It requires iSCSI controller configuration file with a .TGZ extension.</td>
</tr>
<tr>
<td>Restore LUN Masking</td>
<td>This method provides the facility to restore only lun masking configuration of your iSCSI controller. It requires iSCSI controller configuration file with a .TGZ extension.</td>
</tr>
</tbody>
</table>

**NOTE:** A Restore action will reboot the module.
3 Configuring application servers

Overview

This chapter provides general connectivity information for all the supported operating systems. Where applicable, an OS-specific section is included to provide more information.

Clustering

Clustering is connecting two or more computers together so that they behave like a single computer. Clustering is used for parallel processing, load balancing, and fault tolerance.

See the *HP P6000 Enterprise Virtual Array Compatibility Reference* for the clustering software supported on each operating system. See “Related documentation” (page 197) for the location of this document. Clustering is not supported on Linux or VMware.

**NOTE:** For OpenVMS, you must make the Console LUN ID and OS unit IDs unique throughout the entire SAN, not just the controller subsystem.

Multipathing

Multipathing software provides a multiple-path environment for your operating system. See the following website for more information:


See the *HP P6000 Enterprise Virtual Array Compatibility Reference* for the multipathing software supported on each operating system. See “Related documentation” (page 197) for the location of this document.

Installing Fibre Channel adapters

For all operating systems, supported Fibre Channel adapters (FCAs) must be installed in the host server in order to communicate with the EVA.

**NOTE:** Traditionally, the adapter that connects the host server to the fabric is called a host bus adapter (HBA). The server HBA used with the storage systems is called a Fibre Channel adapter (FCA). You might also see the adapter called a Fibre Channel host bus adapter (Fibre Channel HBA) in other related documents.

Follow the hardware installation rules and conventions for your server type. The FCA is shipped with its own documentation for installation. See that documentation for complete instructions. You need the following items to begin:

- FCA boards and the manufacturer’s installation instructions
- Server hardware manual for instructions on installing adapters
- Tools to service your server

The FCA board plugs into a compatible I/O slot (PCI, PCI-X, PCI-E) in the host system. For instructions on plugging in boards, see the hardware manual.

You can download the latest FCA firmware from the following website: http://www.hp.com/support/downloads. Enter HBA in the *Search Products* box and then select your product. For supported FCAs by operating system, go to the Single Point of Connectivity Knowledge website (http://www.hp.com/storage/spock). You must sign up for an HP Passport to enable access.
Testing connections to the array

After installing the FCAs, you can create and test connections between the host server and the array. For all operating systems, you must:

- Add hosts
- Create and present virtual disks
- Verify virtual disks from the hosts

The following sections provide information that applies to all operating systems. For OS-specific details, see the applicable operating system section.

Adding hosts

To add hosts using HP P6000 Command View:

1. Retrieve the worldwide names (WWNs) for each FCA on your host. You need this information to select the host FCAs in HP P6000 Command View.
2. Use HP P6000 Command View to add the host and each FCA installed in the host system.

   **NOTE:** To add hosts using HP P6000 Command View, you must add each FCA installed in the host. Select **Add Host** to add the first adapter. To add subsequent adapters, select **Add Port**. Ensure that you add a port for each active FCA.

3. Select the applicable operating system for the host mode.

   **Table 10 Operating system and host mode selection**

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Host mode selection in HP P6000 Command View</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP-UX</td>
<td>HP-UX</td>
</tr>
<tr>
<td>IBM AIX</td>
<td>IBM AIX</td>
</tr>
<tr>
<td>Linux</td>
<td>Linux</td>
</tr>
<tr>
<td>Mac OS X</td>
<td>Linux</td>
</tr>
<tr>
<td>Microsoft Windows</td>
<td>Microsoft Windows</td>
</tr>
<tr>
<td></td>
<td>Microsoft Windows 2008</td>
</tr>
<tr>
<td></td>
<td>Microsoft Windows 2012</td>
</tr>
<tr>
<td>OpenVMS</td>
<td>OVMS</td>
</tr>
<tr>
<td>Oracle Solaris</td>
<td>Sun Solaris</td>
</tr>
<tr>
<td>VMware</td>
<td>VMware</td>
</tr>
<tr>
<td>Citrix XenServer</td>
<td>Linux</td>
</tr>
</tbody>
</table>

4. Check the Host folder in the Navigation pane of HP P6000 Command View to verify that the host FCAs are added.

   **NOTE:** More information about HP P6000 Command View is available at [http://www.hp.com/support/manuals](http://www.hp.com/support/manuals). Click **Storage Software** under Storage, and then select **HP P6000 Command View Software** under Storage Device Management Software.
Creating and presenting virtual disks

To create and present virtual disks to the host server:

1. From HP P6000 Command View, create a virtual disk on the storage system.
2. Specify values for the following parameters:
   - Virtual disk name
   - Vraid level
   - Size
3. Present the virtual disk to the host you added.
4. If applicable (AIX or OpenVMS) select a LUN number if you chose a specific LUN on the Virtual Disk Properties window.

Verifying virtual disk access from the host

To verify that the host can access the newly presented virtual disks, restart the host or scan the bus.
If you are unable to access the virtual disk:
- Verify that all cabling is connected to the switch, EVA, and host.
- Verify that all firmware levels are appropriate for your configuration. For more information, refer to the Enterprise Virtual Array QuickSpecs and associated release notes. See “Related documentation” (page 197) for the location of these documents.
- Ensure that you are running a supported version of the host operating system. For more information, see the HP P6000 Enterprise Virtual Array Compatibility Reference.
- Ensure that the correct host is selected as the operating system for the virtual disk in HP P6000 Command View.
- Ensure that the host WWN number is set correctly (to the host you selected).
- Verify that the FCA switch settings are correct.
- Verify that the virtual disk is presented to the host.
- Verify that the zoning is correct for your configuration.

Configuring virtual disks from the host

After you create the virtual disks and rescan or restart the host, follow the host-specific conventions for configuring these new disk resources. For instructions, see the documentation included with your server.

HP-UX

To create virtual disks for HP-UX, scan the bus and then create volume groups on a virtual disk.

Scanning the bus

To scan the FCA bus and display information about the devices:

1. Enter the command `# ioscan  -fnCdisk` to start the rescan.
   All new virtual disks become visible to the host.
2. Assign device special files to the new virtual disks using the `insf` command:
   `# insf  -e`

   **NOTE:** Lowercase *e* assigns device special files only to the new devices—in this case, the virtual disks. Uppercase *E* reassigns device special files to all devices.

   The following is a sample output from an `ioscan` command:
Creating volume groups on a virtual disk using vgcreate

You can create a volume group on a virtual disk by issuing a `vgcreate` command. This builds the virtual group block data, allowing HP-UX to access the virtual disk. See the `pvcreate`, `vgcreate`, and `lvcreate` man pages for more information about creating disks and file systems. Use the following procedure to create a volume group on a virtual disk:

**NOTE:** Italicized text is for example only.

1. To create the physical volume on a virtual disk, enter the following command:
   ```bash
   # pvcreate -f /dev/rdsk/c32t0d1
   ```
2. To create the volume group directory for a virtual disk, enter the command:
   ```bash
   # mkdir /dev/vg01
   ```
3. To create the volume group node for a virtual disk, enter the command:
   ```bash
   # mknod /dev/vg01/group c 64 0x010000
   ```
   The designation 64 is the major number that equates to the 64-bit mode. The 0x01 is the minor number in hex, which must be unique for each volume group.
4. To create the volume group for a virtual disk, enter the command:
   ```bash
   # vgcreate -f /dev/vg01 /dev/dsk/c32t0d1
   ```
5. To create the logical volume for a virtual disk, enter the command:
   ```bash
   # lvcreate -L1000 /dev/vg01/lvol1
   ```
   In this example, a 1-Gb logical volume (`lvol1`) is created.
6. Create a file system for the new logical volume by creating a file system directory name and inserting a mount tab entry into `/etc/fstab`.
7. Run the command `mkfs` on the new logical volume. The new file system is ready to mount.
IBM AIX

Accessing IBM AIX utilities

You can access IBM AIX utilities such as the Object Data Manager (ODM), on the following website:

http://www.hp.com/support/downloads

In the Search products box, enter MPIO, and then click AIX MPIO PCMA for HP Arrays. Select IBM AIX, and then select your software storage product.

Adding hosts

To determine the active FCAs on the IBM AIX host, enter:

```
# lsdev -Cc adapter |grep fcs
```

Output similar to the following appears:

```
fcs0      Available 1H-08    FC Adapter
fcs1      Available 1V-08    FC Adapter
```

```
# lscfg -vl
fcs0  fcs0             U0.1-P1-I5/Q1  FC Adapter
     Part Number.........................80P4543
     EC Level.........................A
     Serial Number....................1F4280A419
     Manufacturer...................001F
     Feature Code/Marketing ID...280B
     FRU Number.....................80P4544
     Device Specific.(ZM).........3
     Network Address............10000000C940F529
     ROS Level and ID...........02881914
     Device Specific.(Z0).........1001206D
     Device Specific.(Z1).........00000000
     Device Specific.(Z2).........00000000
     Device Specific.(Z3).........03000909
     Device Specific.(Z4).........80P4544
     Device Specific.(Z5).........02881914
     Device Specific.(Z6).........06831914
     Device Specific.(Z7).........07831914
     Device Specific.(Z8).........20000000C940F529
     Device Specific.(Z9).........TS1.90A4
     Device Specific.(ZA)........T1D1.90A4
     Device Specific.(ZB)........T2D1.90A4
     Device Specific.(YL)........U0.1-P1-I5/Q1b.
```

Creating and presenting virtual disks

When creating and presenting virtual disks to an IBM AIX host, be sure to:

1. Set the OS unit ID to 0.
2. Set Preferred path/mode to No Preference.
3. Select a LUN number if you chose a specific LUN on the Virtual Disk Properties window.

Verifying virtual disks from the host

To scan the IBM AIX bus and list all EVA devices, enter: `cfgmgr -v`

The -v switch (verbose output) requests a full output.

Output similar to the following is displayed:

```
hdisk1 Available 1V-08-01 HP HSV340 Enterprise Virtual Array
hdisk2 Available 1V-08-01 HP HSV340 Enterprise Virtual Array
hdisk3 Available 1V-08-01 HP HSV340 Enterprise Virtual Array
```
Driver failover mode

If you use the `INSTALL` command without command options, the driver’s failover mode depends on whether a QLogic driver is already loaded in memory (listed in the output of the `lsmod` command). Possible driver failover mode scenarios include:

- If an `hp qla2x00src` driver RPM is already installed, the new driver RPM uses the failover of the previous driver package.
- If there is no QLogic driver module (`qla2xxx module`) loaded, the driver defaults to failover mode. This is also true if an inbox driver is loaded that does not list output in the `/proc/scsi/qla2xxx` directory.
- If there is a driver loaded in memory that lists the driver version in `/proc/scsi/qla2xxx` but no driver RPM has been installed, then the driver RPM loads the driver in the failover mode that the driver in memory currently uses.

Installing a QLogic driver

**NOTE:** The HP Emulex driver kit performs in a similar manner; use `./INSTALL -h` to list all supported arguments.

1. Download the appropriate driver kit for your distribution. The driver kit file is in the format `hp qla2x00-yyyy-mm-dd.tar.gz`.
2. Copy the driver kit to the target system.
3. Uncompress and untar the driver kit using the following command:
   
   ```
   # tar zxvf hp qla2x00-yyyy-mm-dd.tar.gz
   ```
4. Change directory to the `hp qla2x00-yyyy-mm-dd` directory.
5. Execute the `INSTALL` command.
   
   The `INSTALL` command syntax varies depending on your configuration.
   
   If a previous driver kit is installed, you can invoke the `INSTALL` command without any arguments. To use the currently loaded configuration:
   
   ```
   # ./INSTALL
   ```
   
   To force the installation to failover mode, use the `-f` flag:
   
   ```
   # ./INSTALL -f
   ```
   
   To force the installation to single-path mode, use the `-s` flag:
   
   ```
   # ./INSTALL -s
   ```
   
   To list all supported arguments, use the `-h` flag:
   
   ```
   # ./INSTALL -h
   ```
   
   The `INSTALL` script installs the appropriate driver RPM for your configuration, as well as the appropriate `fibreutils` RPM.

6. Once the `INSTALL` script is finished, you will either have to reload the QLogic driver modules (`qla2xxx`, `qla2300`, `qla2400`, `qla2xxx_conf`) or reboot your server.

   To reload the driver use one or more of the following commands, as applicable:
   
   ```
   # /opt/hp/src/hp qla2x00src/unload.sh
   # modprobe qla2xxx_conf
   # modprobe qla2xxx
   # modprobe qla2300
   ```
# modprobe qla2400
To reboot the server, enter the `reboot` command.

⚠️ **CAUTION:** If the boot device is attached to the SAN, you must reboot the host.

7. To verify which RPM versions are installed, use the `rpm` command with the `-q` option. For example:

   # rpm -q hp_qla2x00src
   # rpm -q fibreutils

### Upgrading Linux components

If you have any installed components from a previous solution kit or driver kit, such as the `qla2x00` RPM, invoke the INSTALL script with no arguments, as shown in the following example:

   # ./INSTALL
To manually upgrade the components, select one of the following kernel distributions:

- For 2.4 kernel based distributions, use version 7.xx.
- For 2.6 kernel based distributions, use version 8.xx.

Depending on the kernel version you are running, upgrade the driver RPM as follows:

- For the `hp_qla2x00src` RPM:
  
  # rpm -Uvh hp_qla2x00src- version-revision.linux.rpm

- For `fibreutils` RPM, you have two options:
  
  - To upgrade the driver:
    
    # rpm -Uvh fibreutils-version-revision.linux.architecture.rpm
  
  - To remove the existing driver, and install a new driver:
    
    # rpm -e fibreutils
    # rpm -ivh fibreutils-version-revision.linux.architecture.rpm

### Upgrading qla2x00 RPMs

If you have a `qla2x00` RPM from HP installed on your system, use the INSTALL script to upgrade from `qla2x00` RPMs. The INSTALL script removes the old `qla2x00` RPM and installs the new `hp_qla2x00src` while keeping the driver settings from the previous installation. The script takes no arguments. Use the following command to run the INSTALL script:

   # ./INSTALL

**NOTE:** IF you are going to use the failover functionality of the QLA driver, uninstall Secure Path and reboot before you attempt to upgrade the driver. Failing to do so can cause a kernel panic.

### Detecting third-party storage

The preinstallation portion of the RPM contains code to check for non-HP storage. The reason for doing this is to prevent the RPM from overwriting any settings that another vendor may be using. You can skip the detection process by setting the environmental variable `HPQLAX00FORCE` to `y` by issuing the following commands:

   # HPQLAX00FORCE=y
   # export HPQLAX00FORCE

You can also use the `-F` option of the INSTALL script by entering the following command:
Compiling the driver for multiple kernels

If your system has multiple kernels installed on it, you can compile the driver for all the installed kernels by setting the `INSTALLALLKERNELS` environmental variable to `y` and exporting it by issuing the following commands:

```
# INSTALLALLKERNELS=y
# export INSTALLALLKERNELS
```

You can also use the `-a` option of the `INSTALL` script as follows:

```
# ./INSTALL -a
```

Uninstalling the Linux components

To uninstall the components, use the `INSTALL` script with the `-u` option as shown in the following example:

```
# ./INSTALL -u
```

To manually uninstall all components, or to uninstall just one of the components, use one or all of the following commands:

```
# rpm -e fibreutils
# rpm -e hp_qla2x00
# rpm -e hp_qla2x00src
```

Using the source RPM

In some cases, you may have to build a binary `hp_qla2x00` RPM from the source RPM and use that manual binary build in place of the scripted `hp_qla2x00src` RPM. You need to do this if your production servers do not have the kernel sources and gcc installed.

If you need to build a binary RPM to install, you will need a development machine with the same kernel as your targeted production servers. You can install the binary RPM-produced RPM methods on your production servers.

**NOTE:** The binary RPM that you build works only for the kernel and configuration that you build on (and possibly some errata kernels). Ensure that you use the 7.xx version of the `hp_qla2x00` source RPM for 2.4 kernel-based distributions and the 8.xx version of the `hp_qla2x00` source RPM for 2.6 kernel-based distributions.

Use the following procedure to create the binary RPM from the source RPM:

1. Select one of the following options:
   - Enter the `# ./INSTALL -S` command. The binary RPM creation is complete. You do not have to perform 2 through 4.
   - Install the source RPM by issuing the `# rpm -ivh hp_qla2x00-version-revision.src.rpm` command. Continue with 2.

2. Select one of the following directories:
   - For Red Hat distributions, use the `/usr/src/redhat/SPECS` directory.
   - For SUSE distributions, use the `/usr/src/packages/SPECS` directory.

3. Build the RPM by using the `# rpmbuild -bb hp_qla2x00.spec` command.

   **NOTE:** In some of the older Linux distributions, the RPM command contains the RPM build functionality.

   At the end of the command output, the following message appears:
Managing application servers

"Wrote: ...rpm".
This line identifies the location of the binary RPM.

4. Copy the binary RPM to the production servers and install it using the following command:

```
# rpm -ivh hp_qla2x00-version-revision.architecture.rpm
```

HBA drivers

For most configurations and latest version of Linux distributions, native HBA drivers are the supported drivers. **Native driver** means the driver that is included with the OS distribution.

**NOTE:** The term *inbox driver* is also sometimes used and means the same as *native driver.*

However in some configurations, it may require use of an out-of-box driver, which typically requires a driver package be downloaded and installed on the host. In those cases, follow the documentation of the driver package for instruction. Driver support information can be found on the *Single Point of Connectivity Knowledge (SPOCK)* website:

http://www.hp.com/storage/spock

**NOTE:** Registration is required to access SPOCK

Verifying virtual disks from the host

To verify the virtual disks, first verify that the LUN is recognized and then verify that the host can access the virtual disks.

- To ensure that the LUN is recognized after a virtual disk is presented to the host, do one of the following:
  - Reboot the host.
  - Execute the following command (where X is the SCSI host enumerator of the HBA):
    ```
    echo "- - -" > /sys/class/scsi_host/host[X]/scan
    ```

- To verify that the host can access the virtual disks, enter the `# more /proc/scsi/scsi` command.

  The output lists all SCSI devices detected by the server. An P63x0/P65x0 EVAs LUN entry looks similar to the following:

  ```
  Host: scsi3 Channel: 00 ID: 00 Lun: 01
  Vendor: HP     Model: HSV340       Rev:
  Type: Direct-Access                       ANSI SCSI revision: 02
  ```

OpenVMS

Updating the AlphaServer console code, Integrity Server console code, and Fibre Channel FCA firmware

The firmware update procedure varies for the different server types. To update firmware, follow the procedure described in the Installation instructions that accompany the firmware images.

Verifying the Fibre Channel adapter software installation

A supported FCA should already be installed in the host server. The procedure to verify that the console recognizes the installed FCA varies for the different server types. Follow the procedure described in the Installation instructions that accompany the firmware images.
Console LUN ID and OS unit ID

HP P6000 Command View software contains a box for the Console LUN ID on the Initialized Storage System Properties window.

It is important that you set the Console LUN ID to a number other than zero (0). If the Console LUN ID is not set or is set to zero (0), the OpenVMS host will not recognize the controller pair. The Console LUN ID for a controller pair must be unique within the SAN. Table 11 (page 59) shows an example of the Console LUN ID.

You can set the OS unit ID on the Virtual Disk Properties window. The default setting is 0, which disables the ID field. To enable the ID field, you must specify a value between 1 and 32767, ensuring that the number you enter is unique within the SAN. An OS Unit ID greater than 9999 is not capable of being served by MSCP.

⚠️ CAUTION: ⚠️ It is possible to enter a duplicate Console LUN ID or OS unit ID number. You must ensure that you enter a Console LUN ID and OS Unit ID that is not already in use. A duplicate Console LUN ID or OS Unit ID can allow the OpenVMS host to corrupt data due to confusion about LUN identity. It can also prevent the host from recognizing the controllers.

<table>
<thead>
<tr>
<th>ID type</th>
<th>System Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console LUN ID set to 100</td>
<td>$1$GGA100:</td>
</tr>
<tr>
<td>OS unit ID set to 50</td>
<td>$1$DGA50:</td>
</tr>
</tbody>
</table>

Adding OpenVMS hosts

To obtain WWNs on Alpha Servers, do one of the following:

- Enter the `show device fg/full` OVMS command.
- Use the `WWIDMGR -SHOW PORT` command at the SRM console.

To obtain WWNs on Integrity servers, do one of the following:

1. Enter the `show device fg/full` OVMS command.
2. Use the following procedure from the server console:
   a. From the EFI boot Manager, select **EFI Shell**.
   b. In the EFI Shell, enter “Shell> drivers”.

   A list of EFI drivers loaded in the system is displayed.

3. In the listing, find the line for the FCA for which you want to get the WWN information.
   For a Qlogic HBA, look for **HP 4 Gb Fibre Channel Driver** or **HP 2 Gb Fibre Channel Driver** as the driver name. For example:

<table>
<thead>
<tr>
<th>T</th>
<th>D</th>
<th>Y</th>
<th>C</th>
<th>I</th>
<th>R</th>
<th>P</th>
<th>F</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>VERSION</td>
<td>E</td>
<td>G</td>
<td>#</td>
<td>D</td>
<td>C</td>
<td>DRIVER NAME</td>
<td>IMAGE NAME</td>
</tr>
<tr>
<td>==</td>
<td>========</td>
<td>=</td>
<td>=</td>
<td>==</td>
<td>==</td>
<td>==</td>
<td>==</td>
<td>==================================</td>
</tr>
<tr>
<td>22</td>
<td>00000105</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>1</td>
<td>HP 4 Gb Fibre Channel Driver</td>
<td>PciROM:0F:01:01:002</td>
<td></td>
</tr>
</tbody>
</table>

4. Note the driver handle in the first column (22 in the example).
5. Using the driver handle, enter the `drvdfg driver_handle` command to find the Device Handle (Ctrl). For example:

   Shell> `drvdfg 22`
   Configurable Components
6. Using the driver and device handle, enter the `drvdfg -s driver_handle device_handle` command to invoke the EFI Driver configuration utility. For example:

```
Shell> drvdfg -s 22 25
```

7. From the Fibre Channel Driver Configuration Utility list, select item 8 (Info) to find the WWN for that particular port.

Output similar to the following appears:

| Adapter Path         | Acpi(PNP0002,0300)/Pci(01|01) |
|----------------------|---------------------------------|
| Adapter WWPN         | 50060B00003B478A                |
| Adapter WWNN         | 50060B00003B478B                |
| Adapter S/N          | 3B478A                         |

**Scanning the bus**

Enter the following command to scan the bus for the OpenVMS virtual disk:

```
$ MC SYSMAN IO AUTO/LOG
```

A listing of LUNs detected by the scan process is displayed. Verify that the new LUNs appear on the list.

**NOTE:** The console LUN can be seen without any virtual disks presented. The LUN appears as `$1$GGAx` (where `x` represents the console LUN ID on the controller).

After the system scans the fabric for devices, you can verify the devices with the `SHOW DEVICE` command:

```
$ SHOW DEVICE NAME-OF-VIRTUAL-DISK/FULL
```

For example, to display device information on a virtual disk named `$1$DGA50`, enter `$ SHOW DEVICE $1$DGA50:/FULL`.

The following output is displayed:

```
Disk $1$DGA50: (BRCK18), device type HSV210, is online, file-oriented device, shareable, device has multiple I/O paths, served to cluster via MSCP Server, error logging is enabled.

   Error count   2  Operations completed  4107
   Owner process  ""  Owner UIC  [SYSTEM]
   Owner process ID  00000000  Dev Prot  S:RWPL,O:RWPL,G:R,W
   Reference count  0  Default buffer size  512
   Current preferred CPU Id 0  Fastpath  1
   WWID  01000010:6005-08B4-0010-70C7-0001-2000-2E3E-0000
   Host name  "BRCK18"  Host type, avail AlphaServer DS10 466 MHz, yes
   Alternate host name "VMS24"  Alt. type, avail HP rx3600 (1.59GHz/9.0MB), yes
   Allocation class  1
   I/O paths to device  9

   Path PGA0.5000-1FE1-0027-0A38 (BRCK18), primary path.
      Error count  0  Operations completed  145
   Path PGA0.5000-1FE1-0027-0A3A (BRCK18).
      Error count  0  Operations completed  138
   Path PGA0.5000-1FE1-0027-0A3B (BRCK18).
      Error count  0  Operations completed  276
   Path PGA0.5000-1FE1-0027-0A3C (BRCK18).
      Error count  0  Operations completed  282
   Path PGB0.5000-1FE1-0027-0A39 (BRCK18).
      Error count  0  Operations completed  683
   Path PGB0.5000-1FE1-0027-0A3B (BRCK18).
      Error count  0  Operations completed  704
   Path PGB0.5000-1FE1-0027-0A3D (BRCK18).
      Error count  0  Operations completed  853
   Path PGB0.5000-1FE1-0027-0A3F (BRCK18), current path.
      Error count  2  Operations completed  826
   Path MSCP (VMS24).
      Error count  0  Operations completed  0
```

You can also use the `SHOW DEVICE DG` command to display a list of all Fibre Channel disks presented to the OpenVMS host.
NOTE: Restarting the host system shows any newly presented virtual disks because a hardware scan is performed as part of the startup.

If you are unable to access the virtual disk, do the following:

- Check the switch zoning database.
- Use HP P6000 Command View to verify the host presentations.
- Check the SRM console firmware on AlphaServers.
- Ensure that the correct host is selected for this virtual disk and that a unique OS Unit ID is used in HP P6000 Command View.

Configuring virtual disks from the OpenVMS host

To set up disk resources under OpenVMS, initialize and mount the virtual disk resource as follows:

1. Enter the following command to initialize the virtual disk:
   
   ```
   $ INITIALIZE name-of-virtual-disk volume-label
   ```

2. Enter the following command to mount the disk:
   
   ```
   MOUNT/SYSTEM name-of-virtual-disk volume-label
   ```

   **NOTE:** The `/SYSTEM` switch is used for a single stand-alone system, or in clusters if you want to mount the disk only to select nodes. You can use the `/CLUSTER` switch for OpenVMS clusters. However, if you encounter problems in a large cluster environment, HP recommends that you enter a `MOUNT/SYSTEM` command on each cluster node.

3. View the virtual disk’s information with the `SHOW DEVICE` command. For example, enter the following command sequence to configure a virtual disk named `data1` in a stand-alone environment:
   
   ```
   $ INIT $1$DGA1: data1
   $ MOUNT/SYSTEM $1$DGA1: data1
   $ SHOW DEV $1$DGA1: /FULL
   ```

Setting preferred paths

You can use one of the following options for setting, changing, or displaying preferred paths:

- To set or change the preferred path, use the following command:
  
  ```
  $ SET DEVICE $1$DGA83: /PATH=PGA0.5000-1FE1-0007-9772/SWITCH
  ```

  This allows you to control which path each virtual disk uses.

- To display the path identifiers, use the `SHOW DEV/FULL` command.

- For additional information on using OpenVMS commands, see the OpenVMS help file:
  
  ```
  $ HELP TOPIC
  ```

  For example, the following command displays help information for the `MOUNT` command:

  ```
  $ HELP MOUNT
  ```

Oracle Solaris

**NOTE:** The information in this section applies to both SPARC and x86 versions of the Oracle Solaris operating system.
Loading the operating system and software

Follow the manufacturer’s instructions for loading the operating system (OS) and software onto the host. Load all OS patches and configuration utilities supported by HP and the FCA manufacturer.

Configuring FCAs with the Oracle SAN driver stack

Oracle-branded FCAs are supported only with the Oracle SAN driver stack. The Oracle SAN driver stack is also compatible with current Emulex FCAs and QLogic FCAs. Support information is available on the Oracle website:

http://www.oracle.com/technetwork/server-storage/solaris/overview/index-136292.html

To determine which non-Oracle branded FCAs HP supports with the Oracle SAN driver stack, see the latest MPxIO application notes or contact your HP representative.

Update instructions depend on the version of your OS:

• For Solaris 9, install the latest Oracle StorEdge SAN software with associated patches. To locate the software, log into My Oracle Support:

  https://support.oracle.com/CSP/ui/flash.html

  1. Select the Patches & Updates tab and then search for StorEdge SAN Foundation Software 4.4 (formerly called StorageTek SAN 4.4).

  2. Reboot the host after the required software/patches have been installed. No further activity is required after adding any new LUNs once the array ports have been configured with the `cfgadm -c` command for Solaris 9.

  Examples for two FCAs:

  ```
  cfgadm -c configure c3
  cfgadm -c configure c4
  ```

  3. Increase retry counts and reduce I/O time by adding the following entries to the `/etc/system` file:

  ```
  set ssd:ssd_retry_count=0xa
  set ssd:ssd_io_time=0x1e
  ```

  4. Reboot the system to load the newly added parameters.

• For Solaris 10, go to the Oracle Software Downloads website (http://www.oracle.com/technetwork/indexes/downloads/index.html) to install the latest patches. Under Servers and Storage Systems, select Solaris 10. Reboot the host once the required software/patches have been installed. No further activity is required after adding any new LUNs, as the controller and LUN recognition are automatic for Solaris 10.

  1. For Solaris 10 x86/64, ensure patch 138889-03 or later is installed. For SPARC, ensure patch 138888-03 or later is installed.

  2. Increase the retry counts by adding the following line to the `/kernel/drv/sd.conf` file:

  ```
  sd-config-list="HP HSV","retries-timeout:10";
  ```

  3. Reduce the I/O timeout value to 30 seconds by adding the following line to the `/etc/system` file:

  ```
  set sd:sd_io_time=0x1e
  ```

  4. Reboot the system to load the newly added parameters.

Configuring Emulex FCAs with the lpfc driver

To configure Emulex FCAs with the lpfc driver:
1. Ensure that you have the latest supported version of the lpfc driver (see http://www.hp.com/storage/spock).
   You must sign up for an HP Passport to enable access. For more information on how to use SPOCK, see the Getting Started Guide (http://h20272.www2.hp.com/portal/site/hpoversight/index.html).

2. Edit the following parameters in the /kernel/drv/lpfc.conf driver configuration file to set up the FCAs for a SAN infrastructure:
   ```
   topology=2;
   scan-down=0;
   nodev-tmo=60;
   linkdown-tmo=60;
   ```

3. If using a single FCA and no multipathing, edit the following parameter to reduce the risk of data loss in case of a controller reboot:
   ```
   nodev-tmo=120;
   ```

4. If using Veritas Volume Manager (VxVM) DMP for multipathing (single or multiple FCAs), edit the following parameter to ensure proper VxVM behavior:
   ```
   no-device-delay=0;
   ```

5. In a fabric topology, use persistent bindings to bind a SCSI target ID to the world wide port name (WWPN) of an array port. This ensures that the SCSI target IDs remain the same when the system reboots. Set persistent bindings by editing the configuration file or by using the lputil utility.

   **NOTE:** HP recommends that you assign target IDs in sequence, and that the EVA has the same target ID on each host in the SAN.

   The following example for an P63x0/P65x0 EVAs illustrates the binding of targets 20 and 21 (lpfc instance 2) to WWPNs 50001fe100270938 and 50001fe100270939, and the binding of targets 30 and 31 (lpfc instance 0) to WWPNs 50001fe10027093a and 50001fe10027093b:

   ```
   fcp-bind-WWPN="50001fe100270938:lpfc2t20",
   "50001fe100270939:lpfc2t21",
   "50001fe10027093a:lpfc0t30",
   "50001fe10027093b:lpfc0t31";
   ```

   **NOTE:** Replace the WWPNs in the example with the WWPNs of your array ports.

6. For each LUN that will be accessed, add an entry to the /kernel/drv/sd.conf file. For example, if you want to access LUNs 1 and 2 through all four paths, add the following entries to the end of the file:

   ```
   name="sd" parent="lpfc" target=20 lun=1;
   name="sd" parent="lpfc" target=21 lun=1;
   name="sd" parent="lpfc" target=30 lun=1;
   name="sd" parent="lpfc" target=31 lun=1;
   name="sd" parent="lpfc" target=20 lun=2;
   name="sd" parent="lpfc" target=21 lun=2;
   name="sd" parent="lpfc" target=30 lun=2;
   name="sd" parent="lpfc" target=31 lun=2;
   ```
7. Reboot the server to implement the changes to the configuration files.
8. If LUNs have been preconfigured in the `/kernel/drv/sd.conf` file, use the `devfsadm` command to perform LUN rediscovery after configuring the file.

**NOTE:** The `lpfc` driver is **not** supported for Oracle StorEdge Traffic Manager/Oracle Storage Multipathing. To configure an Emulex FCA using the Oracle SAN driver stack, see “Configuring FCAs with the Oracle SAN driver stack” (page 62).

### Configuring QLogic FCAs with the qla2300 driver

See the latest Enterprise Virtual Array release notes or contact your HP representative to determine which QLogic FCAs and which driver version HP supports with the qla2300 driver. To configure QLogic FCAs with the qla2300 driver:

1. Ensure that you have the latest supported version of the `qla2300` driver (see [hp.com/storage/spock](http://www.hp.com/storage/spock)).
2. You must sign up for an HP Passport to enable access. For more information on how to use SPOCK, see the Getting Started Guide ([http://h20272.www2.hp.com/Pages/spock_overview/introduction.html](http://h20272.www2.hp.com/Pages/spock_overview/introduction.html)).
3. Edit the following parameters in the `/kernel/drv/qla2300.conf` driver configuration file to set up the FCAs for a SAN infrastructure (HBA0 is used in the example but the parameter edits apply to all HBAs):

   **NOTE:** If you are using an Oracle-branded QLogic FCA, the configuration file is `\kernel\dri\qlc.conf`.

   ```
   hba0-connection-options=1;
   hba0-link-down-timeout=60;
   hba0-persistent-binding-configuration=1;
   ```

   **NOTE:** If you are using Solaris 10, editing the persistent binding parameter is not required.

4. If using a single FCA and no multipathing, edit the following parameters to reduce the risk of data loss in case of a controller reboot:

   ```
   hba0-login-retry-count=60;
   hba0-port-down-retry-count=60;
   hba0-port-down-retry-delay=2;
   ```

   The `hba0-port-down-retry-delay` parameter is **not** supported with the 4.13.01 driver; the time between retries is fixed at approximately 2 seconds.

5. In a fabric topology, use persistent bindings to bind a SCSI target ID to the world wide port name (WWPN) of an array port. This ensures that the SCSI target IDs remain the same when the system reboots. Set persistent bindings by editing the configuration file or by using the SANsurfer utility.

   **NOTE:** Persistent binding is not required for QLogic FCAs if you are using Solaris10.

   The following example for a P63x0/P65x0 EVA illustrates the binding of targets 20 and 21 (hba instance 0) to WWPNs 50001fe100270938 and 50001fe100270939, and the binding of targets 30 and 31 (hba instance 1) to WWPNs 50001fe10027093a and 50001fe10027093b:

   ```
   hba0-SCSI-target-id-20-fibre-channel-port-name="50001fe100270938";
   hba0-SCSI-target-id-21-fibre-channel-port-name="50001fe100270939";
   hba1-SCSI-target-id-30-fibre-channel-port-name="50001fe10027093a";
   hba1-SCSI-target-id-31-fibre-channel-port-name="50001fe100270939";
   ```
Fabric setup and zoning

To set up the fabric and zoning:
1. Verify that the Fibre Channel cable is connected and firmly inserted at the array ports, host ports, and SAN switch.
2. Through the Telnet connection to the switch or Switch utilities, verify that the WWN of the EVA ports and FCAs are present and online.
3. Create a zone consisting of the WWNs of the EVA ports and FCAs, and then add the zone to the active switch configuration.
4. Enable and then save the new active switch configuration.

NOTE: There are variations in the steps required to configure the switch between different vendors. For more information, see the HP SAN Design Reference Guide, available for downloading on the HP website: http://www.hp.com/go/sandeisign.

Oracle StorEdge Traffic Manager (MPxIO)/Oracle Storage Multipathing

Oracle StorEdge Traffic Manager (MPxIO)/Oracle Storage Multipathing can be used for FCAs configured with the Oracle SAN driver and depending on the operating system version, architecture (SPARC/x86), and patch level installed. For configuration details, see the HP StorageWorks MPxIO application notes, available on the HP support website: http://www.hp.com/support/manuals.

NOTE: MPxIO is included in the SPARC and x86 Oracle SAN driver. A separate installation of MPxIO is not required.

In the Search products box, enter MPxIO, and then click the search symbol. Select the application notes from the search results.
Configuring with Veritas Volume Manager

The Dynamic Multipathing (DMP) feature of Veritas Volume Manager (VxVM) can be used for all FCAs and all drivers. EVA disk arrays are certified for VxVM support. When you install FCAs, ensure that the driver parameters are set correctly. Failure to do so can result in a loss of path failover in DMP. For information about setting FCA parameters, see “Configuring FCAs with the Oracle SAN driver stack” (page 62) and the FCA manufacturer’s instructions.

The DMP feature requires an Array Support Library (ASL) and an Array Policy Module (APM). The ASL/APM enables Asymmetric Logical Unit Access (ALUA). LUNs are accessed through the primary controller. After enablement, use the `vxdisk list <device>` command to determine the primary and secondary paths. For VxVM 4.1 (MP1 or later), you must download the ASL/APM from the Symantec/Veritas support site for installation on the host. This download and installation is not required for VxVM 5.0 or later.

To download and install the ASL/APM from the Symantec/Veritas support website:

2. Enter *Storage Foundation for UNIX/Linux* in the Product Lookup box.
3. Enter *EVA* in the Enter keywords or phrase box, and then click the search symbol.
4. To further narrow the search, select *Solaris* in the Platform box and search again.
5. Read *TechNotes* and follow the instructions to download and install the ASL/APM.
6. Run `vxdctl enable` to notify VxVM of the changes.
7. Verify the configuration of VxVM as shown in Example 3 “Verifying the VxVM configuration” (the output may be slightly different depending on your VxVM version and the array configuration).

### Example 3 Verifying the VxVM configuration

```
# vxddladm listsupport all | grep HP
libvxhpevale.so         HP HSV200, HSV210

# vxddladm listsupport libname=libvxhpevale.so
ATTR_NAME                ATTR_VALUE
LIBNAME                  libvxhpevale.so
VID                      HP
PID                      HSV200, HSV210
ARRAY_TYPE               A/A-A-HP
ARRAY_NAME               EVA4K6K, EVA8000

# vxmdmpadm listapm all | grep HP
dmphpalua dmphpalua 1 A/A-A-HP Active

# vxmdmpadm listapm dmphpalua
Filename:               dmphpalua
APM name:               dmphpalua
APM version:            1
Feature:                VxVM
VxVM version:           41
Array Types Supported:  A/A-A-HP
Depending Array Types:  A/A-A
State:                  Active

# vxmdmpadm listenclosure all
ENCLR_NAME        ENCLR_TYPE     ENCLR_SNO            STATUS       ARRAY_TYPE
============================================================================
Disk              Disk           DISKS                CONNECTED    Disk
EVA81000          EVA8100        50001FE1002709E0     CONNECTED    A/A-A-HP

By default, the EVA I/O policy is set to Round-Robin. For VxVM 4.1 MP1, only one path is used for the I/Os with this policy. Therefore, HP recommends that you change the I/O policy to Adaptive in order to use all paths to the LUN on the primary controller. Example 4 “Setting the I/O policy” shows the commands you can use to check and change the I/O policy.
```
**Example 4 Setting the I/O policy**

```bash
# vxdmpadm getattr arrayname EVA8100 iopolicy
ENCLR_NAME     DEFAULT        CURRENT
==========================================================================
EVA81000       Round-Robin    Round-Robin

# vxdmpadm setattr arrayname EVA81000 iopolicy=adaptive

# vxdmpadm getattr arrayname EVA8100 iopolicy
ENCLR_NAME     DEFAULT        CURRENT
==========================================================================
EVA81000       Round-Robin    Adaptive
```

**Configuring virtual disks from the host**

The procedure used to configure the LUN path to the array depends on the FCA driver. For more information, see “Installing Fibre Channel adapters” (page 50).

To identify the WWLUN ID assigned to the virtual disk and/or the LUN assigned by the storage administrator:

- **Oracle SAN driver, with MPxIO enabled:**
  - You can use the `luxadm probe` command to display the array/node WWN and associated array for the devices.
  - The WWLUN ID is part of the device file name. For example:
    ```
    /dev/rdsk/c5t600508B4001030E40000500000B20000d0s2
    ```
  - If you use `luxadm display`, the LUN is displayed after the device address. For example:
    ```
    50001fe1002709e9,5
    ```

- **Oracle SAN driver, without MPxIO:**
  - The EVA WWPN is part of the file name (which helps you to identify the controller). For example:
    ```
    /dev/rdsk/c3t50001FE1002709E8d5s2
    /dev/rdsk/c3t50001FE1002709ECd5s2
    /dev/rdsk/c4t50001FE1002709E9d5s2
    /dev/rdsk/c4t50001FE1002709EDd5s2
    ```
    If you use `luxadm probe`, the array/node WWN and the associated device files are displayed.
  - You can retrieve the WWLUN ID as part of the `format -e (scsi, inquiry)` output; however, it is cumbersome and hard to read. For example:
    ```
    09 e8 20 04 00 00 00 00 00 00 00 35 30 30 30 31 46 ........50001F
    45 31 30 30 32 37 30 39 45 30 35 30 30 30 31 46 E1002709E050001F
    45 31 30 30 32 37 30 39 45 38 36 30 30 35 30 38 E1002709E600508
    42 34 30 30 31 30 33 30 45 34 33 33 33 30 35 30 B40010300400050
    30 30 30 30 42 32 30 30 30 00 00 00 00 00 00 00 0000B20000
    ```
  - The assigned LUN is part of the device file name. For example:
    ```
    /dev/rdsk/c3t50001FE1002709E8d5s2
    ```
    You can also retrieve the LUN with `luxadm display`. The LUN is displayed after the device address. For example:
Emulex (lpfc)/QLogic (qla2300) drivers:

- You can retrieve the WWPN by checking the assignment in the driver configuration file (the easiest method, because you then know the assigned target) or by using HBAnyware/SANSurfer.
- You can retrieve the WWLUN ID by using HBAnyware/SANSurfer.
  You can also retrieve the WWLUN ID as part of the `format -e (scsi, inquiry)` output; however, it is cumbersome and difficult to read. For example:

  09 e8 20 04 00 00 00 00 00 35 30 30 31 46  ........50001F
  45 31 30 30 32 37 30 39 45 30 35 30 30 31 46  E1002709E050001F
  45 31 30 30 32 37 30 39 45 38 36 30 30 35 30 38  E1002709E8600508
  42 34 30 30 31 30 33 30 45 34 30 30 30 35 30 38  B4001030E4000050
  30 30 30 30 42 32 30 30 30 00 00 00 00 00 00 00 0000B20000

- The assigned LUN is part of the device file name. For example:
  /dev/dsk/c4t20d5s2

**Verifying virtual disks from the host**

Verify that the host can access virtual disks by using the `format` command. See Example 5 “Format command”.

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# format
Searching for disks...done
c2t50001FE1002709F8d1: configured with capacity of 1008.00MB
c2t50001FE1002709F8d2: configured with capacity of 1008.00MB
c2t50001FE1002709Fcd1: configured with capacity of 1008.00MB
c2t50001FE1002709Fcd2: configured with capacity of 1008.00MB
c3t50001FE1002709F9d1: configured with capacity of 1008.00MB
c3t50001FE1002709F9d2: configured with capacity of 1008.00MB
c3t50001FE1002709Fdd1: configured with capacity of 1008.00MB
c3t50001FE1002709Fdd2: configured with capacity of 1008.00MB

AVAILABLE DISK SELECTIONS:

0. c0t0d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248> /pci@1f,4000/scsi@3/sd@0,0
1. c2t50001FE1002709F8d1 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssl@d5001fe1002709f8,1
2. c2t50001FE1002709F8d2 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssl@d5001fe1002709f8,2
3. c2t50001FE1002709Fcd1 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssl@d5001fe1002709fd,1
4. c2t50001FE1002709Fcd2 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssl@d5001fe1002709fd,2
5. c3t50001FE1002709F9d1 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssl@d5001fe1002709f9,1
6. c3t50001FE1002709F9d2 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssl@d5001fe1002709f9,2
7. c3t50001FE1002709Fdd1 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssl@d5001fe1002709fd,1
8. c3t50001FE1002709Fdd2 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssl@d5001fe1002709fd,2

Specify disk (enter its number):

If you cannot access the virtual disks:
- Verify the zoning.
- For Oracle Solaris, verify that the correct WWPNs for the EVA (lpfc, qla2300 driver) have been configured and the target assignment is matched in /kernel/drv/sd.conf (lpfc and qla2300 4.13.01).

Labeling and partitioning the devices

Label and partition the new devices using the Oracle format utility:

⚠️ **CAUTION:** When selecting disk devices, be careful to select the correct disk because using the label/partition commands on disks that have data can cause data loss.

1. Enter the `format` command at the root prompt to start the utility.
2. Verify that all new commands are displayed. If not, enter `quit` or press `Ctrl+D` to exit the format utility, and then verify that the configuration is correct (see “Configuring virtual disks from the host” (page 67)).
3. Record the character-type device file names (for example, `c1t2d0`) for all new disks. You will use this data to create the file systems or to use the file systems with the Solaris or Veritas Volume Manager.
4. When prompted to specify the disk, enter the number of the device to be labeled.
5. When prompted to label the disk, enter `Y`.
6. Because the virtual geometry of the presented volume varies with size, select `autoconfigure` as the disk type.
7. For each new device, use the disk command to select another disk, and then repeat 1 through 6.
8. Repeat this labeling procedure for each new device. (Use the disk command to select another disk.)
9. When you finish labeling the disks, enter quit or press Ctrl+D to exit the format utility.


NOTE: Some format commands are not applicable to the EVA storage systems.

VMware

Configuring the EVA with VMware host servers

To configure an EVA with a VMware ESX server:
1. Using HP P6000 Command View, configure a host for one ESX server.
2. Verify that the Fibre Channel Adapters (FCAs) are populated in the world wide port name (WWPN) list. Edit the WWPN, if necessary.
3. Set the connection type to VMware.
4. Add a port to the host defined in 1. Do not add host entries for servers with more than one FCA.
5. Check the VMware vCenter management GUI to find out the WWPN of your server (see diagram below).

Figure 21 VMware vCenter management GUI

6. Repeat this procedure for each ESX server.

Configuring an ESX server

This section provides information about configuring the ESX server.
Setting the multipathing policy

You can set the multipathing policy for each LUN or logical drive on the SAN to one of the following:

- Most recently used (MRU)
- Fixed
- Round robin

To change multipathing policy, use the VMware vSphere GUI interface under the Configuration tab and select Storage. Then select Devices.

Figure 22 Setting multipathing policy

Use the GUI to change policies, or you can use the following commands from the CLI:

**ESX 4.x commands**

- The `# esxcli nmp device setpolicy --device naa.6001438002a56f220001100000710000 --psp VMW_PSP_MRU` command sets device `naa.6001438002a56f220001100000710000` with an MRU multipathing policy.
- The `# esxcli nmp device setpolicy --device naa.6001438002a56f220001100000710000 --psp VMW_PSP_FIXED` command sets device `naa.6001438002a56f220001100000710000` with a Fixed multipathing policy.
- The `# esxcli nmp device setpolicy --device naa.6001438002a56f220001100000710000 --psp VMW_PSP_RR` command sets device `naa.6001438002a56f220001100000710000` with a RoundRobin multipathing policy.

**NOTE:** Each LUN can be accessed through both EVA storage controllers at the same time; however, each LUN path is optimized through one controller. To optimize performance, if the LUN multipathing policy is Fixed, all servers must use a path to the same controller.
You can also set the multipathing policy from the VMware Management User Interface (MUI) by clicking the **Failover Paths** tab in the Storage Management section and then selecting **Edit... link** for each LUN whose policy you want to modify.

**ESXi 5.x commands**

- The `# esxcli storage nmp device set --device naa.6001438002a56f220001100000710000 --psp VMW_PSP_MRU` command sets device `naa.6001438002a56f220001100000710000` with an MRU multipathing policy.

- The `# esxcli storage nmp device set --device naa.6001438002a56f220001100000710000 --psp VMW_PSP_FIXED` command sets device `naa.6001438002a56f220001100000710000` with an Fixed multipathing policy.

- The `# esxcli storage nmp device set --device naa.6001438002a56f220001100000710000 --psp VMW_PSP_RR` command sets device `naa.6001438002a56f220001100000710000` with a RoundRobin multipathing policy.
Verifying virtual disks from the host

Use the **VMware vCenter management GUI** to check all devices (see figure below).

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**HP P6000 EVA Software Plug-in for VMware VAAI**

The vSphere Storage API for Array Integration (VAAI) is included in VMware vSphere solutions. VAAI can be used to offload certain functions from the target VMware host to the storage array. With the tasks being performed more efficiently by the array instead of the target VMware host, performance can be greatly enhanced.

The HP P6000 EVA Software Plug-in for VMware VAAI (VAAI Plug-in) enables the offloading of the following functions (primitives) to the EVA:

- **Full copy**—Enables the array to make full copies of data within the array, without the ESX server having to read and write the data.
- **Block zeroing**—Enables the array to zero out a large number of blocks to speed up provisioning of virtual machines.
- **Hardware assisted locking**—Provides an alternative means to protect the metadata for VMFS cluster file systems, thereby improving the scalability of large ESX server farms sharing a datastore.
- **Block Space Reclamation**—Enables the array to reclaim storage block space on thin provisioned volumes upon receiving command from ESX server 5.1x or later.

**System prerequisites**

- **VMware operating system**: ESX/ESXi 4.1
- **VMware management station**: VMware vCenter 4.1
- **VMware administration tools**: ESX/ESXi 4.1 environments: vCLI 4.1 (Windows or Linux) ESX 5.0 ESX 5.1
- **HP P6000 controller software**: XCS 11001000 or later

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**Enabling vSphere Storage API for Array Integration (VAAI)**

To enable the VAAI primitives, do the following:
NOTE: By default, the four VAAI primitives are enabled.

NOTE: The EVA VAAI Plug-In is required with vSphere 4.1 in order to permit discovery of the EVA VAAI capability. This is not required for vSphere 5 or later.

1. Install the XCS controller software.
2. Enable the primitives from the ESX server.
   Enable and disable these primitives through the following advanced settings:
   - DataMover.HardwareAcceleratedMove (full copy)
   - DataMover.HardwareAcceleratedInit (block zeroing)
   - VMFS3.HardwareAccelerated Locking (hardware assisted locking)
   For more information about the vSphere Storage API for Array Integration (VAAI), see the ESX Server Configuration Guide.
3. Install the HP EVA VAAI Plug-in.
   For information about installing the VAAI Plug-in, see “Installing the VAAI Plug-in” (page 74).

Installing the VAAI Plug-in

Depending on user preference and environment, choose one of the following three methods to install the HP EVA VAAI Plug-in:

- Using ESX host console utilities
- vCLI/vMA
- Using VUM

The following table compares the three VAAI Plug-in installation methods:

<table>
<thead>
<tr>
<th>Table 12 Comparison of installation methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Installation method</strong></td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>ESX host console utilities—Local console</td>
</tr>
<tr>
<td>ESX host console utilities—Remote console</td>
</tr>
<tr>
<td>VMware CLI (vCLI)</td>
</tr>
<tr>
<td>VM Appliance (vMA)</td>
</tr>
<tr>
<td>VMware Update Manager (VUM)</td>
</tr>
</tbody>
</table>

Installation overview

Regardless of installation method, key installation tasks include:
1. Obtaining the HP VAAI Plug-in software bundle from the HP website.
2. Extracting files from HP VAAI Plug-in software bundle to a temporary location on the server.
3. Placing the target VMware host in maintenance mode.
4. Invoking the software tool to install the HP VAAI Plug-in.
   Automated installation steps include:
   a. Installing the HP VAAI plug-in driver (hp_vaaip_p6000) on the target VMware host.
   b. Adding VIB details to the target VMware host.
   c. Creating VAAI claim rules.
   d. Loading and executing VAAI claim rules.
5. Restarting the target VMware host.
6. Taking the target VMware host out of maintenance mode.

After installing the HP VAAI Plug-in, the operating system will execute all VAAI claim rules and scan every five minutes to check for any array volumes that may have been added to the target VMware host. If new volumes are detected, they will become VAAI enabled.

**Installing the HP EVA VAAI Plug-in using ESX host console utilities**

**NOTE:** This installation method is supported for use only with VAAI Plug-in version 1.00, in ESX/ESXi 4.1 environments. This is required for ESX 4.1, but not for ESX 5i.

1. Obtain the VAAI Plug-in software package and save to a local folder on the target VMware host:
   b. Navigate through the display to locate and then download the HP P6000 EVA Software Plug-in for VMware VAAI to a temporary folder on the server. (Example folder location: /root/vaaip)
2. Install the VAAI Plug-in.
   From the ESX service console, enter a command using the following syntax:
   ```
esxupdate --bundle hp_vaaip_p6000-xxx.zip --maintenance mode update
```
   (where `hp_vaaip_p6000-xxx.zip` represents the filename of the VAAI Plug-in.)
3. Restart the target VMware host.
4. Verify the installation:
   a. Check for new HP P6000 claim rules.
      Using the service console, enter:
      
      ```bash
      esxcli corestorage claimrule list -c VAAI
      ```
      
      The return display will be similar to the following:
      
      | Rule Class | Rule | Class | Type | Plugin            | Matches |
      |------------|------|-------|------|-------------------|---------|
      | VAAI       | 5001 | runtime vendor | hp_vaaip_p6000 | vendor=HP model=HSV |
      | VAAI       | 5001 | file vendor | hp_vaaip_p6000 | vendor=HP model=HSV |

   b. Check for claimed storage devices.
      Using the service console, enter:
      
      ```bash
      esxcli vaai device list
      ```
      
      The return display will be similar to the following:

      a.600c0ff00010e1cbc7523f4d01000000
      Device Display Name: HP iSCSI Disk (a.600c0ff00010e1cbc7523f4d01000000)
      VAAI Plugin Name: hp_vaaip_P6000

      a.600c0ff000da030b521bb64b01000000
      Device Display Name: HP Fibre Channel Disk (a.600c0ff000da030b521bb64b01000000)
      VAAI Plugin Name: hp_vaaip_P6000

   c. Check the VAAI status on the storage devices.
      Using the service console, enter:
      
      ```bash
      esxcfg-scsidevs -l | egrep "Display Name:|VAAI Status:"
      ```
      
      The return display will be similar to the following:

      Display Name: Local TRAC CD-ROM (mpx.vmhba5:C0:T0:L0)
      VAAI Status: unknown

      Display Name: HP Serial Attached SCSI Disk (a.600c0ff00010e1cbc7523f4d01000000)
      VAAI Status: supported

      Display Name: HP Fibre Channel Disk (a.600c0ff000da030b521bb64b01000000)
      VAAI Status: unknown

      Table 13 Possible VAAI device status values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>The array volume is hosted by a non-supported VAAI array.</td>
</tr>
<tr>
<td>Supported</td>
<td>The volume is hosted by a supported VAAI array (such as the HP P6000 EVA) and all three VAAI commands completed successfully.</td>
</tr>
<tr>
<td>Not supported</td>
<td>The volume is hosted by a supported VAAI array (such as the HP P6000 EVA), but all three VAAI commands did not complete successfully.</td>
</tr>
</tbody>
</table>

**NOTE:** VAAI device status will be “Unknown” until all VAAI primitives are attempted by ESX on the device and completed successfully. Upon completion, VAAI device status will be “Supported.”

## Installing the HP VAAI Plug-in using vCLI/vMA

**NOTE:** This installation method is supported for use only with VAAI Plug-in version 1.00, in ESX/ESXi 4.1 environments.

1. Obtain the VAAI Plug-in software package and save to a local folder on the target VMware host:
   b. Locate the HP P6000 Software Plug-in for VMware VAAI and then download it to a temporary folder on the server.
2. Enter maintenance mode.
   Enter a command using the following syntax:
   ```
   vicfg-hostops.pl --server Host_IP_Address --username User_Name --password Account_Password -o enter
   ```

3. Install the VAAI Plug-in using vihostupdate.
   Enter a command using the following syntax:
   ```
   vihostupdate.pl --server Host_IP_Address --username User_Name --password Account_Password --bundle hp_vaaip_p6000_offline-bundle-xyz --install
   ```

4. Restart the target VMware host.
   Enter a command using the following syntax:
   ```
   vicfg-hostops.pl --server Host_IP_Address --username User_Name --password Account_Password -o reboot -f
   ```

5. Exit maintenance mode.
   Enter a command using the following syntax:
   ```
   vicfg-hostops.pl --server Host_IP_Address --username User_Name --password Account_Password -o exit
   ```

6. Verify the claimed VAAI device.
   a. Check for new HP P6000 claim rules.
      Enter a command using the following syntax:
      ```
      esxcli --server Host_IP_Address --username User_Name --password Account_Password corestorage claimrule list -c VAAI
      ```
      The return display will be similar to the following:
      ```
      Rule Class  Rule   Class     Type     Plugin            Matches
      VAAI        5001   runtime   vendor   hp_vaaip_p6000   vendor=HP model=HSV
      VAAI        5001   file      vendor   hp_vaaip_p6000   vendor=HP model=HSV
      ```
   
   b. Check for claimed storage devices.
      List all devices claimed by the VAAI Plug-in.
      Enter a command using the following syntax:
      ```
      esxcli --server Host_IP_Address --username User_Name --password Account_Password vaai device list
      ```
      The return display will be similar to the following:
      ```
      naa.600c0ff00010e1cbc7523f4d01000000
      Device Display Name: HP iSCSI Disk (naa.600c0ff00010e1cbc7523f4d01000000)
      VAAI Plugin Name: hp_vaaip_p6000
      naa.600c0ff000da030b521bb64b01000000
      Device Display Name: HP Fibre Channel Disk (naa.600c0ff000da030b521bb64b01000000)
      VAAI Plugin Name: hp_vaaip_p6000
      ```
   
   c. Check the VAAI status on the storage devices. Use the vCenter Management Station as listed in the following section.

### Table 14 Possible VAAI device status values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>The array volume is hosted by a non-supported VAAI array.</td>
</tr>
<tr>
<td>Supported</td>
<td>The array volume is hosted by a supported VAAI array and all three VAAI commands completed successfully.</td>
</tr>
<tr>
<td>Not supported</td>
<td>The array volume is hosted by a supported VAAI array, but all three VAAI commands did not complete successfully.</td>
</tr>
</tbody>
</table>
NOTE: VAAI device status will be "Unknown" until all VAAI primitives are attempted by ESX on the device and completed successfully. Upon completion, VAAI device status will be “Supported.”

Installing the VAAI Plug-in using VUM

NOTE:

- This installation method is supported for use with VAAI Plug-in versions 1.00 and 2.00, in ESX/ESXi 4.1 environments.
- Installing the plug-in using VMware Update Manager is the recommended method.

Installing the VAAI Plug-in using VUM consists of two steps:
1. “Importing the VAAI Plug-in to the vCenter Server” (page 78)
2. “Installing the VAAI Plug-in on each ESX/ESXi host” (page 79)

Importing the VAAI Plug-in to the vCenter Server

1. Obtain the VAAI Plug-in software package and save it on the system that has VMware vSphere client installed:
   b. Locate the HP P6000 EVA Software Plug-in for VMware VAAI and then download it to a temporary folder on the server.
   c. Expand the contents of the downloaded .zip file into the temporary folder and locate the HP EVA VAAI offline bundle file. The filename will be in one of the following formats:
      hp_vaaip_p6000_offline-bundle_xyz.zip
      (where xyz represents the VAAI Plug-in version.)

2. Open VUM:
   a. Double-click the VMware vSphere Client icon on your desktop, and then log in to the vCenter Server using administrator privileges.
   b. Click the Home icon in the navigation bar.
   c. In the Solutions and Applications pane, click the Update Manager icon to start VUM.

   NOTE: If the Solutions and Applications pane is missing, the VUM Plug-in is not installed on your vCenter Client system. Use the vCenter Plug-ins menu to install VUM.

3. Import the Plug-in:
   a. Select the Patch Repository tab.
   b. Click Import Patches in the upper right corner. The Import Patches dialog window will appear.
   c. Browse to the extracted HP P6000 VAAI offline bundle file. The filename will be in the following format: hp_vaaip_p6000-xyz.zip or hp_vaaip_p6000_offline-bundle-xyz.zip, where xyz will vary, depending on the VAAI Plug-in version. Select the file and then click Next.
   d. Wait for the import process to complete.
   e. Click Finish.
4. Create a new Baseline set for this offline plug-in:
   a. Select the Baselines and Groups tab.
   b. Above the left pane, click Create.
   c. In the New Baseline window:
      • Enter a name and a description. (Example: HP P6000 Baseline and VAAI Plug-in for HP EVA)
      • Select Host Extension.
      • Click Next to proceed to the Extensions window.
   d. In the Extensions window:
      • Select HP EVA VAAI Plug-in for VMware vSphere x.x, where x.x represents the plug-in version.
      • Click the down arrow to add the plug-in in the Extensions to Add panel at the bottom of the display.
      • Click Next to proceed.
      • Click Finish to complete the task and return to the Baselines and Groups tab.

The HP P6000 Baseline should now be listed in the left pane.

Importing the VAAI Plug-in is complete. To install the plug-in, see “Installing the VAAI Plug-in on each ESX/ESXi host” (page 79).

Installing the VAAI Plug-in on each ESX/ESXi host
1. From the vCenter Server, click the Home icon in the navigation bar.
2. Click the Hosts and Clusters icon in the Inventory pane.
3. Click the DataCenter that has the ESX/ESXi hosts that you want to stage.
4. Click the Update Manager tab. VUM automatically evaluates the software recipe compliance for all ESX/ESXi Hosts.
5. Above the right pane, click Attach to open the Attach Baseline or Group dialog window. Select the HP P6000 Baseline entry, and then click Attach.
6. To ensure that the patch and extensions compliance content is synchronized, again click the DataCenter that has the ESX/ESXi hosts that you want to stage. Then, in the left panel, right-click the DataCenter icon and select Scan for Updates. When prompted, ensure that Patches and Extensions is selected, and then click Scan.
7. Stage the installation:
   a. Click Stage to open the Stage Wizard.
   b. Select the target VMware hosts for the extension that you want to install, and then click Next.
   c. Click Finish.
8. Complete the installation:
   a. Click Remediate to open the Remediation Wizard.
   b. Select the target VMware host that you want to remediate, and then click Next.
   c. Make sure that the HP EVA VAAI extension is selected, and then click Next.
   d. Fill in the related information, and then click Next.
   e. Click Finish.

Installing the VAAI Plug-in is complete. View the display for a summary of which ESX/ESXi hosts are compliant with the vCenter patch repository.
NOTE:
- In the Tasks & Events section, the following tasks should have a Completed status: Remediate entry, Install, and Check.
- If any of the above tasks has an error, click the task to view the detail events information.

Verifying VAAI status
1. From the vCenter Server, click the Home Navigation bar and then click Hosts and Clusters.
2. Select the target VMware host from the list and then click the Configuration tab.
3. Click the Storage Link under Hardware.

Table 15 Possible VAAI device status values

<table>
<thead>
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</tr>
<tr>
<td>Not supported</td>
<td>The array volume is hosted by a supported VAAI array (such as the HP P6000), but all three VAAI commands did not complete successfully.</td>
</tr>
</tbody>
</table>

Uninstalling the VAAI Plug-in

Procedures vary, depending on user preference and environment:

Uninstalling VAAI Plug-in using the automated script (hpeva.pl)
1. Enter maintenance mode.
2. Query the installed VAAI Plug-in to determine the name of the bulletin to uninstall.
   Enter a command using the following syntax:
   ```c:\>hpeva.pl --server Host_IP_Address --username User_Name --password Account_Password --query```
3. Uninstall the VAAI Plug-in.
   Enter a command using the following syntax:
   ```c:\>hpeva.pl --server Host_IP_Address --username User_Name --password Account_Password --bulletin Bulletin_Name --remove```
4. Restart the host.
5. Exit maintenance mode.

Uninstalling VAAI Plug-in using vCLI/vMA (vihostupdate)
1. Enter maintenance mode.
2. Query the installed VAAI Plug-in to determine the name of the VAAI Plug-in bulletin to uninstall.
   Enter a command using the following syntax:
   ```c:\>vihostupdate.pl --server Host_IP_Address --username User_Name --password Account_Password --query```
3. Uninstall the VAAI Plug-in.
   Enter a command using the following syntax:
   ```c:\>vihostupdate.pl --server Host_IP_Address --username User_Name --password Account_Password --bulletin 0-HPQ-ESX-4.1.0-hp-vaaip-p6000-1.0.10 --remove```
4. Restart the host.
5. Exit maintenance mode.
Uninstalling VAAI Plug-in using VMware native tools (esxupdate)

1. Enter maintenance mode.
2. Query the installed VAAI Plug-in to determine the name of the VAAI Plug-in bulletin to uninstall.
   Enter a command using the following syntax:
   ```
   $host# esxupdate --vib-view query | grep hp-vaaip-p6000
   ```
3. Uninstall the VAAI Plug-in.
   Enter a command using the following syntax:
   ```
   $host# esxupdate remove -b VAAI_Plug_In_Bulletin_Name
   --maintenancemode
   ```
4. Restart the host.
5. Exit maintenance mode.
4 Replacing array components

Customer self repair (CSR)

Table 16 (page 83) and Table 17 (page 84) identify hardware components that are customer replaceable. Using HP Insight Remote Support software or other diagnostic tools, a support specialist will work with you to diagnose and assess whether a replacement component is required to address a system problem. The specialist will also help you determine whether you can perform the replacement.

Parts-only warranty service

Your HP Limited Warranty may include a parts-only warranty service. Under the terms of parts-only warranty service, HP will provide replacement parts free of charge.

For parts-only warranty service, CSR part replacement is mandatory. If you request HP to replace these parts, you will be charged for travel and labor costs.

Best practices for replacing hardware components

The following information will help you replace the hardware components on your storage system successfully.

⚠️ CAUTION: Removing a component significantly changes the air flow within the enclosure. Components or a blanking panel must be installed for the enclosure to cool properly. If a component fails, leave it in place in the enclosure until a new component is available to install.

Component replacement videos

To assist you in replacing components, videos of the procedures have been produced. To view the videos, go to the following website and navigate to your product:

http://www.hp.com/go/sml

Verifying component failure

- Consult HP technical support to verify that the hardware component has failed and that you are authorized to replace it yourself.
- Additional hardware failures can complicate component replacement. Check your management utilities to detect any additional hardware problems:
  - When you have confirmed that a component replacement is required, you may want to clear the failure message from the display. This makes it easier to identify additional hardware problems that may occur while waiting for the replacement part.
  - Before installing the replacement part, check the management utility for new hardware problems. If additional hardware problems have occurred, contact HP support before replacing the component.
  - See the System Event Analyzer online help for additional information.

Identifying the spare part

Parts have a nine-character spare part number on their label (Figure 23 (page 83)). For some spare parts, the part number will be available in HP P6000 Command View. Alternatively, the HP call center will assist in identifying the correct spare part number.
Replaceable parts

This product contains the replaceable parts listed in “Controller enclosure replacement parts” (page 83) and “Disk enclosure replaceable parts” (page 84). Parts that are available for customer self repair (CSR) are indicated as follows:

✓ Mandatory CSR where geography permits. Order the part directly from HP and repair the product yourself. On-site or return-to-depot repair is not provided under warranty.

• Optional CSR. You can order the part directly from HP and repair the product yourself, or you can request that HP repair the product. If you request repair from HP, you may be charged for the repair depending on the product warranty.

– No CSR. The replaceable part is not available for self repair. For assistance, contact an HP-authorized service provider.

Table 16 Controller enclosure replacement parts

<table>
<thead>
<tr>
<th>Description</th>
<th>Spare part number</th>
<th>CSR status</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Gb P63x0 array controller (HSV340)</td>
<td>537151–001</td>
<td>•</td>
</tr>
<tr>
<td>4 Gb P63x0 array controller (HSV340) with iSCSI (MEZ50–1GbE)</td>
<td>537152–001</td>
<td>•</td>
</tr>
<tr>
<td>4 Gb P63x0 array controller (HSV340) with iSCSI (MEZ75–10GbE)</td>
<td>613468–001</td>
<td>•</td>
</tr>
<tr>
<td>4 Gb P65x0 array controller (HSV360)</td>
<td>537153–001</td>
<td>•</td>
</tr>
<tr>
<td>4 Gb P65x0 array controller (HSV360) with iSCSI/FCoE (MEZ50–10GbE)</td>
<td>537154–001</td>
<td>•</td>
</tr>
<tr>
<td>4 Gb P65x0 array controller (HSV360) with iSCSI/FCoE (MEZ75)</td>
<td>613469–001</td>
<td>•</td>
</tr>
<tr>
<td>1 GB cache DIMM for P63x0 controller</td>
<td>587246–001</td>
<td>•</td>
</tr>
<tr>
<td>2 GB cache DIMM for P63x0/P65x0 controller</td>
<td>583721–001</td>
<td>•</td>
</tr>
<tr>
<td>4 GB cache DIMM for P65x0 controller</td>
<td>681646–001</td>
<td>•</td>
</tr>
<tr>
<td>Array battery for P63x0/P65x0 controller (8 CELL)</td>
<td>671987–001</td>
<td>✓</td>
</tr>
<tr>
<td>Array battery for P63x0/P65x0 controller (6 CELL)</td>
<td>671988–001</td>
<td>✓</td>
</tr>
<tr>
<td>Array battery</td>
<td>460581–001</td>
<td>✓</td>
</tr>
<tr>
<td>Array power supply</td>
<td>519842–001</td>
<td>✓</td>
</tr>
<tr>
<td>Array fan module</td>
<td>460583–001</td>
<td>✓</td>
</tr>
<tr>
<td>Array management module</td>
<td>460584–005</td>
<td>✓</td>
</tr>
<tr>
<td>Array LED membrane display</td>
<td>461489–001</td>
<td>•</td>
</tr>
<tr>
<td>Array midplane</td>
<td>461490–005</td>
<td>•</td>
</tr>
</tbody>
</table>
Table 16 Controller enclosure replacement parts (continued)

<table>
<thead>
<tr>
<th>Description</th>
<th>Spare part number</th>
<th>CSR status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Array riser assembly</td>
<td>461491–005</td>
<td>•</td>
</tr>
<tr>
<td>Array power UID</td>
<td>466264–001</td>
<td>•</td>
</tr>
<tr>
<td>P6300 bezel assembly</td>
<td>583395–001</td>
<td>✓</td>
</tr>
<tr>
<td>P6500 bezel assembly</td>
<td>583396–001</td>
<td>✓</td>
</tr>
<tr>
<td>P63x0 bezel assembly</td>
<td>676972-001</td>
<td>✓</td>
</tr>
<tr>
<td>P65x0 bezel assembly</td>
<td>676973-001</td>
<td>✓</td>
</tr>
<tr>
<td>Y-cable, 2 m</td>
<td>583399–001</td>
<td>•</td>
</tr>
<tr>
<td>SAS cable, SPS-CA, EXT Mini SAS, 2M</td>
<td>408767-001</td>
<td>•</td>
</tr>
</tbody>
</table>

Table 17 Disk enclosure replaceable parts

<table>
<thead>
<tr>
<th>Description</th>
<th>Spare part number</th>
<th>CSR status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk drive, 300 GB, 10K, SFF, 6G, M6625, SAS</td>
<td>583711–001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 450 GB, 10K, SFF, 6G, M6625, SAS</td>
<td>613921–001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 600 GB, 10K, SFF, 6G, M6625, SAS</td>
<td>613922–001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 146 GB, 15K, SFF, 6G, M6625, SAS</td>
<td>583713–001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 200 GB, 15K, LFF, 6G, M6612,SAS</td>
<td>660676-001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 300 GB, 15K, LFF, 6G, M6612,SAS</td>
<td>583716–001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 400 GB, 15K, LFF, 6G, M6612,SAS</td>
<td>660677-001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 450 GB, 15K, LFF, 6G, M6612, SAS</td>
<td>583717–001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 600 GB, 15K, LFF, 6G, M6612, SAS</td>
<td>583718–001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 500 GB, 7.2K, SFF, 6G, M6625, SAS-MDL</td>
<td>583714–001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 900 GB, 7.2K, SFF, 6G, M6625, SAS-MDL</td>
<td>665749-001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 1000 GB, 7.2K, LFF, 6G, M6612, SAS-MDL</td>
<td>660678-001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 2 TB, 7.2K, LFF, 6G, M6612, SAS-MDL</td>
<td>602119–001</td>
<td>✓</td>
</tr>
<tr>
<td>Disk drive, 3 TB, 7.2K, LFF, 6G, M6612, SAS-MDL</td>
<td>687045-001</td>
<td>✓</td>
</tr>
<tr>
<td>I/O board, SAS, 2600</td>
<td>519316–001</td>
<td>•</td>
</tr>
<tr>
<td>I/O board, SAS, 2700</td>
<td>519320–001</td>
<td>•</td>
</tr>
<tr>
<td>Voltage Regulator Module (VRM)</td>
<td>519324-001</td>
<td>•</td>
</tr>
<tr>
<td>Front Unit ID</td>
<td>519322-001</td>
<td>•</td>
</tr>
<tr>
<td>Power supply, 460W</td>
<td>511777-001</td>
<td>✓</td>
</tr>
<tr>
<td>Backplane, 12 slot, SAS, 2600</td>
<td>519317-001</td>
<td>•</td>
</tr>
<tr>
<td>Backplane, 25 slot, SAS, 2700</td>
<td>519321-001</td>
<td>•</td>
</tr>
<tr>
<td>Fan module</td>
<td>519325-001</td>
<td>✓</td>
</tr>
<tr>
<td>Fan module interconnect board</td>
<td>519323-001</td>
<td>•</td>
</tr>
<tr>
<td>Bezel kit</td>
<td>581330-001</td>
<td>–</td>
</tr>
<tr>
<td>Rear power UID</td>
<td>519319-001</td>
<td>•</td>
</tr>
</tbody>
</table>
Table 17 Disk enclosure replaceable parts  (continued)

<table>
<thead>
<tr>
<th>Description</th>
<th>Spare part number</th>
<th>CSR status</th>
</tr>
</thead>
<tbody>
<tr>
<td>External mini-SAS Cable, 0.5m</td>
<td>408765-001</td>
<td>•</td>
</tr>
<tr>
<td>Rackmount kit, 1U/2U</td>
<td>519318-001</td>
<td>•</td>
</tr>
</tbody>
</table>

For more information about CSR, contact your local service provider or see the CSR website: [http://www.hp.com/go/selfrepair](http://www.hp.com/go/selfrepair)

To determine the warranty service provided for this product, see the warranty information website: [http://www.hp.com/go/storagewarranty](http://www.hp.com/go/storagewarranty)

To order a replacement part, contact an HP-authorized service provider or see the HP Parts Store online: [http://www.hp.com/buy/parts](http://www.hp.com/buy/parts)

Replacing the failed component

⚠️ **CAUTION:** Components can be damaged by electrostatic discharge (ESD). Use proper anti-static protection.

- Always transport and store CRUs in an ESD protective enclosure.
- Do not remove the CRU from the ESD protective enclosure until you are ready to install it.
- Always use ESD precautions, such as a wrist strap, heel straps on conductive flooring, and an ESD protective smock when handling ESD sensitive equipment.
- Avoid touching the CRU connector pins, leads, or circuitry.
- Do not place ESD generating material such as paper or non anti-static (pink) plastic in an ESD protective enclosure with ESD sensitive equipment.

- HP recommends waiting until periods of low storage system activity to replace a component.
- When replacing components at the rear of the rack, cabling may obstruct access to the component. Carefully move any cables out of the way to avoid loosening any connections. In particular, avoid cable damage that may be caused by:
  - Kinking or bending.
  - Disconnecting cables without capping. If uncapped, cable performance may be impaired by contact with dust, metal or other surfaces.
  - Placing removed cables on the floor or other surfaces, where they may be walked on or otherwise compressed.

Replacement instructions

Printed instructions are shipped with the replacement part. Instructions for all replaceable components are also included on the documentation CD that ships with the P63x0/P65x0 EVA and posted on the web. For the latest information, HP recommends that you obtain the instructions from the web.

Go to the following web site: [http://www.hp.com/support/manuals](http://www.hp.com/support/manuals). Under Storage, select **Disk Storage Systems**, then select **HP P6300/P6500 Enterprise Virtual Array Systems** under P6000/EVA Disk Arrays. The manuals page for the P63x0/P65x0 EVA appears. Scroll to the Service and maintenance information section where the following replacement instructions are posted:

- **HP P6300/P6500 EVA FC Controller Enclosure Replacement Instructions**
- **HP P6300/P6500 EVA FC-iSCSI Controller Enclosure Replacement Instructions**
• HP Controller Enclosure Battery Replacement Instructions
• HP Controller Enclosure Cache DIMM Replacement Instructions
• HP Controller Enclosure Fan Module Replacement Instructions
• HP Controller Enclosure LED Display Replacement Instructions
• HP Controller Enclosure Management Module Replacement Instructions
• HP Controller Enclosure Midplane Replacement Instructions
• HP Controller Enclosure Power Supply Replacement Instructions
• HP Controller Enclosure Riser Assembly Replacement Instructions
• HP Large Form Factor Disk Enclosure Backplane Replacement Instructions
• HP Small Form Factor Disk Enclosure Backplane Replacement Instructions
• HP Disk Enclosure Fan Module Replacement Instructions
• HP Disk Enclosure Fan Interconnect Board Replacement Instructions
• HP Disk Enclosure Front Power UID interconnect board Replacement Instructions
• HP Disk Enclosure I/O Module Replacement Instructions
• HP Disk Enclosure VRM Replacement Instructions
• HP Disk Enclosure Rear Power UID Interconnect Board Replacement Instructions
• HP Power UID Replacement Instructions
• HP Disk Drive Replacement Instructions
This chapter describes the iSCSI configuration rules and guidelines for the HP P6000 iSCSI and iSCSI/FCoE modules.

### iSCSI or iSCSI/FCoE module rules and supported maximums

The iSCSI or iSCSI/FCoE modules are configured in a dual-controller configuration in the HP P6000. Dual-controller configurations provide for high availability with failover between iSCSI or iSCSI/FCoE modules. All configurations are supported as redundant pairs only. iSCSI connected servers can be configured for access to one or both controllers.

### HP P6000 Command View and iSCSI or iSCSI/FCoE module management rules and guidelines

The HP P6000 Command View implementation provides the equivalent functionality for both iSCSI, iSCSI/FCoE, and Fibre Channel connected servers. Management functions are integrated in HP P6000 Command View.

The following are the HP P6000 Command View rules and guidelines for the iSCSI or iSCSI/FCoE modules:

- Requires HP P6000 Command View for array-based and server-based management
- HP P6000 Command View manages the iSCSI or iSCSI/FCoE modules out of band (IP) through the iSCSI or iSCSI/FCoE controller management IP ports. The HP P6000 Command View application server must be on the same IP network and in the same subnet with the iSCSI or iSCSI/FCoE module’s management IP port.
- The iSCSI or iSCSI/FCoE module iSCSI and FCoE Initiators or iSCSI LUN masking information does not reside in the HP P6000 Command View database. All iSCSI Initiator and LUN presentation information resides in the iSCSI and iSCSI/FCoE modules.
- The default iSCSI Initiator EVA host mode setting is Microsoft Windows. The iSCSI initiator for Apple Mac OS X, Linux, Oracle Solaris, VMware, Windows 2008, and Windows 2012 host mode setting is configured with HP P6000 Command View.

**NOTE:** Communication between HP P6000 Command View and the iSCSI modules is not secured by the communication protocol. If this unsecured communication is a concern, HP recommends a confined or secured IP network within a data center for this purpose.

### HP P63x0/P65x0 EVA storage system software

The iSCSI and iSCSI/FCoE modules are not supported with HP P6000 Continuous Access.

### Fibre Channel over Ethernet switch and fabric support

The iSCSI/FCoE modules provide FCoE target functionality. This enables server side FCoE connectivity from Converged Network Adapters (CNAs) over 10 GbE lossless links and converged network switches to the HP P6000 to realize end-to-end FCoE configurations. A simplified example is illustrated in Figure 25 (page 88). HP P6000 Command View supports the iSCSI/FCoE module’s FCoE LUN presentations while simultaneously servicing Fibre Channel and iSCSI hosts. The iSCSI/FCoE modules support simultaneous operation of iSCSI and FCoE on each port.

The iSCSI/FCoE modules are supported with HP B-series and C-series product line converged network switch models.
Figure 24 Mixed FC and FCoE storage configuration using FC and FCoE storage targets

![Diagram of mixed FC and FCoE storage configuration](image)

- **10-GbE FCoE/iSCSI connection**
- **10-GbE connection**

**Figure 25 FCoE support**

![Diagram of FCoE support](image)

- **10-GbE/FCoE A/FCoE B connection**
- **10-GbE FCoE/iSCSI connection**
- **10-GbE connection**
The following is an example of a Mixed FC and FCoE storage configuration:

Figure 26 Mixed FC and FCoE storage configuration

The following is an example of an FC and FCoE storage with Cisco Fabric Extender for HP BladeSystem configurations:

Figure 27 FC and FCoE storage with Cisco Fabric Extender for HP BladeSystem configuration

For the latest information on Fibre Channel over Ethernet switch model and firmware support, see the Single Point of Connectivity Knowledge (SPOCK) at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access. Also, for information on FCoE configuration and attributes, see the HP SAN Design Reference Guide at: http://www.hp.com/go/sandesign
NOTE: HP recommends that at least one zone be created for the FCoE WWNs from each port of the HP P6000 with the iSCSI/FCoE modules. The zone should also contain CNA WWNs. Zoning should include member WWNs from each one of the iSCSI/FCoE modules to ensure configuration of multipath redundancy.

Operating system and multipath software support

This section describes the iSCSI or iSCSI/FCoE module’s operating system, multipath, and cluster support.

For the latest information on operating system and multipath software support, see the Single Point of Connectivity Knowledge (SPOCK) at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.

Table 18 (page 91) provides the operating system and multipath software support.
## Table 18 Operating system and multipath software support

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Multipath software</th>
<th>Clusters</th>
<th>Connectivity</th>
<th>EVA storage system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple Mac OS X</td>
<td>None</td>
<td>None</td>
<td>iSCSI</td>
<td>EVA4400/4400 with the embedded switch</td>
</tr>
<tr>
<td>Microsoft Windows Server 2008, 2003, Hyper-V, and 2012</td>
<td>MPIO with HP DSM</td>
<td>MSCS</td>
<td>iSCSI, FCoE</td>
<td>EVA4000/4100/6000/6100/8000/8100</td>
</tr>
<tr>
<td>Red Hat Linux, SUSE Linux</td>
<td>Device Mapper</td>
<td>None</td>
<td>iSCSI, FCoE</td>
<td>EVA6400/8400</td>
</tr>
<tr>
<td>Solaris</td>
<td>Solaris MPxIO</td>
<td>None</td>
<td>iSCSI</td>
<td>P6300/P6500</td>
</tr>
<tr>
<td>VMware</td>
<td>VMware MPxIO</td>
<td>None</td>
<td>iSCSI, FCoE</td>
<td>P6350/P6550</td>
</tr>
</tbody>
</table>

---

### iSCSI initiator rules, guidelines, and support

This section describes the following iSCSI Initiator rules and guidelines.

#### General iSCSI initiator rules and guidelines

The following are the iSCSI Initiator rules and guidelines.

- iSCSI Initiators and iSCSI or iSCSI/FCoE ports can reside in different IP subnets. This requires setting the iSCSI or iSCSI/FCoE module’s gateway feature. See “set mgmt command” (page 236) for more information.
- Both single path and multipath initiators are supported on the same iSCSI or iSCSI/FCoE modules.
- Fibre Channel, iSCSI, and FCoE presented LUNs must be uniquely presented to initiators running only one protocol type. Presenting a common LUN to initiators simultaneously running different protocols is unsupported.

#### Apple Mac OS X iSCSI initiator rules and guidelines

The Apple Mac OS X iSCSI initiator supports the following:

- Power PC and Intel Power Mac G5, Xserve, Mac Pro
- ATTO Technology Mac driver
- iSNS
- CHAP

**iSCSI Initiator operating system considerations:**

- Host mode setting – Apple Mac OS X
- Multipathing is not supported

#### Microsoft Windows iSCSI Initiator rules and guidelines

The Microsoft Windows iSCSI Initiator supports the following:

- Microsoft iSCSI Initiator versions 2.08, 2.07
- Multipath on iSCSI or iSCSI/FCoE module single or dual controller configurations
iSCSI Initiator operating system considerations:

- TCPIP parameter Tcp1323Opts must be entered in the registry with a value of DWord=2 under the registry setting #HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters.
- The TimeOutValue parameter should be entered in the registry with a value of DWord=120 under the registry setting #HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Disk.
- TCPIP parameter Tcp1323Opts must be entered in the registry with a value of DWord=2 under the registry setting #HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters.
- The TimeOutValue parameter should be entered in the registry with a value of DWord=120 under the registry setting #HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Disk.

⚠️ CAUTION: Using the Registry Editor incorrectly can cause serious problems that may require reinstallation of the operating system. Backup the registry before making any changes. Use Registry Editor at your own risk.

NOTE: These parameters are automatically set by the HP iSCSI or iSCSI/FCoE module kit. This kit also includes a null device driver for the P6000, and is available at: http://h18006.www1.hp.com/products/storageworks/evaiscsiconnect/index.html

Linux iSCSI Initiator rules and guidelines

The Linux iSCSI Initiator supports the following:

- Red Hat Linux and SUSE Linux
- Multipath using HP Device Mapper

iSCSI Initiator operating system considerations:

- Host mode setting – Linux
- NIC bonding is not supported

Solaris iSCSI Initiator rules and guidelines

The Solaris iSCSI Initiator supports the following:

- Solaris iSCSI initiator only
- Multipath using MPxIO
- MPxIO Symmetric option only
- MPxIO round-robin
- MPxIO auto-failback

iSCSI Initiator operating system considerations:

- Host mode setting – Oracle Solaris
- Does not support TOE NICs or iSCSI HBA
- Does not support LUN 0
VMware iSCSI Initiator rules and guidelines

The VMware iSCSI Initiator supports the following:

- Native iSCSI software initiator in VMware ESX 4.0/3.5
- Guest OS SCSI Controller, LSI Logic and/or BUS Logic (BUS Logic with SUSE Linux only)
- ESX server’s native multipath solution, based on NIC teaming on the server
- Guest OS boot from an iSCSI or an iSCSI/FCoE presented target device
- Virtual Machine File System (VMFS) data stores and raw device mapping for guest OS virtual machines
- Multi-initiator access to the same LUN via VMFS
- VMware ESX server 4.0/3.5 native multipath solution based on NIC teaming

iSCSI Initiator operating system considerations:

- Host mode setting VMware
- Does not support hardware iSCSI initiator (iSCSI HBA)

Supported IP network adapters

For the latest information on network adapter support, see the product release notes or the Single Point of Connectivity Knowledge (SPOCK) at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.

Table 19 (page 93) lists the IP network adapters supported by the iSCSI and iSCSI/FCoE controller.

### Table 19 Operating system and multipath software support

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Network interconnect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple Mac OS X</td>
<td>All standard GbE NICs/ASICs supported by Apple</td>
</tr>
<tr>
<td>Microsoft Windows Server 2012, 2008, 2003, Hyper-V</td>
<td>All standard 1 GbE or 10 GbE NICs/ASICs and TOE NICs supported by HP for Windows 2012, 2008, and 2003 QLogic iSCSI HBAs</td>
</tr>
<tr>
<td>Red Hat Linux, SUSE Linux</td>
<td>All standard 1 GbE or 10 GbE NICs/ASICs supported by HP for Linux QLogic iSCSI HBAs</td>
</tr>
<tr>
<td>Solaris</td>
<td>All standard GbE NICs/ASICs supported by Oracle</td>
</tr>
<tr>
<td>VMware</td>
<td>All standard 1GbE or 10GbE NICs/ASICs supported by HP for VMware QLogic iSCSI HBAs</td>
</tr>
</tbody>
</table>

IP network requirements

HP recommends the following:

- Network protocol: TCP/IP IPv6, IPv4, Ethernet 1000 Mb/s or 10 GbE
- IP data: LAN/VLAN support with less than 10 ms latency; maximum of 2 VLANs per port, 1 VLAN per protocol
- IP management—LAN/WAN support
- Dedicated IP network for iSCSI data
- Jumbo frames

**NOTE:** If you configure IPv6 on any iSCSI or iSCSI/FCoE module’s iSCSI data port, you must also configure IPv6 on the HP P6000 Command View management server.
Set up the iSCSI Initiator

Windows

For Windows Server 2012 and Windows Server 2008, the iSCSI initiator is included with the operating system. For Windows Server 2003, you must download and install the iSCSI initiator (version 2.08 recommended).

HP recommends the following Windows HKEY_LOCAL_MACHINE Registry settings:

Tcp1323opts = "2"
TimeOutvalue = "120"

**NOTE:** Increasing the TimeOutvalue from the default of 60 to 120 will avoid initiator I/O timeouts during controller code loads and synchronizations. These settings are included in the HP P6000 iSCSI/FCoE and MPX200 Multifunction Router kit.
1. Install the HP P6000 iSCSI/FCoE and MPX200 Multifunction Router kit.
   a. Start the installer by running Launch.exe; if you are using a CD-ROM, the installer should start automatically.
   b. Click **Install iSCSI/FCoE software package** (see Figure 28 (page 95) and Figure 29 (page 95)).

   **Figure 28 Windows Server 2003 kit**

   ![Windows Server 2003 kit diagram]

   **Figure 29 Windows registry and controller device installation**

   ![Windows registry and controller device installation diagram]

   For Windows Server 2003, the Microsoft iSCSI initiator installation presents an option for installing MPIO using the Microsoft generic DSM (Microsoft MPIO Multipathing Support for iSCSI check box). For Windows Server 2008, MPIO is installed separately. See Figure 30 (page 96).
c. Click the Microsoft iSCSI Initiator icon to open the Control Panel applet. The iSCSI Initiator Properties window opens.
d. Click the Discovery tab (see Figure 31 (page 96)).

**Figure 31 iSCSI Initiator Properties—Discovery tab**

![iSCSI Initiator Properties—Discovery tab](image)

e. In the Target Portals section, click **Add**. A dialog box opens to enter the iSCSI port IP Address.
f. Click **OK**. The Discovery is now complete.

2. Set up the iSCSI Host and virtual disks on HP P6000 Command View:
a. From HP P6000 Command View, click the EVA storage system icon to start the iSCSI storage presentation. In adding a host, the iSCSI or iSCSI/FCoE modules are the target EVA storage system.

Figure 33 Add a host

b. Select the **Hosts** folder.
c. To create iSCSI Initiator host, click Add host. A dialog box opens.
   - Enter a name for the initiator host in the Name box.
   - Select iSCSI as the Type.
   - Select the initiator iSCSI qualified name (IQN) from the iSCSI node name list. Or, you can enter a port WWN.
   - Select an OS from the Operating System list.

d. Create a virtual disk and present it to the host you created in Step 2.c. Note the numbers in the target IQN; these target WWNs will be referenced during Initiator login. See Figure 34 (page 98) and Figure 35 (page 98).

Figure 34 Virtual disk properties

Figure 35 Host details
3. Set up the iSCSI disk on the iSCSI Initiator:
   a. Open the iSCSI Initiator Control Panel applet.
   b. Click the Targets tab and then the Refresh button to see the available targets (Figure 36 (page 99)). The status should be Inactive.

   **Figure 36 iSCSI Initiator Properties—Targets tab**

   ![Figure 36 iSCSI Initiator Properties—Targets tab](image)

   c. Select the target IQN, keying off the module 1 or 2 field and the WWN field, noted in Step 2.d, and click Log On.
      A dialog box opens.

   d. Configure the target IQN:
      - Select the Automatically box to restore this connection when the system boots.
      - Select the Multipathing box to enable MPIO. The target status is Connected when logged in.

   **NOTE:** HP recommends using the Advanced button to selectively choose the Local Adapter, Source IP, and Target Portal. The Target Portal IP Address is the iSCSI port to which this initiator connection path is defined.

   e. Depending on the operating system, open Server Manager or Computer Management.
   f. Select Disk Management.
   g. Select Action > Rescan Disks. Verify that the newly assigned disk is listed. If not, a reboot may be required.
   h. Prepare the disk for use by formatting and partitioning.

**Multipathing**

Microsoft MPIO includes support for the establishment of redundant paths to send I/O from the initiator to the target. For Windows Server 2008 and Microsoft Windows 2012, MPIO is a separate feature that has to be installed separately. Microsoft iSCSI Software Initiator Version 2.x includes MPIO and has to be selected for installation. Setting up redundant paths properly is important to ensure high availability of the target disk. Ideally, the system would have the paths use separate NIC cards and separate network infrastructure (cables, switches, iSCSI or iSCSI/FCoE modules). HP recommends separate target ports.
Microsoft MPIO support allows the initiator to log in to multiple sessions to the same target and aggregate the duplicate devices into a single device exposed to Windows. Each session to the target can be established using different NICs, network infrastructure, and target ports. If one session fails, another session can continue processing I/O without interruption to the application. The iSCSI target must support multiple sessions to the same target. The Microsoft iSCSI MPIO DSM supports a set of load balance policies that determine how I/O is allocated among the different sessions. With Microsoft MPIO, the load balance policies apply to each LUN individually.

The Microsoft iSCSI DSM v2.x assumes that all targets are active/active and can handle I/O on any path at any time. There is no mechanism within the iSCSI protocol to determine whether a target is active/active or active/passive; therefore, the iSCSI or iSCSI/FCoE modules support only multipath configurations with the EVA with active/active support. More information can be found at:

http://www.microsoft.com/WindowsServer2003/technologies/storage/mPIO/default.mspx
http://download.microsoft.com/download/3/0/4/304083f1-11e7-44d9-92b9-2f3c6bf01048/mPIO.doc

Table 20 (page 100) details the differences between Windows Server 2008 and Windows Server 2003.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>iSCSI Initiator</strong></td>
<td>Included with operating system</td>
</tr>
<tr>
<td><strong>MPIO</strong></td>
<td>Feature has to be installed</td>
</tr>
</tbody>
</table>

Table 21 (page 100) shows the supported MPIO options for the iSCSI or iSCSI/FCoE controller.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HP MPIO Full Featured DSM for EVA</strong></td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Microsoft generic DSM</strong></td>
<td>Supported</td>
</tr>
<tr>
<td>*Preferred</td>
<td></td>
</tr>
</tbody>
</table>

Installing the MPIO feature for Windows Server 2012

**NOTE:** Microsoft Windows 2012 includes a separate MIOP feature that requires installation for use. Microsoft Windows Server 2012 also includes the iSCSI Initiator. Download or installation is not required.

Installing the MPIO feature for Windows Server 2012:
1. Check the box for Multipath I/O in the Add Features page.

![Add Roles and Features Wizard](image)

**Figure 37 Add Features page**

2. Click **Next** and then click **Install**.

3. After the server reboots, add support for iSCSI Devices using the MPIO applet.
NOTE: You must present a virtual disk to the initiator to enable the Add support for iSCSI devices checkbox.

4. A final reboot is required to get the devices MPIO-ed.
Installing the MPIO feature for Windows Server 2008:

1. Check the box for Multipath I/O in the Add Features page (Figure 37 (page 103)).

2. Click Next and then click Install.

3. After the server reboots, add support for iSCSI Devices using the MPIO applet (see Figure 41 (page 103) and Figure 42 (page 104)).

   **NOTE:** You must present a virtual disk to the initiator to enable the Add support for iSCSI devices checkbox.
4. A final reboot is required to get the devices MPIO-ed.

**Installing the MPIO feature for Windows Server 2003**

For Windows Server 2003, if you are installing the initiator for the first time, check all the installation option checkboxes and then click Next to continue (Figure 43 (page 104)).

**Figure 43 Software update installation wizard**

To add or remove specific MS iSCSI software Initiator components after the initial install, run the setup package executable and select the check box to add MPIO. The application automatically checks the boxes for components that are already installed. For example, if you want to add the MS MPIO component, leave the other check boxes unchecked; check only the MS MPIO check box.

**NOTE:** The installation requires a reboot.

**IMPORTANT:** Windows XP Professional is not supported by Microsoft’s MPIO.
About Microsoft Windows Server 2003 scalable networking pack

The Microsoft Windows Server 2003 Scalable Networking Pack (SNP) contains functionality for offloading TCP network processing to hardware. TCP Chimney is a feature that allows TCP/IP processing to be offloaded to hardware. Receive Side Scaling allows receive packet processing to scale across multiple CPUs.

HP’s NC3xxx Multifunction Gigabit server adapters support TCP offload functionality using Microsoft’s Scalable Networking Pack (SNP).

For more support details, read the latest HP adapter information for more support details.

To download the SNP package and for more details see: http://support.microsoft.com/kb/912222.

NOTE: Windows Server 2003 SP2 includes SNP functionality.

SNP setup with HP NC 3xxx GbE multifunction adapter

Microsoft’s Scalable Networking Pack works in conjunction with HP’s NC3xxx Multifunction Gigabit server adapters for Windows 2003 only.

To set up SNP on a Windows 2003 server:

1. Install the hardware and necessary software for the NC3xxx Multifunction Gigabit server adapter, following the manufacturer’s installation procedures.

2. Download the SNP package from the Microsoft website: http://support.microsoft.com/kb/912222.
   a. To start the installation immediately click Run, or
   b. To copy the download to your computer for installation at a later time, click Save.

   A reboot is required after successful installation.

3. After reboot, verify TCP offload settings by opening a Command Prompt window and issuing the command:

   C:\>netsh interface ip show offload
   The following is displayed:

   Offload Options for interface "33-IP Storage Subnet" with index: 10003:
   TCP Transmit Checksum
   IP Transmit Checksum
   TCP Receive Checksum
   IP Receive Checksum
   TCP Large Send TCP Chimney Offload.

4. To modify TOE Chimney settings, use the commands:

   >netsh int ip set chimney enabled
   >netsh int ip set chimney disabled

   For more information, go to:
   http://support.microsoft.com/kb/912222

iSCSI Initiator version 3.10 setup for Apple Mac OS X (single-path)

The EVA4400 and EVA connectivity option supports the Macintosh Xtend iSCSI Initiator provided by ATTO Technologies. For more details please visit http://www.attotech.com.
Set up the iSCSI Initiator for Apple Mac OS X

1. Install the ATTO iSCSI Macintosh Initiator v3.10 following the install instructions provided by the vendor.

2. Run the Xtend SAN application to discover and configure the EVA iSCSI targets. The Xtend SAN iSCSI Initiator can discover targets either by static address or iSNS.

   For static address discovery:
   a. Select Discover Targets and then select Discover by DNS/IP (Figure 44 (page 106)).

   ![Figure 44 Discover targets](image)

   b. Add the static IP address of the iSCSI or iSCSI/FCoE module’s port in the Address field and then select Finish (Figure 45 (page 106)).

   ![Figure 45 Add static IP address](image)

   c. Select a target from the Discovered Target list and then click Add (Figure 44 (page 106)).

**NOTE:** The iSCSI or iSCSI/FCoE module’s port may present several iSCSI targets to the Xtend SAN iSCSI Initiator. Select only one target from the list.
3. For iSNS discovery:
   a. Select **Initiator** and then enter the iSNS name or IP address in the **iSNS Address** field (Figure 46 (page 107)).

![Figure 46 iSNS discovery and verification](image)

b. Test the connection from the initiator to the iSNS server by selecting **Verify iSNS**. If successful, select **Save**.

   If necessary, working on the iSNS server, make the appropriate edits to add the Xtend SAN iSCSI Initiator to any iSNS discovery domains that include iSCSI module targets.

c. Select **Discover Targets**.

d. Select **Discover by iSNS**.

   A list of module targets appears under **Discovered Targets** (Figure 44 (page 106)).

   **NOTE:** The module’s port may present several iSCSI targets to the Xtend SAN iSCSI Initiator. Select only one target from the list.

e. Select the newly-added target under Host name in the left frame.

f. Check the **Visible** box (Figure 47 (page 107)). This allows the initiator to display the target status.

g. Check the **Auto Login** box. This configures the iSCSI Initiator to automatically log in to the iSCSI target at system startup.

h. Click **Save**.

![Figure 47 Selecting newly added target](image)
i. Select **Status**, select **Network Node**, and then select **Login** to connect to the module's target (Figure 48 (page 108)).

The Network Node displays a status of **Connected** and the target status light turns green.

**Figure 48 Select status**
Storage setup for Apple Mac OS X

1. Present LUNs using HP P6000 Command View.
2. Verify that the EVA LUNs are presented to the Macintosh iSCSI Initiator:
   a. Open the Xtend SAN iSCSI application.
   b. Select the iSCSI or iSCSI/FCoE module target entry under the host name.
   c. Click the LUNs button.
      A list of presented EVA LUNs is displayed (Figure 49 (page 109)).

   ![Figure 49 Presented EVA LUNs](image)

   **NOTE:** If no LUNs appear in the list, log out and then log in again to the target, or a
   system reboot may be required.

3. Set up the iSCSI drive on the iSCSI Initiator:
   a. Open Disk Utilities from the Apple Mac OS X Finder Applications list.
   b. Format and partition the EVA LUN as needed.

iSCSI Initiator setup for Linux

Installing and configuring the SUSE Linux Enterprise 10 iSCSI driver

Configure the initiator using the built-in GUI-based tool or the open-iscsi administration utility using
the `iscsiadm` command. See the `iscsiadm (8)` man pages for detailed command information.

1. Modify the Initiator Name by issuing the following command:
   ```
   # vi /etc/initiatorname.iscsi
   ```

2. To configure the Initiator and Targets, start the iSCSI Initiator applet by finding it in the YaST
   Control Center under **Network Services**, and then set the service to start at boot time
   (Figure 50 (page 110)).
3. Click the **Discovered Targets** tab and enter your iSCSI target IP address (Figure 51 (page 110)).

4. Log in to the target (Figure 52 (page 111)).
5. Click the **Connected Targets** tab, and then click the **Toggle Start-Up** button on each target listed so the targets start automatically (Figure 53 (page 111)).

---

**Figure 53 Connected Targets tab**

---

**Installing and configuring for Red Hat 5**

To install and configure for Red Hat 5:

**NOTE:** The iSCSI driver package is included but is not installed by default. Install the package `iscsi-initiator-utils` during or after operating system installation.
1. Use the `iscsiadm` command to control discovery and connectivity:
   
   ```
   # iscsiadm -m discovery -t st -p 10.6.0.33:3260
   ```

2. Edit the initiator name:
   
   ```
   # vi /etc/iscsi/initiatorname.iscsi
   ```

3. To start the iSCSI service use the `service` command:
   
   ```
   # service iscsi start
   ```

4. Verify that the iSCSI service autostarts:
   
   ```
   # chkconfig iscsi on
   ```

**NOTE:** For more detail, see the man pages regarding the `iscsiadm` open-iscsi administration utility.

---

**Installing and configuring for Red Hat 4 and SUSE 9**

To install and configure for Red Hat 4 and for SUSE 9:

**NOTE:** The iSCSI driver is included with the Red Hat 4 and SUSE 9 distributions and is installed by default. Configuration is the same for Red Hat 3, 4, SUSE 8 and 9.

1. Update `/etc/iscsi.conf` to include the IP address of your iSCSI target. A sample configuration file might include entries like this:

   ```
   DiscoveryAddress=33.33.33.101
   ```

   For a more detailed description of the configuration file format, enter:

   ```
   man iscsi.conf
   ```

2. Enter the following command to manually start iSCSI services to test your configuration:

   ```
   /etc/init.d/iscsi start
   ```

3. Modify the `/etc/initiatorname.iscsi` file to reflect a meaningful name for the initiator. For example:

   ```
   InitiatorName=iqn.1987-05.com.cisco:servername.yourcompany.com
   ```

   **NOTE:** In most cases, the only part of the file requiring modification is after the colon.

If there are problems starting the `iscsi` daemon, they are usually caused by an incorrect IP Address or an ill-formatted initiator name.

**Installing the initiator for Red Hat 3 and SUSE 8**

If you are upgrading from a previous installation of an iSCSI driver, HP recommends that you remove the `/etc/initiatorname.iscsi` file before installing the new driver. See the following website for the latest version of the Linux driver for EVA iSCSI connectivity:

http://sourceforge.net/projects/linux-iscsi

**NOTE:** The Linux driver supports both Red Hat 3 and SUSE 8. See the `Readme` file in the tar ball for more information on how to configure the Linux iSCSI Initiator.

---

**Assigning device names**

Because Linux assigns SCSI device nodes dynamically whenever a SCSI logical unit is detected, the mapping from device nodes such as `/dev/sda` or `/dev/sdb` to iSCSI targets and logical units may vary.

Variations in process scheduling and network delay can result in iSCSI targets being mapped to different SCSI device nodes every time the driver is started. Because of this variability, configuring
applications or operating system utilities to use the standard SCSI device nodes to access iSCSI devices can result in sending SCSI commands to the wrong target or logical unit.

To provide consistent naming, the iSCSI driver scans the system to determine the mapping from SCSI device nodes to iSCSI targets. The iSCSI driver creates a tree of directories and symbolic links under /dev/iscsi to make it easier to use a particular iSCSI target's logical unit.

The directory tree under /dev/iscsi contains subdirectories for each iSCSI bus number, each target id number on the bus, and each logical unit number for each target. For example, the whole disk device for bus 0, target ID 0, and LUN 0 would be /dev/iscsi/bus0/target0/LUN0/disk.

In each logical unit directory there is a symbolic link for each SCSI device node that can be connected to that particular logical unit. These symbolic links are modeled after the Linux devfs naming convention:

- The symbolic link disk maps to the whole-disk SCSI device node such as /dev/sda or /dev/sdb.
- The symbolic links part1 through part15 maps to each partition of that SCSI disk. For example, a symbolic link can map to partitions /dev/sda1, dev/sda15, or to as many partitions as necessary.

**NOTE:** These symbolic links exist regardless of the number of disk partitions. Opening the partition devices results in an error if the partition does not actually exist on the disk.

- The symbolic link mt maps to the auto-rewind SCSI tape device node for the LUN /dev/st0, for example. Additional links for mtl, mtm, and mta map to the other auto-rewind devices /dev/st0l, /dev/st0m, /dev/st0a, regardless of whether these device nodes actually exist or could be opened.
- The symbolic link mtn maps to the no-rewind SCSI tape device node, if any. For example, this LUN maps to /dev/nst0. Additional links formtln, mtm, and mta map to the other no-rewind devices such as /dev/nst0l, /dev/nst0m, /dev/nst0a, regardless of whether those device nodes actually exist or could be opened.
- The symbolic link cd maps to the SCSI CD-ROM device node, if any, for the LUN /dev/scd0 for example.
- The symbolic link generic maps to the SCSI generic device node, if any, for the LUN /dev/sg0.

Because the symlink creation process must open all of the SCSI device nodes in /dev in order to determine which nodes map to iSCSI devices, you may see many modprobe messages logged to syslog indicating that modprobe could not find a driver for a particular combination of major and minor numbers. This message can be ignored. The messages occur when Linux is unable to find a driver to associate with a SCSI device node that the iSCSI daemon is opening as part of its symlink creation process. To prevent these messages from occurring, remove the SCSI device nodes that do not contain an associated high-level SCSI driver.

**Target bindings**

The iSCSI driver automatically maintains a bindings file, /var/iscsi/bindings. This file contains persistent bindings to ensure that the same iSCSI bus and target ID number are used for every iSCSI session with a particular iSCSI TargetName, even when the driver is repeatedly restarted.

This feature ensures that the SCSI number in the device symlinks (described in “Assigning device names” (page 112)) always map to the same iSCSI target.
NOTE: Because of the way Linux dynamically allocates SCSI device nodes as SCSI devices are found, the driver does not and cannot ensure that any particular SCSI device node /dev/sda, for example, always maps to the same iSCSI TargetName. The symlinks described in “Assigning device names” (page 112) are intended to provide application and fstab file persistent device mapping and must be used instead of direct references to particular SCSI device nodes.

If the bindings file grows too large, lines for targets that no longer exist may be manually removed by editing the file. Manual editing should not be needed, however, since the driver can maintain up to 65,535 different bindings.

Mounting file systems

Because the Linux boot process normally mounts file systems listed in /etc/fstab before the network is configured, adding mount entries in iSCSI devices to /etc/fstab will not work. The iscsi-mountall script manages the checking and mounting of devices listed in the file /etc/fstab.iscsi, which has the same format as /etc/fstab. This script is automatically invoked by the iSCSI startup script.

NOTE: If iSCSI sessions are unable to log in immediately due to network or authentication problems, the iscsi-mountall script can time out and fail to mount the file systems.

Mapping inconsistencies can occur between SCSI device nodes and iSCSI targets, such as mounting the wrong device due to device name changes resulting from iSCSI target configuration changes or network delays. Instead of directly mounting SCSI devices, HP recommends one of the following options:

- Mount the /dev/iscsi tree symlinks.
- Mount file system UUIDs or labels (see man pages for mke2fs, mount, and fstab).
- Use logical volume management (see Linux LVM).

Unmounting file systems

It is very important to unmount all file systems on iSCSI devices before the iSCSI driver stops. If the iSCSI driver stops while iSCSI devices are mounted, buffered writes may not be committed to disk, and file system corruption can occur.

Since Linux will not unmount file systems that are being used by a running process, any processes using those devices must be stopped (see fuser(1)) before iSCSI devices can be unmounted.

To avoid file system corruption, the iSCSI shutdown script automatically stops all processes using devices in /etc/fstab.iscsi, first by sending them SIGTERM, and then by sending any remaining processes SIGKILL. The iSCSI shutdown script unmounts all iSCSI file systems and stops the iSCSI daemon, terminating all connections to iSCSI devices.

CAUTION: File systems not listed in /etc/fstab.iscsi cannot be automatically unmounted.
Presenting EVA storage for Linux

To set up LUNs using HP P6000 Command View:
1. Set up LUNs using HP P6000 Command View. For procedure steps, see Step 2.
2. Set up the iSCSI drive on the iSCSI Initiator:
   a. Restart the iSCSI services:
      `/etc/rc.d/initd/iscsi restart`
   b. Verify that the iSCSI LUNs are presented to the operating system by entering the following command:
      `fdisk -l`

Setting up the iSCSI Initiator for VMware

The software iSCSI Initiator is built into the ESX server VMkernel and uses standard 10 GigE/GigE NICs to connect to the iSCSI or iSCSI/FCoE modules.

To set up software-based iSCSI storage connectivity:
1. Install the appropriate license from VMware to enable the iSCSI software driver using the VMware instructions.
2. Configure the VMKernel TCP/IP networking stack for iSCSI support. Configure the VMkernel service console with dedicated virtual switch using a dedicated NIC for iSCSI data traffic. Follow the instructions from VMware. Figure 54 (page 115) shows an example of a configuration.

**Figure 54 Configuration tab**

3. Open a firewall port by enabling the iSCSI software client service:
   a. Using the VMware VI client, select the server.
   b. Click the **Configuration** tab, and then click **Security Profile**.
   c. Click the **Properties** link.
      The Firewall Properties dialog box is displayed (see Figure 55 (page 116)).
d. Select the **Software iSCSI** check box for to enable iSCSI traffic.

e. Click **OK**.

4. Enable the iSCSI software initiators:
   a. In the VMware VI client, select the server from the inventory panel.
   b. Click the **Configuration** tab, and then click **Storage Adapters** under Hardware.
   c. Under iSCSI Software Adapter, choose the available software initiator.
   d. Click the **Properties** link of the software adapter.
      The iSCSI Initiator Properties dialog box is displayed.
   e. Click **Configure**.
      The General Properties dialog box is displayed (see Figure 56 (page 116)).

**Figure 56 General Properties dialog box**

f. Select the **Enabled** check box.

g. Click **OK**.

5. Set up Discovery Addressing for the software initiator:
   a. Repeat Step 4 to open the iSCSI initiator Properties dialog box.
   b. Click the **Dynamic Discovery** tab
   c. Click **Add** to add a new iSCSI target.
      The Add Send Target Server dialog box is displayed (see Figure 57 (page 117)).
d. Enter the iSCSI IP address of the iSCSI or iSCSI/FCoE module.
e. Click **OK**.

6. To verify that the LUNs are presented to the VMware host, rescan for new iSCSI LUNs:
   a. In VMware’s VI client, select a server and click the **Configuration** tab.
   b. Choose **Storage Adapters** in the hardware panel and click **Rescan** above the Storage Adapters panel.

   The Rescan dialog box is displayed (see Figure 58 (page 117)).

![Figure 58 Rescan dialog box](image)

   c. Select the **Scan for New Storage Devices** and the **Scan for New VMFS Volumes** check boxes.
   d. Click **OK**.

   The LUNs are now available for the ESX server.

When presenting iSCSI storage to Virtual Machines, you must do the following:

- Create Virtual Machines using LSI Logic emulation.
- Present iSCSI storage to a Virtual Machine either as a data store created on an iSCSI device or raw device mapping.

**Configuring multipath with the Solaris 10 iSCSI Initiator**

This section contains information about configuring multipath with the Solaris 10 iSCSI Initiator to the iSCSI or iSCSI/FCoE modules.
MPxIO overview

The Oracle multipathing software (MPxIO) provides basic failover and load-balancing capability to HP P6000, and EVA4x00/6x00/8x00 storage systems. MPxIO allows the merging of multiple SCSI layer paths, such as an iSCSI device exposing the same LUN via several different iSCSI target names. Because MPxIO is independent of transport, it can multipath a target that is visible on both iSCSI and FC ports. This section describes only the iSCSI implementation of MPxIO with the iSCSI or iSCSI/FCoE modules.

For more information about MPxIO, see the Solaris Fibre Channel and Storage Multipathing Administration Guide at: http://docs.sun.com/source/819-0139.

Preparing the host system

To verify that MPxIO is enabled:
1. Enter the following command to verify that the MPIO setting is no:
   cat kernel/drv/iscsi.conf
2. Verify mpxio-disable="no"
   If setting is yes change to no, and reboot:
   Reboot -- -r

Example: MPxIO on all iSCSI port settings in /kernel/dev/iscsi.conf.

```
# Copyright 2006 Sun Microsystems, Inc. All rights reserved.
# Use is subject to license terms.
#
#ident "@(##)iscsi.conf 1.2 06/06/12 SMI"
name="iscsi" parent="/" instance=0;
ddi-forceattach=1;
#
# I/O multipathing feature (MPxIO) can be enabled or disabled using
# mpxio-disable property. Setting mpxio-disable="no" will activate
# I/O multipathing; setting mpxio-disable="yes" disables the feature.
#
# Global mpxio-disable property:
#
# To globally enable MPxIO on all iscsi ports set:
# mpxio-disable="no";
# To globally disable MPxIO on all iscsi ports set:
# mpxio-disable="yes";
#
# mpxio-disable="no";
#
```

Enabling MPxIO for HP P63x0/P65x0 EVA

This section describes the steps necessary to configure a Solaris server to recognize an HP storage array in an iSCSI multipath environment with the iSCSI or iSCSI/FCoE modules.

Edit the scsi_vhci.conf file

HP EVA storage arrays are supported with MPxIO:

- As symmetric devices only
- With no load balancing
- With no failback

To configure MPxIO for HP storage devices, the appropriate information needs to be added in the /kernel/drv/scsi_vhci.conf file. To enable MPxIO for HP storage:
1. Use a text editor to change the configuration file. For example:
   # vi /kernel/drv/scsi_vhci.conf
2. Modify load balancing to none:
   \texttt{load-balance="none";} 
3. Modify auto-failback to disable:
   \texttt{auto-failback="disable";} 
4. Add the following lines to cover the 4x00/6x00/8x00/P6000 HP arrays:
   \texttt{device-type-scsi-options-list =}
   \texttt{"HP HSV", "symmetric-option";} 
   \texttt{symmetric-option = 0x1000000;} 

\textbf{NOTE:} You must enter six spaces between \texttt{HP} and \texttt{HSV}, as shown.

\textbf{Example:} HP storage array settings in \texttt{/kernel/drv/scsi_vhci.conf:}

```
# # Copyright 2004 Sun Microsystems, Inc. All rights reserved.
# Use is subject to license terms.
# #pragma ident "(#)scsi_vhci.conf 1.9 04/08/26 SMI"
# name="scsi_vhci" class="root";
# # Load balancing global configuration: setting load-balance="none" will cause
# all I/O to a given device (which supports multipath I/O) to occur via one
# path. Setting load-balance="round-robin" will cause each path to the device
# to be used in turn.
# # load-balance="none";
# # Automatic failback configuration
# # possible values are auto-failback="enable" or auto-failback="disable"
# auto-failback="disable";
# # For enabling MPxIO support for 3rd party symmetric device need an
# entry similar to following in this file. Just replace the "SUN SENA"
# part with the Vendor ID/Product ID for the device, exactly as reported by
# Inquiry cmd.
# # device-type-scsi-options-list =
# "SUN SENA", "symmetric-option";
# # symmetric-option = 0x1000000;
# device-type-scsi-options-list =
# "HP HSV", "symmetric-option";
# symmetric-option = 0x1000000;
```

5. Activate the changes, by a reconfiguration reboot:
   
   ```
   # reboot -- -r
   ```

\textbf{Edit the} \texttt{sgen.conf} \textbf{file}

To ensure that the HP storage arrays are recognized by Solaris as scsi controllers, the appropriate
information needs to be added in the \texttt{/kernel/drv/sgen.conf} file.

1. Use a text editor to change the configuration file. For example:
   ```
   # vi /kernel/drv/scsi_vhci.conf
   ```
2. Add \texttt{array_ctrl} to \texttt{device-type-config-list:}
   ```
   device-type-config-list="array_ctrl";
   ```
3. Uncomment all target/lun pair entries.

\textbf{Example:} HP storage array settings in \texttt{/kernel/drv/sgen.conf}.
# devices on your system. Please refer to sgen(7d) for details.

# sgen may be configured to bind to SCSI devices exporting a particular device
# type, using the device-type-config-list, which is a ',' delimited list of
# strings.
# device-type-config-list="array_ctrl";
.
.
# After configuring the device-type-config-list and/or the inquiry-config-list,
# the administrator must uncomment those target/lun pairs at which there are
# devices for sgen to control. If it is expected that devices controlled by
# sgen will be hotplugged or added into the system later, it is recommended
# that all of the following lines be uncommented.

name="sgen" class="scsi" target=0 lun=0;
name="sgen" class="scsi" target=1 lun=0;
name="sgen" class="scsi" target=2 lun=0;
name="sgen" class="scsi" target=3 lun=0;
name="sgen" class="scsi" target=4 lun=0;
name="sgen" class="scsi" target=5 lun=0;
name="sgen" class="scsi" target=6 lun=0;
name="sgen" class="scsi" target=7 lun=0;
name="sgen" class="scsi" target=8 lun=0;
name="sgen" class="scsi" target=9 lun=0;
name="sgen" class="scsi" target=10 lun=0;
name="sgen" class="scsi" target=11 lun=0;
name="sgen" class="scsi" target=12 lun=0;
name="sgen" class="scsi" target=13 lun=0;
name="sgen" class="scsi" target=14 lun=0;
name="sgen" class="scsi" target=15 lun=0;

Create an sgen driver alias

The HP storage array is a self identifying scsi device and must be bound to the sgen driver using an alias.

1. Enter the following command to update the sgen driver.

   # update_drv -a -I "scsiclass,0c" sgen

   **NOTE:** Lowercase c is mandatory.

2. Verify sgen alias setting:

   # egrep sgen /etc/driver_aliases

   Example:
   
   # rep sgen /etc/driver_aliases
   sgen "scsa,08.bfcp"
   sgen "scsa,08.bvhci"
   sgen "scsiclass,0c"

Enable iSCSI target discovery

Solaris supports three iSCSI target discovery methods:

- SendTargets
- Static
- iSNS

This section describes SendTargets discovery only. For further information on Static and iSNS discovery please see: [http://docs.sun.com/app/docs/doc/817-5093/fqnIkl?l=en&=view](http://docs.sun.com/app/docs/doc/817-5093/fqnIkl?l=en&=view)
To enable iSCSI target discovery:
1. Enable Sendtargets discovery:
   
   ```
   # iscsiadm modify discovery -t enable
   ```

2. Verify SendTargets setting is enabled:
   
   ```
   # iscsiadm list discovery
   ```

3. The iSCSI or iSCSI/FCoE module has multiple iSCSI ports available to the Solaris iSCSI initiator. To discover the targets available, enter the following command for each iSCSI port IP address that the iSCSI initiator will access:
   
   ```
   # iscsiadm add discovery-address 'iscsi port IP address'
   ```

4. Verify discovery address entries:
   
   ```
   # iscsiadm list discovery-address
   ```

5. Once discovery addresses are entered, the Solaris initiator polls each address for all targets available. To list the discovered targets available to the initiator, enter the following command:
   
   ```
   # iscsiadm list target
   ```

**Example:**

```
Target: iqn.2004-09.com.hp.fcgw.mez50.2.01.50014380025da539
   Alias: -
   TPGT: 0
   ISID: 4000002a0000
   Connections: 1
```

```
Target: iqn.2004-09.com.hp.fcgw.mez50.1.01.50014380025da538
   Alias: -
   TPGT: 0
   ISID: 4000002a0000
   Connections: 1
```

**NOTE:** The iSCSI Initiator must discover all targets presented by each iSCSI or iSCSI/FCoE module’s iSCSI port that will be used in a multipath configuration.

6. Create the iSCSI device links for the local system:

   ```
   # devfsadm -i iscsi
   ```

**Modify target parameter MaxRecvDataSegLen**

Oracle recommends setting the Maximum Receive Data Segment Length to 655536 bytes for each iSCSI discovered target. Refer to the following URL for more information: [http://wikis.sun.com/display/StorageDev/iSCSI+Features+Related+to+RFC+3720+Parameters](http://wikis.sun.com/display/StorageDev/iSCSI+Features+Related+to+RFC+3720+Parameters).

To modify target parameter `MaxRecvDataSegLen`:

1. List all iSCSI targets:

   ```
   # iscsiadm list target-param
   ```

2. Modify `maxrecvdataseglen` to 65536 for each target:

   ```
   # iscsiadm modify target-param -p maxrecvdataseglen=65536 'target ign'
   ```

3. Verify target setting using the example below.

**Example:**

```
# iscsiadm list target-param
Target: ign.2004-09.com.hp.fcgw.mez50.1.01.50014380025da538
```

```
# iscsiadm modify target-param -p maxrecvdataseglen=65536 ign.2004-09.com.hp.fcgw.mez50.1.01.50014380025da538
```

```
# iscsiadm list target-param -v ign.2004-09.com.hp.fcgw.mez50.1.01.50014380025da538
```
Monitor Multipath devices

Once virtual disks are presented by HP P6000 Command View to the Solaris host, the following commands should be used to monitor the configuration:

1. `iscsiadm list target -S`

   This command lists targets with their presented LUNs. In a multipath environment, the same LUN number should appear under different EVA port targets from the same controller.

   **Example:**
   ```
   iscsiadm list target -S
   Target: iqn.2004-09.com.hp.fcgw.mez50.2.01.50014380025da539
       Alias: -
       TPGT: 0
       ISID: 4000002a0000
       Connections: 1
       LUN: 120
           Vendor: HP
           Product: HSV340
           OS Device Name: /dev/rdsk/c5t600508B4000B15A200005000038E0000d0s2
   ```

2. `mpathadm list lu`

   This command lists the total and operational path count for each logical unit. Both controller and device path counts are displayed.

   **Example:**
   ```
   #mpathadm list lu
   /scsi_vhci/array-controller@g50014380025c4170
       Total Path Count: 2
       Operational Path Count: 2
   /dev/rdsk/c5t600508B4000B15A200005000038E0000d0s2
       Total Path Count: 2
   ```
3. `mpathadm show lu 'logical-unit'`

   This command lists details regarding a specific logical unit. This command can help verify symmetric mode, load balancing, and autofailback settings, as well as path and target port information.

   **Example:**

   ```
   #mpathadm show lu /dev/rdsk/c5t600508B40000B15A2000050000038E0005d0s2
   Logical Unit:  /dev/rdsk/c5t600508B40000B15A2000050000038E0005d0s2
   mpath-support:  libmpscsi_vhci.so
   Vendor:  HP
   Product:  HSV340
   Revision:  0005
   Name Type:  unknown type
   Name:  600508B40000B15A2000050000038E0005
   Asymmetric:  no
   Current Load Balance:  none
   Logical Unit Group ID:  NA
   Auto Failback:  off
   Auto Probing:  NA
   Paths:
   Initiator Port Name:  iqn.1986-03.com.sun:01:sansun-s04,4000002a00ff
   Target Port Name:  4000002a0000,iqn.2004-09.com.hp.fcgw.mez50.2.01.
   50014380025da539
   Override Path:  NA
   Path State:  OK
   Disabled:  no
   Initiator Port Name:  iqn.1986-03.com.sun:01:sansun-s04,4000002a00ff
   Target Port Name:  4000002a0000,iqn.2004-09.com.hp.fcgw.mez50.1.01.
   50014380025da538d
   Override Path:  NA
   Path State:  OK
   Disabled:  no
   Target Ports:
   Name:  4000002a0000,iqn.1986-03.com.hp.fcgw.MEZ50.0834e00028.
   b2.01.50014380025c4179
   Relative ID:  0
   Name:  4000002a0000,iqn.2004-09.com.hp.fcgw.mez50.1.01.
   50014380025da538
   Relative ID:  0
   ```

   **Managing and Troubleshooting Solaris iSCSI Multipath devices**


   **Configuring Microsoft MPIO iSCSI devices**

   For Microsoft MPIO, the load balance policies apply to each LUN individually. To display and modify the LUN load balance policy (see Figure 59 (page 124)):

   1. Start the MS iSCSI control panel applet.
   2. Select the **Target** tab.
   3. Click **Details**.
   4. Click **Devices**.
   5. Highlight a LUN device name and click **Advanced**.
   6. Select the MPIO check box.
7. Select the desired options on the Load Balance Policy menu to set the policy.

Figure 59 iSCSI Initiator MPIO properties

The features of Microsoft MPIO for iSCSI include the following:

- **Failover Only.** No load balancing is performed. There is a single active path and the rest of the paths are standby paths. The active path is used for sending all I/O. If the active path fails, one of the standby paths is used. When the formerly active path is reconnected, it becomes active and the activated standby path returns to standby.

- **Round Robin.** All paths are active paths; they are used for sending I/O in a round robin fashion.

- **Round Robin with a subset of paths.** A set of paths is configured as active and a set of paths is configured as standby. I/O is sent in a round robin fashion over the active paths. If all of the active paths fail, one of the standby paths is used. If any of the formerly active paths become available again, the formerly active paths are used. The activated standby path becomes a standby path again.

- **Weighted Path.** Each path is assigned a weight and I/O is sent on the path with the lowest weight. If the path with the lowest weight fails, the path with the next lowest weight is used.

- **Least Queue Depth.** This is not supported by MPIO.

**NOTE:** For raw disk access, MPIO load balance policy must be set to **Failover Only**. For file system disk access, all MPIO load balance policies are supported. Failover policies are set on a LUN-by-LUN basis. MPIO support does not have global failover settings.
Microsoft MPIO with QLogic iSCSI HBA

The QLogic iSCSI HBA is supported in a multipath Windows configuration that is used in conjunction with Microsoft iSCSI Initiator Services and Microsoft MPIO. Because the iSCSI driver resides onboard the QLogic iSCSI HBA, it is not necessary to install the Microsoft iSCSI Initiator.

Installing the QLogic iSCSI HBA

Install the QLogic iSCSI HBA hardware and software following the instructions in the QLogic installation manual. The QLogic iSCSI HBA is managed by QLogic’s SANsurfer Management Suite (SMS).

**NOTE:** Once the QLogic iSCSI HBA is installed, the configuration settings for the QLogic iSCSI Initiator must now be set through SMS. The QLogic iSCSI HBA will not appear in Microsoft’s Network Connection device list.

Installing the Microsoft iSCSI Initiator services and MPIO

To install the Microsoft iSCSI Initiator:

1. Access the Microsoft iSCSI Initiation Installation page of the Software Update Installation Wizard (Figure 60 (page 125))
2. Reboot your system.

**Figure 60 Microsoft iSCSI Initiator services screen**

[[Image of Microsoft iSCSI Initiator services screen]]

**IMPORTANT:** Do not check Microsoft Software Initiator; the QLogic initiator resides on the iSCSI HBA.

Configuring the QLogic iSCSI HBA

To configure the QLogic iSCSI HBA:

1. Start QLogic SMS either from the desktop icon or through Start/Programs and connect to localhost (see Figure 61 (page 126)).
2. Click **Yes** to start the general configuration wizard (see Figure 62 (page 126)). Use the Wizard to:

- Choose **iSCSI HBA** port to configure the QLogic iSCSI HBA.
- Configure HBA Port network settings.
- Configure HBA Port DNS settings (optional).
- Configure SLP Target Discovery settings (optional).
- Configure iSNS Target Discovery settings (optional).

**Figure 61 Connect to host screen**

**Figure 62 Start general configuration wizard**

---

**Adding targets to QLogic iSCSI Initiator**

To add the HBA Port iSCSI targets:
1. Click the green plus sign (see Figure 63 (page 127)).
2. Enter the first iSCSI or iSCSI/FCoE module’s target port IP address.
3. Repeat Steps 1 and 2 to add each additional iSCSI or iSCSI/FCoE target iSCSI port.
4. Click **Next**.
5. To enable the changes, enter the SMS password: `config`.
6. Select the **Target Settings** tab. Verify that the HBA state is Ready, Link Up and each target entry’s state is Session Active (Figure 64 (page 127)).

**Figure 64 Target Settings tab**

---

**Presenting LUNs to the QLogic iSCSI Initiator**

To present LUNs to the QLogic iSCSI Initiator:

1. Set up the iSCSI Initiator.
1. Follow procedures in Step 2 to:
   - Create an iSCSI host.
   - Present LUNs to the iSCSI host.

2. On the iSCSI HBA tab (Figure 65 (page 128) verify that the QLogic iSCSI HBA is connected to the iSCSI LUNs in SMS under the HBA iSCSI port.

![Figure 65 HBA iSCSI port connections](image)

Use Microsoft’s iSCSI services to manage the iSCSI target login and LUN load balancing policies.

Installing the HP MPIO Full Featured DSM for EVA

Follow the steps in the Installation and Reference Guide located at:

http://h20000.www2.hp.com/bizsupport/TechSupport/DocumentIndex.jsp?contentType=SupportManual&lang=en&cc=us&docIndexId=64179&taskID=101&prodTypeld=18964&prodSeriesId=421492

Following the installation of the HP MPIO Full Featured DSM for EVA, open Computer Management to view and control the iSCSI LUNs (see Figure 66 (page 129)).
Microsoft Windows Cluster support

Microsoft Cluster Server for Windows 2003

iSCSI failover clustering is supported by the iSCSI or iSCSI/FCoE modules. For more information, see:


Requirements

- Operating system: Windows Server 2003 Enterprise, SP2, R2, x86/x64
- Firmware: minimum version—3.1.0.0, released November 2009
- Initiator:
  - Persistent Reservation registry key—for Microsoft Generic DSM
  - Multiple NIC/iSCSI HBA ports—four recommended:
    - one public
    - one private
    - two storage, for higher availability and performance
  - MPIO—use HP DSM or the Microsoft Generic DSM. HP recommends using the latest available DSM.
- Connectivity: Dual blade configuration for redundancy

Setting the Persistent Reservation registry key

The iSCSI Persistent Reservation Setup utility assists you in creating the proper registry settings for use with the Microsoft Generic DSM and Microsoft Cluster Server. This must be run on every node of the cluster.

1. Run PRset.hta to start the application.
   This automatically adds the registry key and values seen.
2. Click Modify to make changes (see Figure 67 (page 130)).
3. Click **Done** to finish.

Each cluster is required to have its own value, and each node of a single cluster must have its own value. For example, Cluster A could have the default setting of AABBCCCCBBAA. Possible node settings:

<table>
<thead>
<tr>
<th>Node</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

When the HP Full Featured DSM for EVA is installed, it sets up Persistent Reservation in the registry by default. For more information on the HP DSM, see:


**Microsoft Cluster Server for Windows 2008**

iSCSI Failover clustering is supported on the HP StorageWorks MPX200 Multifunction Router. For more information, see:


**Requirements**

- **Operating system**: Windows Server 2008 Enterprise, SP2, R2, x86/x64
- **Firmware**: Minimum version—3.1.0.0, released November 2009
- **Initiator**:  
  - Multiple NIC/iSCSI HBA ports—four recommended  
    - one public  
    - one private  
    - two storage, for higher availability and performance  
  - MPIO—use HP DSM or the Microsoft Generic DSM. HP recommends using the latest available DSM.  
- **Connectivity**: Dual blade configuration for redundancy
Setting up authentication

Challenge Handshake Authentication Protocol (CHAP) is an authentication protocol used for secure logon between the iSCSI Initiator and iSCSI target. CHAP uses a challenge-response security mechanism for verifying the identity of an initiator without revealing a secret password that is shared by the two entities. It is also referred to as a three-way handshake. An important concept of CHAP is that the initiator must prove to the target that it knows a shared secret without actually revealing the secret. (Sending the secret across the wire could reveal it to an eavesdropper.) CHAP provides a mechanism for doing this.

**NOTE:** Setting up authentication for your iSCSI devices is optional. If you require authentication, HP recommends that you configure it after you have properly verified installation and operation of the iSCSI implementation without authentication.

In a secure environment, authentication may not be required, access to the targets is limited only to trusted initiators.

In a less secure environment, the target cannot determine if a connection request is truly from a given host. In that case, the target can use CHAP to authenticate an initiator.

When an initiator contacts a target that uses CHAP, the target (called the authenticator) responds by sending the initiator a challenge. The challenge is a piece of information that is unique for this authentication session. The initiator then encrypts this information, using a previously-issued password that is shared by both initiator and target. The encrypted information is then returned to the target. The target has the same password and uses it as a key to encrypt the information it originally sent to the initiator. It compares its results with the encrypted results sent by the initiator. If they are the same, the initiator is assumed to be authentic.

These schemes are often called proof of possession protocols. The challenge requires that an entity prove possession of a shared key or one of the key pairs in a public key scheme.

This procedure is repeated throughout the session to verify that the correct initiator is still connected. Repeating these steps prevents someone from stealing the initiator’s session by replaying information that was intercepted on the line.

There are several Internet RFCs that cover CHAP in more detail:
- RFC 2433 (Microsoft PPP CHAP Extensions, October 1998)
- RFC 2759 (Microsoft PPP CHAP Extensions version 2, January 2000)

**CHAP restrictions**

The CHAP restrictions are as follows:
- Maximum length of 100 characters
- Minimum length of 1 character
- No restriction on the type of characters that can be entered
- Entering an IQN using the HP P6000 Command View add host tab requires the iSCSI initiator to have been registered by the iSCSI or iSCSI/FCoE module’s initiator database. Implying that the initiator’s target discovery has completed.

**Microsoft Initiator CHAP secret restrictions**
- Maximum length of 16 characters
- Minimum length of 12 characters
- No restriction on the type of characters that can be entered
- When an initiator uses iSNS for target discovery, only normal session CHAP applies
Linux version

- CHAP is supported with Linux open-iscsi Initiator and the iSCSI or iSCSI/FCoE modules.
- CHAP setup with Linux iSCSI Initiator is not supported with the iSCSI or iSCSI/FCoE modules.

ATTO Macintosh Chap restrictions

The ATTO Macintosh iSCSI Initiator does not support CHAP at this time.

Recommended CHAP policies

- The same CHAP secret should not be configured for authentication of multiple initiators or multiple targets.
- Any CHAP secret used for initiator authentication must not be configured for the authentication of any target; and any CHAP secret used for target authentication must not be configured for authentication of any initiator.
- CHAP should be configured after the initial iSCSI Initiator/target login to validate initiator/target connectivity. The first initiator/target login also creates a discovered iSCSI Initiator entry on the iSCSI or iSCSI/FCoE modules that will be used in the CHAP setup.

iSCSI session types

iSCSI defines two types of sessions:

- Discovery. SCSI discovery allows an initiator to find the targets to which it has access.
- Normal operational session. A normal operational session is unrestricted.

CHAP is enforced on both the discovery and normal operational session.

The iSCSI or iSCSI/FCoE controller CHAP modes

The iSCSI or iSCSI/FCoE modules support two CHAP modes:

- Single-direction. The target authenticates the identity of the initiator with the user-provided CHAP secret. To enable single-direction CHAP, you need to enable CHAP for a specific initiator record on the iSCSI or iSCSI/FCoE modules and input a corresponding CHAP secret from the iSCSI host.
- Bi-directional. The initiator and target authenticate identity of each other with the user-provided CHAP secrets. To enable bi-directional CHAP for a discovery session, you need to provide a CHAP secret for the initiator and for the iSCSI port for which you are performing discovery. To enable bi-directional CHAP for a normal session, you will need to provide a CHAP secret for the initiator and for the iSCSI-presented target that you are trying to log in to.

Once CHAP is enabled, it is enforced for both the normal and discovery sessions. You only have the choice of what type (single or bi-directional) of CHAP to perform:

- Single-direction CHAP during discovery and during normal session
- Single-direction CHAP during discovery and bi-directional CHAP during normal session
- Bi-directional CHAP during discovery and single–direction CHAP during normal session
- Bi-directional CHAP during discovery and during normal session

Enabling single–direction CHAP during discovery and normal session

Table 22 (page 133) lists the parameters you use to enable single-direction CHAP.
### Table 22 iSCSI or iSCSI/FCoE module secret settings

<table>
<thead>
<tr>
<th>Source</th>
<th>Setting (example)</th>
<th>Action</th>
<th>Setting (example)</th>
</tr>
</thead>
<tbody>
<tr>
<td>iSCSI Port</td>
<td>N/A</td>
<td>General Tab Secret</td>
<td>N/A</td>
</tr>
<tr>
<td>Discovered iSCSI Initiator</td>
<td>CHAPsecret01</td>
<td>Add Target Portal</td>
<td>CHAPsecret01</td>
</tr>
<tr>
<td>iSCSI Present Target</td>
<td>N/A</td>
<td>Log on to Target</td>
<td>CHAPsecret01</td>
</tr>
</tbody>
</table>

**NOTE:** These are examples of secret settings. Configure CHAP with settings that apply to your specific network environment.

1. Enable CHAP for the iSCSI or iSCSI/FCoE modules discovered iSCSI Initiator entry. CHAP can be enabled via CLI only. To enable CHAP for the iSCSI or iSCSI/FCoE modules discovered iSCSI Initiator entry using the iSCSI or iSCSI/FCoE module's CLI:
   a. If the iSCSI Initiator is not listed under `set chap` command:
      - HP Command View Option: add the initiator iqn name string via HP Command View’s `add host` tab.
        - Go to the HP P6000 Command View and select **Hosts** then select **Add Host** tab and enter the iqn name string.
      - CLI Option: Enter the initiator add command and add the iSCSI Initiator that is about to do discovery.
   b. If the iSCSI Initiator is listed under `set chap` command, then enable CHAP secret. For example: CHAPsecret01:
      - Select the index of the iSCSI Initiator.
      - To Enable CHAP, select 0, then type the CHAP secret.
2. Enable CHAP for the Microsoft iSCSI Initiator:
   a. Click **Discovery**.
      - For manually discovering iSCSI target portals:
        a. Click **Add** under Target Portals.
        b. Enter the IP address of the iSCSI port of the iSCSI or iSCSI/FCoE module.
        c. Click **Advanced**.
        d. Select the CHAP Login Information check box.
        e. Enter the CHAP secret for the iSCSI or iSCSI/FCoE modules discovered iSCSI Initiator in the Target Secret box. For example:
           \texttt{CHAPsecret01}
        f. Click **OK** and the initiator completes Target discovery.
   b. Click **Targets**.
   c. Select the appropriate target for login.
   d. Click **Log On**.
   e. Click **Advanced**.
   f. Select the **CHAP Login Information** check box.
   g. Enter the CHAP secret for the iSCSI or iSCSI/FCoE modules discovered iSCSI Initiator in the Target Secret box.
   h. Click **OK**.
   i. Click **OK** and the initiator completes normal login.

**Enabling CHAP for the iSCSI or iSCSI/FCoE module-discovered iSCSI initiator entry**

CHAP can be enabled via CLI only. To enable CHAP for the iSCSI or iSCSI/FCoE modules discovered iSCSI Initiator entry using the iSCSI or iSCSI/FCoE module's CLI:

1. If the iSCSI Initiator is not listed under set chap command:
   a. HP Command View Option: add the initiator iqn name string via HP Command View’s **Add Host** tab.
      - Go to HP Command View and select **Hosts** then select the **Add Host** tab and enter the iqn name string.
   b. CLI Option: Enter the initiator add command and add the iSCSI Initiator that is about to do discovery.

2. If the iSCSI Initiator is listed under the **set chap** command, enable CHAP secret. For example: **CHAPsecret01**.
   a. Select the index of the iSCSI Initiator.
   b. To Enable CHAP, select 0, then enter the CHAP secret.
Enable CHAP for the Microsoft iSCSI Initiator

1. Click **Discovery**. For manually discovering iSCSI target portals:
   a. Click **Add** under Target Portals.
   b. Enter the IP address of the iSCSI port of the iSCSI or iSCSI/FCoE module.
   c. Click **Advanced**.
   d. Select the CHAP Login Information checkbox.
   e. Enter the CHAP secret for the iSCSI or iSCSI/FCoE module's-discovered iSCSI Initiator in the Target Secret box, for example, **CHAPsecret01**.
   f. Click **OK** and the initiator completes Target discovery. Using iSNS for target discovery:
      • Click **Add** under iSNS Servers.
      • Enter the IP address of the iSNS server.
      • Click **OK**.

2. Click **Targets** and select the appropriate target for login.
3. Click **Log On** and then click **Advanced**.
4. Select the CHAP Login Information checkbox.
5. Enter the CHAP secret for the iSCSI or iSCSI/FCoE module's-discovered iSCSI Initiator in the Target Secret box.
6. Click **OK**.
7. Click **OK** again.

Enable CHAP for the open-iscsi iSCSI Initiator

To enable CHAP in open-iscsi, you need to edit `/etc/iscsi/iscsid.conf` file:

1. Enable CHAP for both Discovery and Normal Session by:
   ```
   node.session.auth.authmethod = CHAP
   node.session.auth.authmethod = CHAP
   ```

2. Setup Username and Password for Initiator for Normal Session. For Example:
   ```
   # To set a CHAP username and password for initiator
   # authentication by the target(s), uncomment the following lines:
   node.session.auth.username = username
   node.session.auth.password = password
   node.session.auth.password = CHAPsecret01
   ```

3. Setup Username and Password for Initiator for Discovery Session. For example:
   ```
   # To set a discovery session CHAP username and password for the initiator
   # authentication by the target(s), uncomment the following lines:
   discovery.sendtargets.auth.username = username
   discovery.sendtargets.auth.password = password
   discovery.sendtargets.auth.password = CHAPsecret01
   ```

4. Save the file and start or restart iscsi:
   ```
   [root@sanergy33 iscsi]# /etc/init.d/iscsi start or /etc/init.d/iscsi restart
   ```

5. Using the `iscsiadm` do a discovery. For example:
   ```
   [root@sanergy33 iscsi]# iscsiadm -m discovery -t sendtargets -p 10.10.1.23
   ```
6. Using the iscsiadm do a login into the iSCSI Target. For example:

```
[root@sanergy33 iscsi]# iscsiadm --mode node --targetname
ign.2004-09.com.hp.fcgw.mez50.1.01.50014380025da538 --login
```

The following is a sample iscsid.conf file for CHAP:

```
# *************
# CHAP Settings
# *************

# To enable CHAP authentication set node.session.auth.authmethod
# to CHAP. The default is None.
#node.session.auth.authmethod = CHAP
node.session.auth.authmethod = CHAP

# To set a CHAP username and password for initiator
# authentication by the target(s), uncomment the following lines:
#node.session.auth.username = username
node.session.auth.username = ign.1994-05.com.redhat:fc813cac13.sanergy33
#node.session.auth.password = password
node.session.auth.password = CHAPSecret01

# To set a CHAP username and password for target(s)
# authentication by the initiator, uncomment the following lines:
#node.session.auth.username_in = username_in
#node.session.auth.password_in = password_in

# To enable CHAP authentication for a discovery session to the target
# set discovery.sendtargets.auth.authmethod to CHAP. The default is None.
#discovery.sendtargets.auth.authmethod = CHAP
node.session.auth.authmethod = CHAP

# To set a discovery session CHAP username and password for the initiator
# authentication by the target(s), uncomment the following lines:
#discovery.sendtargets.auth.username = username
#discovery.sendtargets.auth.password = password
discovery.sendtargets.auth.password = CHAPSecret01

# To set a discovery session CHAP username and password for target(s)
# authentication by the initiator, uncomment the following lines:
#discovery.sendtargets.auth.username_in = username_in
#discovery.sendtargets.auth.password_in = password_in
```

Enabling single–direction CHAP during discovery and bi-directional CHAP during normal session

Table 23 (page 136) lists the parameters you need to enable single-direction CHAP during discovery.

**Table 23 Parameters enabling single-direction CHAP**

<table>
<thead>
<tr>
<th>MS Initiator secret settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>iSCSI Port</td>
</tr>
<tr>
<td>Discovered iSCSI Initiator</td>
</tr>
<tr>
<td>iSCSI Presented Target</td>
</tr>
</tbody>
</table>

**Note:** These are examples of secret settings. You must configure CHAP with settings that apply to your specific network environment.
1. Enable CHAP for the iSCSI or iSCSI/FCoE controller-discovered iSCSI Initiator entry. CHAP can be enabled via CLI only.
   To enable CHAP for the iSCSI or iSCSI/FCoE controller-discovered iSCSI Initiator entry using the iSCSI or iSCSI/FCoE controller CLI:
   a. If the iSCSI Initiator is not listed under the set chap command:
      • HP Command View Option: add the initiator iqn name string via HP Command View’s Add Host tab.
      • Go to HP Command View and select Hosts then select Tab Add Host and enter the iqn name string.
      • CLI Option: Enter the initiator add command and add the iSCSI Initiator that is about to do discovery.
   b. If the iSCSI Initiator is listed under set chap command, then enable CHAP secret. For example: CHAPsecret01.
      • Select the index of the iSCSI Initiator.
      • To Enable CHAP, select 0, then enter the CHAP secret.

2. Enable CHAP for the iSCSI or iSCSI/FCoE controller iSCSI presented target:
   • To enable CHAP for the iSCSI or iSCSI/FCoE controller Discovered iSCSI Initiator entry using the iSCSI or iSCSI/FCoE controller CLI:
      • Enter the set CHAP command.
      • Select the Presented Target the initiator will log in to.
      • Enable CHAP and enter a CHAP secret. For example: hpstorageworks
3. Enable CHAP for the Microsoft iSCSI Initiator.
   a. Click the **General** tab.
   b. Click **Secret** in the middle of the screen.
   c. Click **Reset**.
   d. Enter the iSCSI or iSCSI/FCoE controller iSCSI Presented Target CHAP secret. For example: `hpstorageworks`.
   e. Click **Discovery**.
      - For manually discovering iSCSI target portals:
         a. Click **Add** under **Target Portals**.
         b. Enter the IP address of the iSCSI port of the iSCSI or iSCSI/FCoE controller.
         c. Click **Advanced**.
         d. Select the **CHAP Login Information** check box.
         e. Enter the CHAP secret for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator in the **Target Secret** box. For example: `CHAPsecret01`.
         f. Click **OK** and the initiator completes target discovery.
      - Using iSNS for target discovery:
         a. Click **Add** under **iSNS Servers**.
         b. Enter the IP address of the iSNS server.
         c. Click **OK**.
   f. Click **Targets**.
   g. Select the appropriate target for login.
   h. Click **Log On**.
   i. Click **Advanced**.
   j. Select the **CHAP Login Information** check box.
   k. Enter the CHAP secret for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator in the **Target Secret** box. For example: `CHAPsecret01`.
   l. Select the **Mutual Authentication** check box.
   m. Click **OK**.
   n. Click **OK** and the initiator completes normal login.

### Enabling bi-directional CHAP during discovery and single–direction CHAP during normal session

Table 24 (page 138) lists the parameters you need to enable bi-direction CHAP during discovery and bi-directional CHAP during normal session.

**Table 24 Parameters enabling bi-direction CHAP**

<table>
<thead>
<tr>
<th>MS Initiator secret settings</th>
<th>iSCSI Port</th>
<th>Discovered iSCSI Initiator</th>
<th>iSCSI Presented Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Tab Secret</td>
<td><code>hpstorageworks</code></td>
<td><code>CHAPsecret01</code></td>
<td><code>N/A</code></td>
</tr>
<tr>
<td>hpstorageworks</td>
<td><code>hpstorageworks</code></td>
<td><code>Add Target Portal</code></td>
<td><code>Log on to Target</code></td>
</tr>
<tr>
<td>hpstorageworks</td>
<td><code>hpstorageworks</code></td>
<td><code>CHAPsecret0</code></td>
<td><code>CHAPsecret01</code></td>
</tr>
</tbody>
</table>

**Note:** These secret settings are for example only. Please configure CHAP with settings that apply to your specific network environment.
1. Enable CHAP for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator entry. CHAP can be enabled via CLI only.

To enable CHAP for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator entry using the iSCSI or iSCSI/FCoE controller CLI:

   a. If the iSCSI Initiator is not listed under the set chap command:
      - **HP Command View Option:** add the initiator iqn name string via the HP Command View **Add Host** tab.
        Go to HP Command View and select **Hosts** then select the **Add Host** tab and enter the iqn name string.
      - **CLI Option:** Enter the *initiator add* command and add the iSCSI Initiator that is about to do discovery.

   b. If the iSCSI Initiator is listed under the set chap command, then enable CHAP secret. For example: CHAPsecret01.
      - Select the index of the iSCSI Initiator.
      - To Enable CHAP, select 0, then enter the CHAP secret.

2. Enable CHAP for the iSCSI or iSCSI/FCoE controller iSCSI port:

   a. To enable CHAP for the iSCSI or iSCSI/FCoE controller iSCSI port using HP P6000 Command View:
      - Select the appropriate iSCSI Controller, then select the **IP Ports** tab, then select the appropriate IP Port.
      - Under Security, select **Enabled in CHAP Status**, then enter the CHAP Secret. For example, hpstorageworks
      - Click the **Save Changes** tab to save the changes.

   b. To enable CHAP for the iSCSI or iSCSI/FCoE controller iSCSI port using the iSCSI or iSCSI/FCoE controller CLI:
      - Enter the set *chap* command.
      - Select the appropriate Portal iqn name index that the initiator will log in to.
      - Select 0 to enable CHAP.
      - Enter a CHAP secret. For example: hpstorageworks.
3. Enable CHAP for the Microsoft iSCSI Initiator.
   a. Click the General tab.
   b. Click Secret in the middle of the screen.
   c. Click Reset.
   d. Enter the iSCSI or iSCSI/FCoE controller iSCSI Presented Target CHAP secret. For example: hpstorageworks.
   e. Click OK.
   f. Click Discovery.
   - For manually discovering iSCSI target portals:
     a. Click Add under Target Portals.
     b. Enter the IP address of the iSCSI port of the iSCSI or iSCSI/FCoE controller.
     c. Click Advanced.
     d. Select the CHAP Login Information check box.
     e. Enter the CHAP secret for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator in the Target Secret box. For example: CHAPsecret01.
     f. Select the Mutual Authentication check box.
     g. Click OK.
     h. Click OK and the initiator completes Target discovery.
      - Using iSNS for Target discovery:
        a. Click Add under iSNS Servers.
        b. Enter the IP address of the iSNS server.
        c. Click OK.
        g. Click Targets.
        h. Select the appropriate target for login.
        i. Click Log On.
        j. Click Advanced.
        k. Select the CHAP Login Information check box.
        l. Enter the CHAP secret for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator in the Target Secret box. For example: CHAPsecret01.
        m. Select the Mutual Authentication check box.
        n. Click OK.
        o. Click OK and the initiator completes normal login.

Enabling bi-directional CHAP during discovery and bi-directional CHAP during normal session

Table 25 (page 140) lists the parameters you need to enable bi–directional CHAP during discovery and bi-directional CHAP during normal session.

<table>
<thead>
<tr>
<th></th>
<th>MS Initiator secret settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>iSCSI Port</td>
<td>hpstorageworks</td>
</tr>
<tr>
<td></td>
<td>General Tab Secret</td>
</tr>
<tr>
<td>Discovered iSCSI</td>
<td>hpstorageworks</td>
</tr>
<tr>
<td>Initiator</td>
<td>CHAPsecret01</td>
</tr>
<tr>
<td></td>
<td>Add Target Portal</td>
</tr>
<tr>
<td>iSCSI Presented</td>
<td>hpstorageworks</td>
</tr>
<tr>
<td>Target</td>
<td>Log on to Target</td>
</tr>
<tr>
<td></td>
<td>CHAPsecret01</td>
</tr>
</tbody>
</table>

Note: These are examples of secret settings. You must configure CHAP with settings that apply to your specific network environment.
1. Enable CHAP for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator entry. CHAP can be enabled via CLI only. To enable CHAP for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator entry using the iSCSI or iSCSI/FCoE controller CLI:
   a. If the iSCSI Initiator is not listed under set chap command:
      • HP Command View Option: add the initiator iqn name string via Command View’s Add Host tab.
      • Go to HP P6000 Command View and select Hosts then select Tab Add Host and enter the iqn name string.
      • CLI Option: Enter the initiator add command and add the iSCSI Initiator that is about to do discovery.
   b. If the iSCSI Initiator is listed under set chap command, then enable CHAP secret. For example: CHAPsecret01.
      a. Select the index of the iSCSI Initiator.
      b. To Enable CHAP, select 0, then type the CHAP secret.

2. Enable CHAP for the iSCSI or iSCSI/FCoE controller iSCSI port:
   a. To enable CHAP for the iSCSI or iSCSI/FCoE controller iSCSI port using HP P6000 Command View:
      • Select the appropriate iSCSI Controller, then select the IP Ports tab, then select the appropriate IP Port.
      • Under Security, select Enabled in CHAP Status, then enter the CHAP Secret. For example: hpstorageworks.
      • Click the Save Changes tab to save the changes.
   b. To enable CHAP for the iSCSI or iSCSI/FCoE controller iSCSI port using the iSCSI or iSCSI/FCoE controller CLI:
      • Enter the set chap command.
      • Select the appropriate Portal iqn name index that the initiator will log in to.
      • Select 0 to enable CHAP.
      • Enter a CHAP secret. For example: hpstorageworks.

3. Enable CHAP for the iSCSI or iSCSI/FCoE controller iSCSI presented target:
   • To enable CHAP for the iSCSI or iSCSI/FCoE controller Discovered iSCSI Initiator entry using the iSCSI or iSCSI/FCoE controller CLI:
      • Enter the set CHAP command.
      • Select the Presented Target the initiator will log in to.
      • Enable CHAP and enter a CHAP secret. For example: hpstorageworks.
4. Enable CHAP for the Microsoft iSCSI Initiator.
   a. Click the **General** tab.
   b. Click **Secret** in the middle of the screen.
   c. Click **Reset**.
   d. Enter the iSCSI or iSCSI/FCoE controller iSCSI Presented Target CHAP secret. For example: hpstorageworks.
   e. Click **OK**.
   f. Click **Discovery**.
      - For manually discovering iSCSI target portals:
        a. Click **Add** under **Target Portals**.
        b. Enter the IP address of the iSCSI port of the iSCSI or iSCSI/FCoE controller.
        c. Click **Advanced**.
        d. Select the **CHAP Login Information** check box.
        e. Enter the CHAP secret for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator in the Target Secret box. For example: CHAPsecret01.
        f. Select the **Mutual Authentication** check box.
        g. Click **OK**.
        h. Click **OK** and the initiator completes target discovery.
      - Using iSNS for target discovery:
        a. Click **Add** under **iSNS Servers**.
        b. Enter the IP address of the iSNS server.
        c. Click **OK**.
   g. Click **Targets**.
   h. Select the appropriate target for login.
   i. Click **Log On**.
   j. Click **Advanced**.
   k. Select the **CHAP Login Information** check box.
   l. Enter the CHAP secret for the iSCSI or iSCSI/FCoE controller discovered iSCSI Initiator in the Target Secret box. For example: CHAPsecret01.
   m. Select the **Mutual Authentication** check box.
   n. Click **OK**.
   o. Click **OK** and the initiator completes normal login.

Enable CHAP for the open-iscsi iSCSI Initiator

To enable CHAP in open-iscsi, you need to edit the /etc/iscsi/iscsid.conf file.

1. Enable CHAP for both Discovery and Normal Session by:
   ```
   node.session.auth.authmethod = CHAP
   node.session.auth.authmethod = CHAP
   ```

2. Setup Username and Password for Initiator and Target for Normal Session. For Example:
   ```
   # To set a CHAP username and password for initiator
   # authentication by the target(s), uncomment the following lines:
   #node.session.auth.username = username
   #node.session.auth.password = password
   node.session.auth.password = CHAPsecret01
   # To set a CHAP username and password for target(s)
   # authentication by the initiator, uncomment the following lines:
   #node.session.auth.username_in = username_in
   #node.session.auth.password_in = password_in
   node.session.auth.username_in = iqn.2004-09.com.hp.fcgw.mez50.1.01.50014380025da538
   #node.session.auth.password_in = password_in
   ```
3. Setup Username and Password for Initiator and Portal for Discovery Session. For example:

```plaintext
# To set a discovery session CHAP username and password for the initiator
# authentication by the target(s), uncomment the following lines:
#discovery.sendtargets.auth.username = username
#discovery.sendtargets.auth.password = password
#discovery.sendtargets.auth.authmethod = CHAPSecret01
# To set a discovery session CHAP username and password for target(s)
# authentication by the initiator, uncomment the following lines:
#discovery.sendtargets.auth.username_in = username_in
#discovery.sendtargets.auth.password_in = password_in
#discovery.sendtargets.auth.password_in = hpstorageworks
```

4. Save the file and start or restart iscsi:

```
[root@sanergy33 iscsi]# /etc/init.d/iscsi start or /etc/init.d/iscsi restart
```

5. Using the `iscsiadm` do a discovery. For example:

```
[root@sanergy33 iscsi]# iscsiadm -m discovery -t sendtargets -p 10.10.1.23
```

6. Using the `iscsiadm` do a login into the iSCSI Target. For example:

```
[root@sanergy33 iscsi]# iscsiadm --mode node --targetname iqn.2004-09.com.hp.fcgw.mez50.1.01.50014380025da538 --login
```

The following is a sample `iscsid.conf` file for CHAP:

```plaintext
# *************
# CHAP Settings
# *************
# To enable CHAP authentication set node.session.auth.authmethod
to CHAP. The default is None.
#node.session.auth.authmethod = CHAP
node.session.auth.authmethod = CHAP

# To set a CHAP username and password for initiator
# authentication by the target(s), uncomment the following lines:
#node.session.auth.username = username
#node.session.auth.password = password
node.session.auth.password = CHAPSecret01

# To set a CHAP username and password for target(s)
# authentication by the initiator, uncomment the following lines:
#node.session.auth.username_in = username_in
#node.session.auth.username_in = iqn.2004-09.com.hp.fcgw.mez50.1.01.50014380025da538
#node.session.auth.password_in = password_in
#node.session.auth.password_in = hpstorageworks

# To enable CHAP authentication for a discovery session to the target
# set discovery.sendtargets.auth.authmethod to CHAP. The default is None.
#discovery.sendtargets.auth.authmethod = CHAP
#discovery.sendtargets.auth.authmethod = CHAP

# To set a discovery session CHAP username and password for the initiator
# authentication by the target(s), uncomment the following lines:
#discovery.sendtargets.auth.username = username
#discovery.sendtargets.auth.password = password
#discovery.sendtargets.auth.password = CHAPSecret01

# To set a discovery session CHAP username and password for target(s)
# authentication by the initiator, uncomment the following lines:
#discovery.sendtargets.auth.username_in = username_in
#discovery.sendtargets.auth.username_in = iqn.2004-09.com.hp.fcgw.mez50.1.01.50014380025da538
#discovery.sendtargets.auth.password_in = password_in
#discovery.sendtargets.auth.password_in = hpstorageworks
```

Set up the iSCSI Initiator
iSCSI and FCoE thin provision handling

iSCSI and FCoE presented LUNs which experience the thin provision (TP) Overcommitted state, as detected by P6000 Command View and illustrated in Figure 68 (page 144) will generally be write-protected until the Overcommitted state is cleared. However, there is a special case for Windows and Windows 2008 FCoE or iSCSI initiators, the TP Overcommitted LUNs are masked and manual intervention through P6000 Command View is required to remove the mask by re-presenting the LUN(s) to the iSCSI or FCoE initiator(s).

Note that the TP Overcommitted mask state, only for the iSCSI and FCoE presented LUNs, is cleared by a restart of both of the iSCSI controllers.

Figure 68 FCoE presented LUN reported as TP Overcommitted

The masking is visible by navigating to the LUN’s presentation tab as illustrated in Figure 69 (page 145), where it can be seen that the LUN is presented to the P6000 iSCSI Host port, but no longer to a iSCSI or FCoE initiator. A user may walk through the Virtual Disks tabs and note each TP Overcommitted LUN and then present after the TP Overcommitted state is cleared. Or a user may first clear the TP Overcommitted state and then walk through the Virtual Disks presentation tabs and re-present each LUN listed in the iSCSI HOST 01,02,03,04 lists which are found to no longer be presented to iSCSI or FCoE initiators.
Lists of all presented LUNs, per Virtual Port Group, are always available by navigating to the HOSTs tab and then to the one of four iSCSI HOSTs VPGroups, as illustrated in Figure 70 (page 146).
Figure 70 iSCSI Host presented LUNs list

Figure 71 (page 147) shows an iSCSI LUN being re-presented.
The normal condition is illustrated in Figure 72 (page 148).
Figure 72 Normal view of iSCSI LUN presented to iSCSI initiator
6 Single path implementation

This chapter provides guidance for connecting servers with a single path host bus adapter (HBA) to the Enterprise Virtual Array (EVA) storage system with no multipath software installed. A single path HBA is defined as:

- A single HBA port to a switch with no multipathing software installed
- A single HBA port to a switch with multipathing software installed

HBA LUNs are not shared by any other HBA in the server or in the SAN. Failover action is different depending on which single path method is employed.

The failure scenarios demonstrate behavior when recommended configurations are employed, as well as expected failover behavior if guidelines are not met. To implement single adapter servers into a multipath EVA environment, configurations should follow these recommendations.

The purpose of single HBA configurations for non-mission critical storage access is to control costs. This chapter describes the configurations, limitations, and failover characteristics of single HBA servers under different operating systems. Several of the descriptions are based on a single HBA configuration resulting in a single path to the device, but OpenVMS has native multipath features by default.

NOTE: Tru64 and NetWare are not supported with the P63x0/P65x0 EVA.

With OpenVMS, a single HBA configuration will result in two paths to the device by having connections to both EVA controllers. Single HBA configurations are not single path configurations with these operating systems.

In addition, cluster configurations for OpenVMS provide enhanced availability and security. To achieve availability within cluster configurations, configure each member with its own HBAs and connectivity to shared LUNs. For further information on cluster configurations and attributes, see the appropriate operating system guide and the HP SAN Design Reference Guide.

NOTE: HP continually makes additions to its storage solution product line. For more information about the HP Fibre Channel product line, the latest drivers, and technical tips, and to view other documentation, see the HP website at:

Installation requirements

- The host must be placed in a zone with any EVA worldwide IDs (WWIDs) that access storage devices presented by the hierarchical storage virtualization (HSV) controllers to the single path HBA host. The preferred method is to use HBA and HSV WWIDs in the zone configurations.
- On OpenVMS, the zones consist of the single HBA systems and two HSV controller ports. This results in a configuration where there are two paths per device, or multiple paths.

Recommended mitigations

EVA is designed for the mission-critical enterprise environment. When used with multipath software, high data availability and fault tolerance are achieved. In single path HBA server configurations, neither multipath software nor redundant I/O paths are present. Server-based operating systems are not designed to inherently recover from unexpected failure events in the I/O path (for example, loss of connectivity between the server and the data storage). It is expected that most operating systems will experience undesirable behavior when configured in non-high-availability configurations.
Because of the risks of using servers with a single path HBA, HP recommends the following actions:

- Use servers with a single path HBA that are not mission-critical or highly available.
- Perform frequent backups of the single path server and its storage.

**Supported configurations**

All examples detail a small homogeneous Storage Area Network (SAN) for ease of explanation. Mixing of dual and single path HBA systems in a heterogeneous SAN is supported. In addition to this document, reference and adhere to the *HP SAN Design Reference Guide* for heterogeneous SANs, located at:

http://www.hp.com/go/sandesign

**General configuration components**

All configurations require the following components:

- XCS controller software
- HBAs
- Fibre Channel switches

**Connecting a single path HBA server to a switch in a fabric zone**

Each host must attach to one switch (fabric) using standard Fibre Channel cables. Each host has its single path HBA connected through switches on a SAN to one port of an EVA.

Because a single path HBA server has no software to manage the connection and ensure that only one controller port is visible to the HBA, the fabric containing the single path HBA server, SAN switch, and EVA controller must be zoned. Configuring the single path by switch zoning and the LUNs by Selective Storage Presentation (SSP) allows for multiple single path HBAs to reside in the same server. A single path HBA server with the OpenVMS operating system should be zoned with two EVA controllers. See the *HP SAN Design Reference Guide* at the following HP website for additional information about zoning:


To connect a single path HBA server to a SAN switch:

1. Plug one end of the Fibre Channel cable into the HBA on the server.
2. Plug the other end of the cable into the switch.

*Figure 73 (page 151)* and *Figure 74 (page 151)* represent configurations containing both single path HBA server and dual HBA server, as well as a SAN appliance, connected to redundant SAN switches and EVA controllers. Whereas the dual HBA server has multipath software that manages the two HBAs and their connections to the switch, the single path HBA has no software to perform this function. The dashed line in the figure represents the fabric zone that must be established for the single path HBA server. Note that in *Figure 74 (page 151)*, servers with OpenVMS can be zoned with two controllers.
Figure 73 Single path HBA server without OpenVMS

1. Network interconnection
2. Single HBA server (Host 1)
3. Dual HBA server (Host 2)
4. Management server
5. Multiple single HBA paths
6. SAN switch 1
7. SAN switch 2
8. Fabric zone
9. Controller A
10. Controller B

Figure 74 Single path HBA server with OpenVMS

1. Network interconnection
2. Single HBA server (Host 1)
3. Dual HBA server (Host 2)
4. Management server
5. Multiple single HBA paths
6. SAN switch 1
7. SAN switch 2
8. Fabric zone
9. Controller A
10. Controller B

Supported configurations 151
HP-UX configuration

Requirements

- Proper switch zoning must be used to ensure each single path HBA has an exclusive path to its LUNs.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- Single path HBA server cannot share LUNs with any other HBAs.
- In the use of snapshots and snapclones, the source virtual disk and all associated snapshots and snapclones must be presented to the single path hosts that are zoned with the same controller. In the case of snapclones, after the cloning process has completed and the clone becomes an ordinary virtual disk, you may present that virtual disk as you would any other ordinary virtual disk.

HBA configuration

- Host 1 is a single path HBA host.
- Host 2 is a multiple HBA host with multipathing software.

See Figure 75 (page 153).

Risks

- Disabled jobs hang and cannot umount disks.
- Path or controller failure may result in loss of data accessibility and loss of host data that has not been written to storage.

**NOTE:** For additional risks, see “HP-UX” (page 164).

Limitations

- HP P6000 Continuous Access is not supported with single-path configurations.
- Single path HBA server is not part of a cluster.
- Booting from the SAN is not supported.
Windows Server 2003 (32-bit), Windows Server 2008 (32-bit), and Windows Server 2012 (32-bit) configurations

Requirements

- Switch zoning or controller level SSP must be used to ensure each single path HBA has an exclusive path to its LUNs.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- Single path HBA server cannot share LUNs with any other HBAs.
- In the use of snapshots and snapclones, the source virtual disk and all associated snapshots and snapclones must be presented to the single path hosts that are zoned with the same controller. In the case of snapclones, after the cloning process has completed and the clone becomes an ordinary virtual disk, you may present that virtual disk as you would any other ordinary virtual disk.

HBA configuration

- Host 1 is a single path HBA host.
- Host 2 is a multiple HBA host with multipathing software.

See Figure 76 (page 154).

Risks

- Single path failure will result in loss of connection with the storage system.
- Single path failure may cause the server to reboot.
- Controller shutdown puts controller in a failed state that results in loss of data accessibility and loss of host data that has not been written to storage.
Limitations

- HP P6000 Continuous Access is not supported with single path configurations.
- Single path HBA server is not part of a cluster.
- Booting from the SAN is not supported on single path HBA servers.

Figure 76 Windows Server 2003 (32-bit) and Windows 2008 (32-bit) configuration

1. Network interconnection
2. Single HBA server (Host 1)
3. Dual HBA server (Host 2)
4. Management server
5. SAN switch 1
6. SAN switch 2
7. Controller A
8. Controller B

Windows Server 2003 (64-bit) and Windows Server 2008 (64-bit) configurations

Requirements

- Switch zoning or controller level SSP must be used to ensure each single path HBA has an exclusive path to its LUNs.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- Single path HBA server cannot share LUNs with any other HBAs.

HBA configuration

- Hosts 1 and 2 are single path HBA hosts.
- Host 3 is a multiple HBA host with multipathing software.

See Figure 77 (page 155).

NOTE: Single path HBA servers running the Windows Server 2003 (x64) or Windows Server 2008 (x64) operating system will support multiple single path HBAs in the same server. This is accomplished through a combination of switch zoning and controller level SSP. Any single path HBA server will support up to four single path HBAs.
Risks

- Single path failure will result in loss of connection with the storage system.
- Single path failure may cause the server to reboot.
- Controller shutdown puts controller in a failed state that results in loss of data accessibility and loss of host data that has not been written to storage.

**NOTE:** For additional risks, see “Windows Servers” (page 165).

Limitations

- HP P6000 Continuous Access is not supported with single path configurations.
- Single path HBA server is not part of a cluster.
- Booting from the SAN is not supported on single path HBA servers.

**Figure 77 Windows Server 2003 (64-bit) and Windows Server 2008 (64-bit) configurations**

**Oracle Solaris configuration**

**Requirements**

- Switch zoning or controller level SSP must be used to ensure each single path HBA has an exclusive path to its LUNs.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- Single path HBA server cannot share LUNs with any other HBAs.
- In the use of snapshots and snapclones, the source virtual disk and all associated snapshots and snapclones must be presented to the single path hosts that are zoned with the same controller. In the case of snapclones, after the cloning process has completed and the clone
becomes an ordinary virtual disk, you may present that virtual disk as you would any other ordinary virtual disk.

- HBA must be properly configured to work in a single HBA server configuration. The user is required to:
  - Download and extract the contents of the TAR file.

**HBA configuration**

- Host 1 is a single path HBA host.
- Host 2 is a multiple HBA host with multipathing software.

See **Figure 78 (page 156)**.

**Risks**

- Single path failure may result in loss of data accessibility and loss of host data that has not been written to storage.
- Controller shutdown results in loss of data accessibility and loss of host data that has not been written to storage.

**NOTE:** For additional risks, see “Oracle Solaris” (page 165).

**Limitations**

- HP P6000 Continuous Access is not supported with single path configurations.
- Single path HBA server is not part of a cluster.
- Booting from the SAN is not supported.

**Figure 78 Oracle Solaris configuration**

1. Network interconnection
2. Single HBA server (Host 1)
3. Dual HBA server (Host 2)
4. Management server
5. SAN switch 1
6. SAN switch 2
7. Controller A
8. Controller B
OpenVMS configuration

Requirements

- Switch zoning or controller level SSP must be used to ensure each single path HBA has an exclusive path to its LUNs.
- All nodes with direct connection to a disk must have the same access paths available to them.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- In the use of snapshots and snapclones, the source virtual disk and all associated snapshots and snapclones must be presented to the single path hosts that are zoned with the same controller. In the case of snapclones, after the cloning process has completed and the clone becomes an ordinary virtual disk, you may present that virtual disk as you would any other ordinary virtual disk.

HBA configuration

- Host 1 is a single path HBA host.
- Host 2 is a dual HBA host.

See Figure 79 (page 158).

Risks

- For nonclustered nodes with a single path HBA, a path failure from the HBA to the SAN switch will result in a loss of connection with storage devices.

**NOTE:** For additional risks, see “OpenVMS” (page 165).
Limitations

- HP P6000 Continuous Access is not supported with single path configurations.

Figure 79 OpenVMS configuration

1. Network interconnection
2. Single HBA server (Host 1)
3. Dual HBA server (Host 2)
4. Management server
5. SAN switch 1
6. SAN switch 2
7. Controller A
8. Controller B

Xen configuration

Requirements

- Switch zoning or controller level SSP must be used to ensure each single path HBA has an exclusive path to its LUNs.
- All nodes with direct connection to a disk must have the same access paths available to them.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- In the use of snapshots and snapclones, the source virtual disk and all associated snapshots and snapclones must be presented to the single path hosts that are zoned with the same controller. In the case of snapclones, after the cloning process has completed and the clone becomes an ordinary virtual disk, you may present that virtual disk as you would any other ordinary virtual disk.

HBA configuration

- Host 1 is a single path HBA.
- Host 2 is a dual HBA host with multipathing software.

See Figure 80 (page 159).
Risks

- Single path failure may result in data loss or disk corruption.

Limitations

- HP P6000 Continuous Access is not supported with single path configurations.
- Single path HBA server is not part of a cluster.
- Booting from the SAN is not supported.

Figure 80 Xen configuration

1. Network interconnection
2. Single HBA server (Host 1)
3. Dual HBA server (Host 2)
4. Management server
5. SAN switch 1
6. SAN switch 2
7. Controller A
8. Controller B

Linux (32-bit) configuration

Requirements

- Switch zoning or controller level SSP must be used to ensure each single path HBA has an exclusive path to its LUNs.
- All nodes with direct connection to a disk must have the same access paths available to them.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- In the use of snapshots and snapclones, the source virtual disk and all associated snapshots and snapclones must be presented to the single path hosts that are zoned with the same controller. In the case of snapclones, after the cloning process has completed and the clone becomes an ordinary virtual disk, you may present that virtual disk as you would any other ordinary virtual disk.
- Single HBA path to the host with MPIO driver enabled to provide recovery from controller on controller link failures.
HBA configuration

- Host 1 is a single path HBA.
- Host 2 is a dual HBA host with multipathing software.

See Figure 81 (page 160).

Risks

- Single path failure may result in data loss or disk corruption.

NOTE: For additional risks, see “Linux” (page 166).

Limitations

- HP P6000 Continuous Access is not supported with single path configurations.
- Single HBA path at the host server is not part of a cluster, unless in a Linux High Availability Cluster.
- Booting from the SAN is supported on single path HBA servers.

Figure 81 Linux (32-bit) configuration

1. Network interconnection
2. Single HBA server (Host 1)
3. Dual HBA server (Host 2)
4. Management server
5. SAN switch 1
6. SAN switch 2
7. Controller A
8. Controller B

Linux (Itanium) configuration

Requirements

- Switch zoning or controller level SSP must be used to ensure each single path HBA has an exclusive path to its LUNs.
- All nodes with direct connection to a disk must have the same access paths available to them.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- In the use of snapshots and snapclones, the source virtual disk and all associated snapshots and snapclones must be presented to the single path hosts that are zoned with the same...
controller. In the case of snapclones, after the cloning process has completed and the clone becomes an ordinary virtual disk, you may present that virtual disk as you would any other ordinary virtual disk.

- Linux 64-bit servers can support up to 14 single or dual path HBAs per server. Switch zoning and SSP are required to isolate the LUNs presented to each HBA from each other.

**HBA configuration**

- Host 1 is a single path HBA.
- Host 2 is a dual HBA host with multipathing software.

See Figure 82 (page 161).

**Risks**

- Single path failure may result in data loss or disk corruption.

**NOTE:** For additional risks, see “Linux” (page 166).

**Limitations**

- HP P6000 Continuous Access is not supported with single path configurations.
- Single path HBA server is not part of a cluster.
- Booting from the SAN is supported on single path HBA servers.

*Figure 82 Linux (Itanium) configuration*

```
1. Network interconnection          5. SAN switch 1
2. Single HBA server (Host 1)       6. SAN switch 2
3. Dual HBA server (Host 2)         7. Controller A
```
IBM AIX configuration

Requirements

- Switch zoning or controller level SSP must be used to ensure each single path HBA has an exclusive path to its LUNs.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- Single path HBA server cannot share LUNs with any other HBAs.
- In the use of snapshots and snapclones, the source virtual disk and all associated snapshots and snapclones must be presented to the single path hosts that are zoned with the same controller. In the case of snapclones, after the cloning process has completed and the clone becomes an ordinary virtual disk, you may present that virtual disk as you would any other ordinary virtual disk.

HBA configuration

- Host 1 is a single path HBA host.
- Host 2 is a dual HBA host with multipathing software.

See Figure 83 (page 163).

Risks

- Single path failure may result in loss of data accessibility and loss of host data that has not been written to storage.
- Controller shutdown results in loss of data accessibility and loss of host data that has not been written to storage.

**NOTE:** For additional risks, see “IBM AIX” (page 167).

Limitations

- HP P6000 Continuous Access is not supported with single path configurations.
- Single path HBA server is not part of a cluster.
- Booting from the SAN is not supported.
VMware configuration

Requirements

- Switch zoning or controller level SSP must be used to ensure each single path HBA has an exclusive path to its LUNs.
- All nodes with direct connection to a disk must have the same access paths available to them.
- Single path HBA server can be in the same fabric as servers with multiple HBAs.
- In the use of snapshots and snapclones, the source virtual disk and all associated snapshots and snapclones must be presented to the single path hosts that are zoned with the same controller. In the case of snapclones, after the cloning process has completed and the clone becomes an ordinary virtual disk, you may present that virtual disk as you would any other ordinary virtual disk.

HBA configuration

- Host 1 is a single path HBA.
- Host 2 is a dual HBA host with multipathing software.

See Figure 84 (page 164).

Risks

- Single path failure may result in data loss or disk corruption.

NOTE: For additional risks, see “VMware” (page 167).
Limitations

- HP P6000 Continuous Access is not supported with single path configurations.
- Single HBA path at the host server is not part of a cluster, unless in a VMware High Availability Cluster.
- Booting from the SAN is supported on single path HBA servers.

Figure 84 VMware configuration

1. Network interconnection
2. Single HBA server (Host 1)
3. Dual HBA server (Host 2)
4. Management server
5. SAN switch 1
6. SAN switch 2
7. Controller A
8. Controller B

Mac OS configuration

For information about Mac OS connectivity, see Mac OS X Fibre Channel connectivity to the HP StorageWorks Enterprise Virtual Array Storage System Configuration Guide (to download, see “Related documentation” (page 197)).

Failure scenarios

HP-UX

<table>
<thead>
<tr>
<th>Fault stimulus</th>
<th>Failure effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server failure (host power-cycled)</td>
<td>Extremely critical event on UNIX. Can cause loss of system disk.</td>
</tr>
<tr>
<td>Switch failure (SAN switch disabled)</td>
<td>Short term: Data transfer stops. Possible I/O errors.</td>
</tr>
<tr>
<td></td>
<td>Long term: Job hangs, cannot umount disk, fsck failed, disk corrupted, need mkfs disk.</td>
</tr>
<tr>
<td>Controller failure</td>
<td>Short term: Data transfer stops. Possible I/O errors.</td>
</tr>
<tr>
<td></td>
<td>Long term: Job hangs, cannot umount disk, fsck failed, disk corrupted, need mkfs disk.</td>
</tr>
<tr>
<td>Controller restart</td>
<td>Short term: Data transfer stops. Possible I/O errors.</td>
</tr>
<tr>
<td></td>
<td>Long term: Job hangs, cannot umount disk, fsck failed, disk corrupted, need mkfs disk.</td>
</tr>
</tbody>
</table>
### Windows Servers

<table>
<thead>
<tr>
<th>Fault stimulus</th>
<th>Failure effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server path failure</td>
<td>Short term: Data transfer stops. Possible I/O errors. Long term: Job hangs, cannot umount disk, fsck failed, disk corrupted, need mkfs disk.</td>
</tr>
<tr>
<td>Storage path failure</td>
<td>Short term: Data transfer stops. Possible I/O errors. Long term: Job hangs, replace cable, I/O continues. Without cable replacement job must be aborted; disk seems error free.</td>
</tr>
</tbody>
</table>

### Oracle Solaris

<table>
<thead>
<tr>
<th>Fault stimulus</th>
<th>Failure effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server failure (host power-cycled)</td>
<td>Check disk when rebooting. Data loss, data that finished copying survived.</td>
</tr>
<tr>
<td>Switch failure (SAN switch disabled)</td>
<td>Short term: Data transfer stops. Possible I/O errors. Long term: Repeated error messages on console, no access to CDE. System reboot causes loss of data on disk. Must newfs disk.</td>
</tr>
<tr>
<td>Controller failure</td>
<td>Short term: Data transfer stops. Possible I/O errors. Long term: Repeated error messages on console, no access to CDE. System reboot causes loss of data on disk. Must newfs disk.</td>
</tr>
<tr>
<td>Controller restart</td>
<td>Short term: Data transfer stops. Possible I/O errors. Long term: Repeated error messages on console, no access to CDE. System reboot causes loss of data on disk. Must newfs disk.</td>
</tr>
<tr>
<td>Server path failure</td>
<td>Short term: Data transfer stops. Possible I/O errors. Long term: Repeated error messages on console, no access to CDE. System reboot causes loss of data on disk. Must newfs disk.</td>
</tr>
<tr>
<td>Storage path failure</td>
<td>Short term: Job hung, data lost. Long term: Repeated error messages on console, no access to CDE. System reboot causes loss of data on disk. Must newfs disk.</td>
</tr>
</tbody>
</table>

### OpenVMS

<table>
<thead>
<tr>
<th>Fault stimulus</th>
<th>Failure effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server failure (host power-cycled)</td>
<td>Nonclustered-Processes fail. Clustered—Other nodes running processes that used devices served from the single-path HBA failed over access</td>
</tr>
<tr>
<td>Fault stimulus</td>
<td>Failure effect</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>to a different served path. When the single-path node crashes, only the processes executing on that node fail. In either case, no data is lost or corrupted.</td>
<td></td>
</tr>
<tr>
<td>Switch failure (SAN switch disabled)</td>
<td>I/O is suspended or process is terminated across this HBA until switch is back online. No data is lost or corrupted. The operating system will report the volume in a Mount Verify state until the MVTIMEOUT limit is exceeded, when it then marks the volume as Mount Verify Timeout. No data is lost or corrupted.</td>
</tr>
<tr>
<td>Controller failure</td>
<td>I/O fails over to the surviving controller. No data is lost or corrupted.</td>
</tr>
<tr>
<td>Controller restart</td>
<td>I/O is suspended or process is terminated across this HBA until EVA is back online. No data is lost or corrupted. The operating system will report the volume in a Mount Verify state until the MVTIMEOUT limit is exceeded, when it then marks the volume as Mount Verify Timeout.</td>
</tr>
<tr>
<td>Server path failure</td>
<td>If the LUN is not shared, I/O is suspended or process is terminated across this HBA until path is restored. If running OpenVMS 7.3-1 and the LUN is shared, another cluster node having direct access will take over serving the device, resulting in no loss of service. In either case, no data is lost or corrupted. The operating system will report the volume in a Mount Verify state until the MVTIMEOUT limit is exceeded, when it then marks the volume as Mount Verify Timeout.</td>
</tr>
<tr>
<td>Storage path failure</td>
<td>I/O is suspended or process is terminated across this HBA until path is restored. No data is lost or corrupted. The operating system will report the volume in a Mount Verify state until the MVTIMEOUT limit is exceeded, when it then marks the volume as Mount Verify Timeout.</td>
</tr>
</tbody>
</table>

**Linux**

<table>
<thead>
<tr>
<th>Fault stimulus</th>
<th>Failure effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server failure (host power-cycled)</td>
<td>OS reboots, automatically checks disks. HSV disks must be manually checked unless auto mounted by the system.</td>
</tr>
<tr>
<td>Switch failure (SAN switch disabled)</td>
<td>Short: I/O suspended, possible data loss. Long: I/O halts with I/O errors, data loss. HBA driver must be reloaded before failed drives can be recovered, fsck should be run on any failed drives before remounting.</td>
</tr>
<tr>
<td>Controller failure</td>
<td>Short term: I/O suspended, possible data loss. Long term: I/O halts with I/O errors, data loss. Cannot reload driver, need to reboot system, fsck should be run on any failed disks before remounting.</td>
</tr>
<tr>
<td>Controller restart</td>
<td>Short term: I/O suspended, possible data loss. Long term: I/O halts with I/O errors, data loss. Cannot reload driver, need to reboot system, fsck should be run on any failed disks before remounting.</td>
</tr>
</tbody>
</table>
### IBM AIX

<table>
<thead>
<tr>
<th>Fault stimulus</th>
<th>Failure effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server path failure</td>
<td>Short: I/O suspended, possible data loss. Long: I/O halts with I/O errors, data loss. HBA driver must be reloaded before failed drives can be recovered, fsck should be run on any failed drives before remounting.</td>
</tr>
<tr>
<td>Storage path failure</td>
<td>Short: I/O suspended, possible data loss. Long: I/O halts with I/O errors, data loss. HBA driver must be reloaded before failed drives can be recovered, fsck should be run on any failed drives before remounting.</td>
</tr>
</tbody>
</table>

### VMware

<table>
<thead>
<tr>
<th>Fault stimulus</th>
<th>Failure effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server failure (host power-cycled)</td>
<td>OS reboots, automatically checks disks. HSV disks must be manually checked unless auto mounted by the system.</td>
</tr>
<tr>
<td>Switch failure (SAN switch disabled)</td>
<td>Short: I/O suspended, possible data loss. Long: I/O halts with I/O errors, data loss. HBA driver must be reloaded before failed drives can be recovered, fsck should be run on any failed drives before remounting.</td>
</tr>
<tr>
<td>Fault stimulus</td>
<td>Failure effect</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Server path failure</td>
<td>Short: I/O suspended, possible data loss. Long: I/O halts with I/O errors, data loss. HBA driver must be reloaded before failed drives can be recovered, fsck should be run on any failed drives before mounting.</td>
</tr>
<tr>
<td>Storage path failure</td>
<td>Short: I/O suspended, possible data loss. Long: I/O halts with I/O errors, data loss. HBA driver must be reloaded before failed drives can be recovered, fsck should be run on any failed drives before remounting.</td>
</tr>
</tbody>
</table>

**Mac OS**

<table>
<thead>
<tr>
<th>Fault stimulus</th>
<th>Failure effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server failure (host power-cycled)</td>
<td>OS reboots. Both HFS and StorNext replay journal on filesystem. Disk auto mounted by OS.</td>
</tr>
<tr>
<td>Switch failure</td>
<td>Short term: I/O suspended, possible data loss.</td>
</tr>
<tr>
<td>Controller failure</td>
<td>Long term: I/O halts with I/O errors.</td>
</tr>
<tr>
<td>Controller restart</td>
<td>Short term: I/O suspended, possible data loss.</td>
</tr>
<tr>
<td></td>
<td>Long term: I/O fails over to alternate storage controller if visible (by zoning). Otherwise, I/O halts with I/O errors, data loss. Can require a server reboot for full recovery.</td>
</tr>
<tr>
<td>Server path failure</td>
<td>Short term: I/O suspended, possible data loss.</td>
</tr>
<tr>
<td></td>
<td>Long term: I/O halts with I/O errors.</td>
</tr>
<tr>
<td></td>
<td>Can require a server reboot for full recovery.</td>
</tr>
<tr>
<td>Storage path failure</td>
<td>Short term: I/O suspended, possible data loss.</td>
</tr>
<tr>
<td></td>
<td>Long term: I/O fails over to alternate storage controller if available. Otherwise, I/O halts with I/O errors.</td>
</tr>
<tr>
<td></td>
<td>Can require a server reboot for full recovery.</td>
</tr>
</tbody>
</table>
7 Troubleshooting

If the disk enclosure does not initialize

1. **IMPORTANT:** After a power failure, the system automatically returns to the last-powered state (On or Off) when A/C power is restored.

2. Ensure that the power on/standby button was pressed firmly and held for approximately three seconds.
3. Verify that the power on/standby button LED is green.
4. Verify that the power source is working:
   a. Verify that the power supplies are working by viewing the power supply LEDs. If necessary, remove and reinstall the power supplies to verify that they are seated properly.
   b. Remove and inspect AC power cords from both power supplies and reconnect them.

### Diagnostic steps

#### Is the enclosure front fault LED amber?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Possible Reasons</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>System functioning properly.</td>
<td>No action required.</td>
</tr>
<tr>
<td>Yes</td>
<td>• Front Status and UID module might not be inserted properly, might have a damaged connector, or might have failed. • Possible error condition exists.</td>
<td>• Be sure that the Front Status and UID module is undamaged and is fully seated. • Check rear fault LEDs to isolate failed component. • Contact an authorized service provider for assistance.</td>
</tr>
</tbody>
</table>

#### Is the enclosure rear fault LED amber?

<table>
<thead>
<tr>
<th>Answers</th>
<th>Possible Reasons</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Functioning properly.</td>
<td>No action required</td>
</tr>
<tr>
<td>Yes</td>
<td>Rear power and UID module might not be inserted properly, might have a damaged connector, or might have failed.</td>
<td>• Be sure that the rear power and UID module is undamaged and is fully seated. • Contact an authorized service provider for assistance.</td>
</tr>
</tbody>
</table>
### Is the power on/standby button LED amber?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Possible Reasons</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>System functioning properly.</td>
<td>No action required.</td>
</tr>
</tbody>
</table>
| Yes    | - The power on/standby button has not been pressed firmly or held long enough.  
       | - The system midplane and/or power button/LED assembly might need to be replaced. | - Firmly press the power on/standby button and hold for approximately three seconds.  
       |                                           | - Be sure that all components are fully seated.  
       |                                           | - Contact an authorized service provider for assistance. |

### Is the power supply LED amber?

<table>
<thead>
<tr>
<th>Answers</th>
<th>Possible Reasons</th>
<th>Actions</th>
</tr>
</thead>
</table>
| No      | - Both power cords not connected or AC power is unavailable.  
       | - Power supply functioning properly. | - Remove and inspect the AC power cords from both power supplies and reconnect them.  
       |                                           | - No action required. |
| Yes     | - This supply is not receiving AC power, but the other supply is receiving AC power.  
       |       | - Verify AC input power.  
       |       | - Be sure that the power supply is undamaged and is fully seated.  
       |       | - Be sure that all pins on connectors and components are straight.  
       |       | - Contact an authorized service provider for assistance.  
       | - Power supply might not be inserted properly, might have a damaged connector, or might have failed.  
       |       | - NOTE: It is possible for one power supply to show a green status and the other supply to show an amber status. |

### Is the I/O module fault LED amber?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Possible Reasons</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Functioning properly.</td>
<td>No action required.</td>
</tr>
</tbody>
</table>
| Yes    | - The I/O module is locked.  
       | - The I/O module has failed.  
       | - Other fault condition exists. | - Make sure that the I/O module is seated properly by pressing the I/O module firmly into its bay after the handle has clicked in place.  
       |                                           | CAUTION: Never remove an I/O module from the chassis while the status LED is green. Removing an active I/O module can result in data loss.  
       |                                           | - Contact an authorized service provider for assistance. |
Is the fan LED amber?

<table>
<thead>
<tr>
<th>Answers</th>
<th>Possible Reasons</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Functioning properly.</td>
<td>No action required</td>
</tr>
</tbody>
</table>
| Yes     | Fan might not be inserted properly, might have a damaged connector, or might have failed. | • Be sure that the fan is undamaged and is fully seated.  
• Contact an authorized service provider for assistance. |

Effects of a disk drive failure

When a disk drive fails, all virtual disks that are in the same array are affected. Each virtual disk in an array might be using a different fault-tolerance method, so each can be affected differently.

- RAID0 configurations cannot tolerate drive failure. If any physical drive in the array fails, all non-fault-tolerant (RAID0) logical drives in the same disk group also fail.
- RAID1+0 configurations can tolerate multiple drive failures as long as no failed drives are mirrored to one another (with no spares assigned).
- RAID5 configurations can tolerate one drive failure (with no spares assigned).
- RAID6 configurations can tolerate simultaneous failure of two drives (with no spares assigned).

Compromised fault tolerance

If more disk drives fail than the fault-tolerance method allows, fault tolerance is compromised, and the virtual disk fails.

Factors to consider before replacing disk drives

Before replacing a degraded drive:

- Be sure that the array has a current, valid backup.
- Use replacement drives that have a capacity at least as great as that of the smallest drive in the array. The controller immediately fails drives that have insufficient capacity.
To minimize the likelihood of fatal system errors, take these precautions when removing failed drives:

- Do not remove a degraded drive if any other drive in the array is offline (the online LED is off). In this situation, no other drive in the array can be removed without data loss.

- **Exceptions:**
  - When RAID1+0 is used, drives are mirrored in pairs. Several drives can be in a failed condition simultaneously (and they can all be replaced simultaneously) without data loss, as long as no two failed drives belong to the same mirrored pair.
  - When RAID6 is used, two drives can fail simultaneously (and be replaced simultaneously) without data loss.
  - If the offline drive is a spare, the degraded drive can be replaced.

- Do not remove a second drive from an array until the first failed or missing drive has been replaced and the rebuild process is complete. (The rebuild is complete when the Online LED on the front of the drive stops blinking.)

- **Exceptions:**
  - In RAID6 configurations, any two drives in the array can be replaced simultaneously.
  - In RAID1+0 configurations, any drives that are not mirrored to other removed or failed drives can be simultaneously replaced offline without data loss.

### Automatic data recovery (rebuild)

When you replace a disk drive in an array, the controller uses the fault-tolerance information on the remaining drives in the array to reconstruct the missing data (the data that was originally on the replaced drive) and write it to the replacement drive. This process is called automatic data recovery, or rebuild. If fault tolerance is compromised, this data cannot be reconstructed and is likely to be permanently lost.

### Time required for a rebuild

The time required for a rebuild varies considerably, depending on several factors:

- The priority that the rebuild is given over normal I/O operations
- The amount of I/O activity during the rebuild operation
- The rotational speed of the disk drives
- The availability of drive cache
- The model and age of the drives
- The amount of unused capacity on the drives
- The number of drives in the array (for RAID5 and RAID6)

Allow approximately 5 minutes per gigabyte without any I/O activity during the rebuild process. This figure is conservative, and newer drive models usually require less time to rebuild.

System performance is affected during the rebuild, and the system is unprotected against further drive failure until the rebuild has finished. Therefore, replace drives during periods of low activity when possible.

⚠️ **CAUTION:** If the Online LED of the replacement drive stops blinking and the amber fault LED glows, or if other drive LEDs in the array go out, the replacement drive has failed and is producing unrecoverable disk errors. Remove and replace the failed replacement drive.
When automatic data recovery has finished, the online LED of the replacement drive stops blinking and begins to glow steadily.

**Failure of another drive during rebuild**

If a non-correctable read error occurs on another physical drive in the array during the rebuild process, the Online LED of the replacement drive stops blinking and the rebuild abnormally terminates. If this situation occurs, restart the server. The system might temporarily become operational long enough to allow recovery of unsaved data. In any case, locate the faulty drive, replace it, and restore data from backup.

**Handling disk drive failures**

If the controller was configured with hardware fault tolerance, complete the following steps after a disk drive failure:

1. Determine which physical drive failed. On hot-plug drives, an amber drive failure LED illuminates.
2. If the unit containing the failed drive does not support hot-plug drives, perform a normal shutdown.
3. Remove the failed drive and replace it with a drive that is of the same capacity. For hot-plug drives, after you secure the drive in the bay, the LEDs on the drive each flash once in an alternating pattern to indicate a successful connection. The online LED flashes, indicating that the controller recognized the drive replacement and began the recovery process.
4. Power up the server, if applicable.
5. The controller reconstructs the information on the new drive, based on information from the remaining physical drives in the logical drive. While reconstructing the data on hot-plug drives, the online LED flashes. When the drive rebuild is complete, the online LED is illuminated.

**iSCSI module diagnostics and troubleshooting**

Diagnostic information is also available through HP P6000 Command View and the CLI event logs and error displays. This section describes diagnostics.

**iSCSI and iSCSI/FCoE diagnostics**

The iSCSI and iSCSI/FCoE self test status and operational status are indicated by the MEZZ LED as shown in Figure 85 (page 173) and Table 26 (page 173).

**Figure 85 Controller status LEDs**

![Figure 85 Controller status LEDs](image)

**Table 26 Controller status LEDs**

<table>
<thead>
<tr>
<th>Item</th>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UID</td>
<td>Blue LED identifies a specific controller within the enclosure and the iSCSI or iSCSI/FCoE module within the controller.</td>
</tr>
<tr>
<td>2</td>
<td><img src="image" alt="LED_icon" /></td>
<td>Green LED indicates controller health. LED flashes green during boot and becomes solid green after boot.</td>
</tr>
</tbody>
</table>
Table 26 Controller status LEDs (continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>![Flash symbol]</td>
<td>Flashing amber indicates a controller termination, or the system is inoperative and attention is required. Solid amber indicates that the controller cannot reboot, and that the controller should be replaced. If both the solid amber and solid blue LEDs are lit, the controller has completed a warm removal procedure, and can be safely swapped.</td>
</tr>
<tr>
<td>4</td>
<td>MEZZ</td>
<td>Amber LED indicates the iSCSI or iSCSI/FCoE module status that is communicated to the array controller. Slow flashing amber LED indicates an IP address conflict on the management port. Solid amber indicates an iSCSI or iSCSI/FCoE module critical error, or shutdown.</td>
</tr>
<tr>
<td>5</td>
<td>![Green and White LED]</td>
<td>Green LED indicates write-back cache status. Slow flashing green LED indicates standby power. Solid green LED indicates cache is good with normal AC power applied.</td>
</tr>
<tr>
<td>6</td>
<td>![Amber LED]</td>
<td>Amber LED indicates DIMM status. The LED is off when DIMM status is good. Slow flashing amber indicates DIMMs are being powered by battery (during AC power loss). Solid amber indicates a DIMM failure.</td>
</tr>
</tbody>
</table>

Locate the iSCSI or iSCSI/FCoE module

A flashing UID beacon (blue LED) indicates the identification beacon is ON. There are two ways to identify the location of an iSCSI or iSCSI/FCoE module.

1. Enter the CLI command **beacon on** (see Figure 86 (page 174)).

**Figure 86 Beacon on command**
2. In HP P6000 Command View, click the **General** tab and then click the **Locate** button. Use the **Locate ON** and **Locate OFF** buttons to control the blue LED (see Figure 87 (page 175)).

**Figure 87 Locate Hardware Device**

---

### iSCSI or iSCSI/FCoE module’s log data

The iSCSI or iSCSI/FCoE modules maintain logs that can be displayed or collected through the CLI. The log is persistent through reboots or power cycles. To view the log use the CLI command `show logs`.

See “iSCSI or iSCSI/FCoE module log messages” (page 284) for log data descriptions.

### iSCSI or iSCSI/FCoE module statistics

Statistics are available via the iSCSI or iSCSI/FCoE module CLI for the iSCSI and Fibre Channel ports. To view the statistics use the CLI command `show stats`.

### Troubleshoot using HP P6000 Command View

HP P6000 Command View can display the properties for each iSCSI module. At a glance, you can check each module’s software revision, serial number, temperature, and power/cooling status (see Figure 88 (page 175)).

**Figure 88 iSCSI and iSCSI/FCoE module properties**

---

### Issues and solutions

**Issue:** HP P6000 Command View does not discover the iSCSI or iSCSI/FCoE modules

1. **Solution 1:** Ensure that a DHCP server is available.
2. **Solution 2:** Set a static IP address on each iSCSI and iSCSI/FCoE module through the CLI.
3. **Solution 3:** Ensure the HP P6000 Command View station is on the same subnet of the management ports.
4. **Solution 4:** Enter the known IP address of the management port of the iSCSI modules in the HP P6000 Command View discovery screen.
Issue: Initiator cannot login to iSCSI or iSCSI/FCoE module target

**Solution 1:** Ensure the correct iSCSI port IP address is used

**Solution 2:** In HP P6000 Command View, for each iSCSI controller 01 and 02, click the **IP ports** tab, then expand the **TCP properties** under the **Advanced Settings**. There should be available connections; if not, choose another IP port to log in to or reduce the connections from other initiators by logging out from unused connections (see **Figure 89 (page 176)**).

**Figure 89 IP Ports tab**

---

**Issue:** Initiator logs in to iSCSI or iSCSI/FCoE controller target but EVA assigned LUNs are not appearing on the initiator

**Solution 1.** The initiator needs to log in to the target where the EVA LUN was assigned.

**Solution 2.** The EVA LUN was assigned to a different iSCSI Host then was expected.

**Issue:** EVA presented virtual disk is not seen by the initiator

**Solution 1.** The initiator has to login to the proper iSCSI target. Match the virtual disk presentation properties as in **Figure 90 (page 177)** and **Figure 91 (page 177)** to the initiator’s target login.
Issue: Windows initiators may display **Reconnecting** if NIC MTU changes after connection has logged in.

**Solution.** Log out of those sessions and Log On again to re-establish the **Connected** state.

Issue: When communication between HP P6000 Command View and iSCSI or iSCSI/FCoE module is down, use following options:

**Solution 1.** Refresh using **Hardware > iSCSI Devices > iSCSI Controller 01 or 02 > Refresh** button.

**Solution 2.** If the IPv4 management port IP address is set:
1. Discover the controller. This option is exposed through iSCSI controller —> Set options —> Discover controller
2. Enter a valid IPv4 mgmt Ip address under Mgmt Port and click the **Save changes** button. If only IPv6 mgmt port IP address is set, enter a valid IPv6 management IP address under Mgmt Port and click the **Save changes** button.

**NOTE:** If you configure IPv6 on any iSCSI or iSCSI/FCoE module’s iSCSI port, you must also configure IPv6 on the HP P6000 Command View EVA management server.

### HP P6000 Command View issues and solutions

<table>
<thead>
<tr>
<th>Issue</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovered iSCSI Controller not found with selected EVA.</td>
<td>Click the Refresh button on the iSCSI Controller properties page. Check management port connection. Check the iSCSI Controller Properties Condition/State of the FC ports.</td>
</tr>
<tr>
<td><strong>NOTE:</strong> If you configure IPv6 on any iSCSI or iSCSI/FCoE module’s iSCSI port, you must also configure IPv6 on the HP P6000 Command View EVA management server.</td>
<td></td>
</tr>
<tr>
<td>Not a supported configuration. Both HP Storage Works iSCSI or iSCSI/FCoE modules should belong to same chassis/enclosure.</td>
<td>Only iSCSI or iSCSI/FCoE modules that are in the same controller chassis are supported for connectivity.</td>
</tr>
<tr>
<td>Not a supported configuration. HP iSCSI/FCoE module cannot be discovered with this EVA.</td>
<td>Check FCoE zoning/connectivity to the EVA.</td>
</tr>
<tr>
<td>The virtual disk operation has failed. Please make sure that FC target connections are online.</td>
<td>Check all iSCSI or iSCSI/FCoE module FC Ports Condition/State. Check that the iSCSI or iSCSI/FCoE module and HP P6000 Command View are in a consistent state, each with the same hosts and presented LUNs. You may have to use the iSCSI or iSCSI/FCoE module’s CLI to reset factory or reset mappings, and remove all presentations and hosts from HP P6000 Command View.</td>
</tr>
<tr>
<td>IP port of iSCSI controller 01 and 02 should be enabled to change the corresponding port attributes.</td>
<td>Enable port.</td>
</tr>
<tr>
<td>Command not supported with this version of HP iSCSI.</td>
<td>Check software version. Code load latest revision if necessary.</td>
</tr>
<tr>
<td>Unable to process command at this time. Check all connections as iSCSI or iSCSI/FCoE module’s Fibre Channel ports are unavailable.</td>
<td>Check the status of the P6000 controller health and the MEZZ status for failed conditions. Ensure that the P6000 FC ports are up.</td>
</tr>
<tr>
<td>Invalid iSCSI Controller configuration file extension.</td>
<td>Ensure the correct file is being used to restore configuration.</td>
</tr>
<tr>
<td>Operation failed; iSCSI controller code load file cannot open/read.</td>
<td>File may be invalid or corrupt. Retrieve another copy of firmware file.</td>
</tr>
<tr>
<td>iSCSI Controller code load process have been failed.</td>
<td>Process may have been interrupted during code load, try again.</td>
</tr>
<tr>
<td>Invalid iSCSI controller code load file extension.</td>
<td>Ensure the correct file is being used.</td>
</tr>
<tr>
<td>iSCSI or iSCSI/FCoE LUN presentation: Operation Failed! The virtual disk operation has failed. Please make sure that the FC target connections are online.</td>
<td>A result of HP P6000 Command View and the iSCSI or iSCSI/FCoE LUN mask being inconsistent while trying to map a LUN that is already mapped or is offline. This can result from misuse of the CLI or making LUN masking changes while a module or controller is down. Use the CLI to reset mappings/reboot or reset factory/reboot, then unmapping all presented LUNs, deleting the iSCSI HOSTs and also removing both iSCSI controllers. The CLI show luns, show luninfo, and show initiators_lunmask commands can provide information on which LUNs are causing the inconsistency.</td>
</tr>
<tr>
<td>Volume information mismatch across cveva and Optimize ReTrim used space</td>
<td>There can be a mismatch on the Vdisk allocated size in comparison with the host volume size shown by optimizer (slab count and volume information).</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Space reclaim is very minimal for iSCSI LUN during the file deletion.</td>
<td>Based on the controller load, the efficiency of space reclamation might vary and the reclamation not start immediately. Reclaim of the specified space (or majority of the specified space) may complete over a period of time and may not be instantly.</td>
</tr>
<tr>
<td>Thin Provisioning Threshold and Resource Exhaustion Test (LOGO) Failed</td>
<td>The system event log when the threshold limit of the vdisk is reached, When the system event log reaches the threshold limit on the vdisk, the user can see an event on the LUN utilization capacity and pool availability capacity for LUN is restricted by either size of LUN or available capacity in pool.</td>
</tr>
</tbody>
</table>
# Error messages

This list of error messages is in order by status code value, 0 to 243.

## Table 27 Error Messages

<table>
<thead>
<tr>
<th>Status code value</th>
<th>Meaning</th>
<th>How to correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful Status</td>
<td>The SCMI command completed successfully.</td>
</tr>
</tbody>
</table>
| 1                 | Object Already Exists | The object or relationship already exists. | Delete the associated object and try the operation again. Several situations can cause this message: Presenting a LUN to a host:  
- Delete the current association or specify a different LUN number. Storage cell initialize:  
- Remove or erase disk volumes before the storage cell can be successfully created. Adding a port WWN to a host:  
- Specify a different port WWN. Adding a disk to a disk group:  
- Delete the specified disk volume before creating a new disk volume. |
<p>| 2                 | Supplied Buffer Too Small | The command or response buffer is not large enough to hold the specified number of items. This can be caused by a user or program error. | Report the error to product support. |
| 3                 | Object Already Assigned | This error is no longer supported. | Report the error to product support. |
| 4                 | Insufficient Available Data Storage | There is insufficient storage available to perform the request. | Reclaim some logical space or add physical hardware. |
| 5                 | Internal Error | An unexpected condition was encountered while processing a request. | Report the error to product support. |
| 6                 | Invalid status for virtual disk | This error is no longer supported. | Report the error to product support. |
| 7                 | Invalid Class | The supplied class code is of an unknown type. This can be caused by a user or program error. | Report the error to product support. |
| 8                 | Invalid Function | The function code specified with the class code is of an unknown type. | Report the error to product support. |
| 9                 | Invalid Logical Disk Block State | This error is no longer supported. | Report the error to product support. |
| 10                | Invalid Loop Configuration | This error is no longer supported. | Report the error to product support. |
| 11                | Invalid parameter | There are insufficient resources to fulfill the request, the requested value is not supported, or the parameters supplied are invalid. This can indicate a user or program error. | Report the error to product support. |</p>
<table>
<thead>
<tr>
<th>Status code value</th>
<th>Meaning</th>
<th>How to correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Invalid Parameter handle</td>
<td>The supplied handle is invalid. This can indicate a user error, program error, or a storage cell in an uninitialized state. In the following cases, the storage cell is in an uninitialized state, but no action is required: Storage cell discard (informational message): Storage cell look up object count (informational message): Storage cell look up object (informational message):</td>
<td>In the following cases, the message can occur because the operation is not allowed when the storage cell is in an uninitialized state. If you see these messages, initialize the storage cell and retry the operation. Storage cell set device addition policy Storage cell set name Storage cell set time Storage cell set volume replacement delay Storage cell free command lock Storage cell set console lun id</td>
</tr>
<tr>
<td>13 Invalid Parameter Id</td>
<td>The supplied identifier is invalid. This can indicate a user or program error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>14 Invalid Quorum Configuration</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>15 Invalid Target Handle</td>
<td>The supplied target handle is invalid. This can indicate a user or program error (Case 1), or Volume set requested usage (Case 2): The operation could not be completed because the disk has never belonged to a disk group and therefore cannot be added to a disk group.</td>
<td>Case 1: Report the error to product support. Case 2: To add additional capacity to the disk group, use the management software to add disks by count or capacity.</td>
</tr>
<tr>
<td>16 Invalid Target Id</td>
<td>The supplied target identifier is invalid. This can indicate a user or program error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>17 Invalid Time</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>18 Media is Inaccessible</td>
<td>The operation could not be completed because one or more of the disk media was inaccessible.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>19 No Fibre Channel Port</td>
<td>The Fibre Channel port specified is not valid. This can indicate a user or program error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>20 No Image</td>
<td>There is no firmware image stored for the specified image number.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>21 No Permission</td>
<td>The disk device is not in a state to allow the specified operation.</td>
<td>The disk device must be in either maintenance mode or in a reserved state for the specified operation to proceed.</td>
</tr>
<tr>
<td>22 Storage system not initialized</td>
<td>The operation requires a storage cell to exist.</td>
<td>Create a storage cell and retry the operation.</td>
</tr>
<tr>
<td>23 Not a Loop Port</td>
<td>The Fibre Channel port specified is either not a loop port or is invalid. This can indicate a user or program error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>24 Not a Participating Controller</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>Status code value</td>
<td>Meaning</td>
<td>How to correct</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>25</td>
<td>Objects in your system are in use, and their state prevents the operation you wish to perform.</td>
<td>Case 1: Either delete the associated object or resolve the in progress state. Case 2: Report the error to product support. Case 3: Unpresent the LUNs before deleting this virtual disk. Case 4: Resolve the delay before performing the operation. Case 5: Delete any remaining virtual disks or wait for the used capacity to reach zero before the disk group can be deleted. If this is the last remaining disk group, uninitialized the storage cell to remove it. Case 6: Report the error to product support. Case 7: The disk must be in a reserved state before it can be erased. Case 8: Delete the virtual disks or LUN presentations before uninitialized the storage cell. Case 9: Delete the LUN presentations before deleting the EVA host. Case 10: Report the error to product support. Case 11: Resolve the situation before attempting the operation again. Case 12: Resolve the situation before attempting the operation again. Case 13: Select another disk or remove the disk from the disk group before making it a member of a different disk group. Case 14: Remove the virtual disks from the group and retry the operation.</td>
</tr>
<tr>
<td>26</td>
<td>Parameter Object Does Not Exist</td>
<td>Report the error to product support.</td>
</tr>
</tbody>
</table>
### Table 27 Error Messages (continued)

<table>
<thead>
<tr>
<th>Status code value</th>
<th>Meaning</th>
<th>How to correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 Target Object Does Not Exist</td>
<td>The operation cannot be performed because the object does not exist. This can indicate a user or program error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>28 Timeout</td>
<td>A timeout has occurred in processing the request.</td>
<td>Verify the hardware connections and that communication to the device is successful.</td>
</tr>
<tr>
<td>29 Unknown Id</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>30 Unknown Parameter Handle</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>31 Unrecoverable Media Error</td>
<td>The operation could not be completed because one or more of the disk media had an unrecoverable error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>32 Invalid State</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>33 Transport Error</td>
<td>A SCMI transport error has occurred.</td>
<td>Verify the hardware connections, communication to the device, and that the management software is operating successfully.</td>
</tr>
<tr>
<td>34 Volume is Missing</td>
<td>The operation could not be completed because the drive volume is in a missing state.</td>
<td>Resolve the condition and retry the request. Report the error to product support.</td>
</tr>
<tr>
<td>35 Invalid Cursor</td>
<td>The supplied cursor or sequence number is invalid. This may indicate a user or program error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>36 Invalid Target for the Operation</td>
<td>The specified target virtual disk already has an existing data sharing relationship. This can indicate a user or program error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>37 No More Events</td>
<td>There are no more events to retrieve. (This message is informational only.)</td>
<td>No action required.</td>
</tr>
<tr>
<td>38 Lock Busy</td>
<td>The command lock is busy and being held by another process.</td>
<td>Retry the request at a later time.</td>
</tr>
<tr>
<td>39 Time Not Set</td>
<td>The storage system time is not set. The storage system time is set automatically by the management software.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>40 Not a Supported Version</td>
<td>The requested operation is not supported by this firmware version. This can indicate a user or program error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>41 No Logical Disk for Vdisk</td>
<td>This is an internal error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>42 Virtual disk Presented</td>
<td>The virtual disk specified is already presented to the client and the requested operation is not allowed.</td>
<td>Delete the associated presentation(s) and retry the request.</td>
</tr>
<tr>
<td>43 Operation Denied On Slave</td>
<td>The request is not allowed on the slave controller. This can indicate a user or program error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>44 Not licensed for data replication</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>Status code value</td>
<td>Meaning</td>
<td>How to correct</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>45 Not DR group member</td>
<td>The operation cannot be performed because the virtual disk is not a member of a Continuous Access group.</td>
<td>Configure the virtual disk to be a member of a Continuous Access group and retry the request.</td>
</tr>
<tr>
<td>46 Invalid DR mode</td>
<td>The operation cannot be performed because the Continuous Access group is not in the required mode.</td>
<td>Configure the Continuous Access group correctly and retry the request.</td>
</tr>
<tr>
<td>47 The target DR member is in full copy, operation rejected</td>
<td>The operation cannot be performed because at least one of the virtual disk members is in a copying state.</td>
<td>Wait for the copying state to complete and retry the request.</td>
</tr>
<tr>
<td>48 Security credentials needed. Please update your system’s ID and password in the Storage System Access menu.</td>
<td>The management software is unable to log in to the storage system. The storage system password has been configured.</td>
<td>Use the management software to save the password specified so communication can proceed.</td>
</tr>
<tr>
<td>49 Security credentials supplied were invalid. Please update your system’s ID and password in the Storage System Access menu.</td>
<td>The management software is unable to login to the device. The storage system password may have been re-configured or removed.</td>
<td>Use the management software to set the password to match the device so communication can proceed.</td>
</tr>
<tr>
<td>50 Security credentials supplied were invalid. Please update your system’s ID and password in the Storage System Access menu.</td>
<td>The management software is already logged in to the device. (This message is informational only.)</td>
<td>No action required.</td>
</tr>
<tr>
<td>51 Storage system connection down</td>
<td>The Continuous Access group is unable to communicate to the remote site.</td>
<td>Verify that devices are powered on and that device hardware connections are functioning correctly. In particular, validate that the inter-site link is functioning correctly.</td>
</tr>
<tr>
<td>52 DR group empty</td>
<td>No virtual disks are members of the Continuous Access group.</td>
<td>Add one or more virtual disks as members and retry the request.</td>
</tr>
<tr>
<td>53 Incompatible attribute</td>
<td>The request cannot be performed because one or more of the attributes specified is incompatible.</td>
<td>Retry the request with valid attributes for the operation. Currently, this error code is only used for mirror clone operations, and is returned when a fracture or invert is requested and all operations are not alike.</td>
</tr>
<tr>
<td>54 Vdisk is a DR group member</td>
<td>The requested operation cannot be performed on a virtual disk that is already a member of a data replication group.</td>
<td>Remove the virtual disk as a member of a data replication group and retry the request.</td>
</tr>
<tr>
<td>55 Vdisk is a DR log unit</td>
<td>The requested operation cannot be performed on a virtual disk that is a log unit.</td>
<td>No action required.</td>
</tr>
<tr>
<td>56 Cache batteries failed or missing.</td>
<td>The battery system is missing or discharged.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>57 Vdisk is not presented</td>
<td>The virtual disk member is not presented to a client.</td>
<td>The virtual disk member must be presented to a client before this operation can be performed.</td>
</tr>
<tr>
<td>58 Other controller failed</td>
<td>The other controller failed during the execution of this operation.</td>
<td>Retry the operation once controller failout is complete.</td>
</tr>
</tbody>
</table>
Table 27 Error Messages (continued)

<table>
<thead>
<tr>
<th>Status code value</th>
<th>Meaning</th>
<th>How to correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>Maximum Number of Objects Exceeded.</td>
<td>Case 1: If this operation is still desired, delete one or more of the items allowed has been reached. Case 2: If this operation is still desired, delete one or more of the EVA hosts has been reached. Case 3: If this operation is still desired, delete one or more of the port WWNs has been reached.</td>
</tr>
<tr>
<td>60</td>
<td>Max size exceeded</td>
<td>Case 1: If this operation is still desired, delete one or more of the items already exist on the destination storage cell. Case 2: If this operation is still desired, delete one or more of the EVA hosts already exist on the destination storage cell. Case 3: If this operation is still desired, delete one or more of the port WWNs already exist on the destination storage cell. Case 4: If this operation is still desired, delete one or more of the virtual disks already exist. Case 5: If this operation is still desired, delete one or more of the Continuous Access groups already exist.</td>
</tr>
<tr>
<td>61</td>
<td>Password mismatch. Please update your system’s password in the Storage System Access menu. Continued attempts to access this storage system with an incorrect password will disable management of this storage system.</td>
<td>The login password entered on the controllers does not match. Reconfigure one of the storage system controller passwords, then use the management software to set the password to match the device so communication can proceed.</td>
</tr>
<tr>
<td>62</td>
<td>DR group is merging</td>
<td>The operation cannot be performed because the Continuous Access connection is currently merging. Wait for the merge operation to complete and retry the request.</td>
</tr>
<tr>
<td>63</td>
<td>DR group is logging</td>
<td>The operation cannot be performed because the Continuous Access connection is currently logging. Wait for the logging operation to complete and retry the request.</td>
</tr>
<tr>
<td>64</td>
<td>Connection is suspended</td>
<td>The operation cannot be performed because the Continuous Access connection is currently suspended. Resolve the suspended mode and retry the request.</td>
</tr>
<tr>
<td>65</td>
<td>Bad image header</td>
<td>The firmware image file has a header checksum error. Retrieve a valid firmware image file and retry the request.</td>
</tr>
<tr>
<td>66</td>
<td>Bad image</td>
<td>The firmware image file has a checksum error. Retrieve a valid firmware image file and retry the request.</td>
</tr>
<tr>
<td>67</td>
<td>Obsolete</td>
<td>This error is no longer supported. Report the error to product support.</td>
</tr>
<tr>
<td>Status code value</td>
<td>Meaning</td>
<td>How to correct</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>68</td>
<td>Obsolete</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>69</td>
<td>Obsolete</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>70</td>
<td>Image incompatible</td>
<td>Retrieve a valid firmware image file and retry the request.</td>
</tr>
<tr>
<td>71</td>
<td>Bad image segment</td>
<td>Verify that the firmware image is not corrupted and retry the firmware download process.</td>
</tr>
<tr>
<td>72</td>
<td>Image already loaded</td>
<td>No action required.</td>
</tr>
<tr>
<td>73</td>
<td>Image Write Error</td>
<td>Verify that the firmware image is not corrupted and retry the firmware download process.</td>
</tr>
<tr>
<td>74</td>
<td>Virtual Disk Sharing</td>
<td>Case 1: No action required. Case 2: No action required. Case 3: If a snapclone operation is in progress, wait until the snapclone operation has completed and retry the operation. Otherwise, the operation cannot be performed on this virtual disk. Case 4: No action required. Case 5: No action required.</td>
</tr>
<tr>
<td>75</td>
<td>Bad Image Size</td>
<td>Retrieve a valid firmware image file and retry the request.</td>
</tr>
<tr>
<td>76</td>
<td>Image Busy</td>
<td>Retry the request once the firmware download process is complete.</td>
</tr>
<tr>
<td>77</td>
<td>Volume Failure Predicted</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>78</td>
<td>Invalid object condition for this command</td>
<td>Resolve the condition and retry the request.</td>
</tr>
<tr>
<td>79</td>
<td>Snapshot (or snapclone) deletion in progress. The requested operation is currently not allowed. Please try again later.</td>
<td>Wait for the operation to complete and retry the request.</td>
</tr>
<tr>
<td>Status code value</td>
<td>Meaning</td>
<td>How to correct</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>80</strong> Invalid Volume Usage</td>
<td>The disk volume is already a part of a disk group.</td>
<td>Resolve the condition by setting the usage to a reserved state, wait for the usage to change to this state, and retry the request.</td>
</tr>
<tr>
<td><strong>81</strong> Minimum Volumes In Disk Group</td>
<td>The disk volume usage cannot be modified, as the minimum number of disks exist in the disk group.</td>
<td>Resolve the condition by adding additional disks and retry the request.</td>
</tr>
<tr>
<td><strong>82</strong> Shutdown In Progress</td>
<td>The controller is currently shutting down.</td>
<td>No action required.</td>
</tr>
<tr>
<td><strong>83</strong> Controller API Not Ready, Try Again Later</td>
<td>The device is not ready to process the request.</td>
<td>Retry the request at a later time.</td>
</tr>
<tr>
<td><strong>84</strong> Is Snapshot</td>
<td>This is a snapshot virtual disk and cannot be a member of a Continuous Access group.</td>
<td>No action required.</td>
</tr>
<tr>
<td><strong>85</strong> Cannot add or remove DR group member. Mirror cache must be active for this Vdisk. Check controller cache condition.</td>
<td>An incompatible mirror policy of the virtual disk is preventing it from becoming a member of a Continuous Access group.</td>
<td>Modify the mirror policy and retry the request.</td>
</tr>
<tr>
<td><strong>86</strong> HP P6000 Command View has detected this array as inoperative. Contact HP Service for assistance.</td>
<td>Case 1: A virtual disk is in an inoperative state and the request cannot be processed. This is due to a loss of cache data from power/controller loss or disk drive failure.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td></td>
<td>Case 2: The snapclone cannot be associated with a virtual disk that is in an inoperative state. HP P6000 Command View has detected this array as inoperative. Contact HP Services for assistance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case 3: The snapshot cannot be associated with a virtual disk that is in an inoperative state. This is due to a loss of cache data from power/controller loss or disk drive failure.</td>
<td></td>
</tr>
<tr>
<td><strong>87</strong> Disk group inoperative</td>
<td>The disk group is in an inoperative state and cannot process the request.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td><strong>88</strong> Storage system inoperative</td>
<td>The storage system is inoperative and cannot process the request because all disk groups have lost sufficient drives such that no data is available.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td><strong>89</strong> Failsafe Locked</td>
<td>The request cannot be performed because the Continuous Access group is in a failsafe locked state.</td>
<td>Resolve the condition and retry the request.</td>
</tr>
<tr>
<td><strong>90</strong> Data Flush Incomplete</td>
<td>The disk cache data need to be flushed before the condition can be resolved.</td>
<td>Retry the request later.</td>
</tr>
<tr>
<td><strong>91</strong> Redundancy Mirrored Inoperative</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td><strong>92</strong> Duplicate LUN</td>
<td>The LUN number is already in use by another client of the storage system.</td>
<td>Select another LUN number and retry the request.</td>
</tr>
<tr>
<td><strong>93</strong> Other remote controller failed</td>
<td>While the request was being performed, the remote storage system controller terminated.</td>
<td>Retry the request once remote controller failout is complete.</td>
</tr>
<tr>
<td><strong>94</strong> Unknown remote Vdisk</td>
<td>The remote storage system specified does not exist.</td>
<td>Correctly select the remote storage system and retry the request.</td>
</tr>
<tr>
<td>Status code value</td>
<td>Meaning</td>
<td>How to correct</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>95</td>
<td>The remote Continuous Access group specified does not exist.</td>
<td>Correctly select the remote Continuous Access group retry the request.</td>
</tr>
<tr>
<td>96</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>97</td>
<td>Another process has already taken the SCMI lock on the storage system.</td>
<td>Retry the request later.</td>
</tr>
<tr>
<td>98</td>
<td>While the request was being performed, an error occurred on the remote storage system.</td>
<td>Resolve the condition and retry the request.</td>
</tr>
<tr>
<td>99</td>
<td>The request failed because the operation cannot be performed on a Continuous Access connection that is up.</td>
<td>Resolve the condition and retry the request.</td>
</tr>
<tr>
<td>100</td>
<td>The management software is unable to log into the device as the password has changed.</td>
<td>The storage system password may have been re-configured or removed. The management software must be used to set the password up to match the device so communication can proceed.</td>
</tr>
<tr>
<td>101</td>
<td>The maximum number of login sessions allowed to the storage system has been reached.</td>
<td>Log out of a management agent session before attempting a new login.</td>
</tr>
<tr>
<td>102</td>
<td>The command cookie sent in the attempted command is invalid.</td>
<td>Retry the operation later. If the error persists, report the error to product support.</td>
</tr>
<tr>
<td>103</td>
<td>The login session is no longer valid due to timeout.</td>
<td>Log in again.</td>
</tr>
<tr>
<td>104</td>
<td>The virtual disk has reached the maximum number of allowed snapshots.</td>
<td>Remove a snapshot before attempting this command again.</td>
</tr>
<tr>
<td>105</td>
<td>Case 1: Creation of the virtual disk failed due to an invalid capacity value.</td>
<td>Case 1: Specify a valid capacity value.</td>
</tr>
<tr>
<td></td>
<td>Case 2: Virtual disk mirror policy does not match other snapshots.</td>
<td>Case 2: Choose a valid mirror policy value.</td>
</tr>
<tr>
<td>106</td>
<td>Management agent was not able to log in because password is not set.</td>
<td>Set a password before logging in. Without a password no login is required.</td>
</tr>
<tr>
<td>107</td>
<td>Invalid port when trying to get host port information.</td>
<td>Check if the port number refers to a valid host port and try again.</td>
</tr>
<tr>
<td>108</td>
<td>A virtual disk with this WWID is already presented.</td>
<td>Unpresent the already presented virtual disk or change the WWID of this virtual disk.</td>
</tr>
<tr>
<td>109</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>110</td>
<td>This is an internal error.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>Status code value</td>
<td>Meaning</td>
<td>How to correct</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Snapclone Active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>111 EMU Load Busy</td>
<td>The operation cannot be completed while the drive enclosures are undergoing code load.</td>
<td>Wait several minutes for the drive enclosure code load to finish, then retry the operation.</td>
</tr>
<tr>
<td>112 Duplicate User Name</td>
<td>An existing Continuous Access group already has this user name.</td>
<td>Change the user name for the new Continuous Access group or delete the existing Continuous Access group with the same name.</td>
</tr>
<tr>
<td>113 Drive Reserved For Code Load</td>
<td>The operation is not allowed because the drive is in a migrate code load state.</td>
<td>Allow the drive to finish code load.</td>
</tr>
<tr>
<td>114 Already Presented</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>115 Invalid Remote Storage Cell</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>116 No Management Interface Lock</td>
<td>The SCMI lock context in StorageCell is empty where the lock is expected to be taken by the management agent.</td>
<td>Retry the operation later. If the error persists, report the error to product support.</td>
</tr>
<tr>
<td>117 Maximum Members</td>
<td>The specified Continuous Access group already has the maximum number of members.</td>
<td>Use another Continuous Access group or remove members from the existing Continuous Access group.</td>
</tr>
<tr>
<td>118 Maximum Destinations</td>
<td>The specified Continuous Access group is attempting to use a new destination past the maximum number.</td>
<td>Use an existing destination or stop using a destination.</td>
</tr>
<tr>
<td>119 Empty User Name</td>
<td>The user name field for the specified Continuous Access group is empty.</td>
<td>Populate the user name field.</td>
</tr>
<tr>
<td>120 Storage Cell Exists</td>
<td>The command is not valid when a StorageCell is already formed and the NSC is operating normally as a member of the storage cell.</td>
<td>Use the command form designed to be used when no storage cell exists yet.</td>
</tr>
<tr>
<td>121 Already Open</td>
<td>The requested session is already open on this NSC. It cannot be opened for multiple session operation.</td>
<td>Close the requested session before attempting this command again.</td>
</tr>
<tr>
<td>122 Session Not Open</td>
<td>The requested session was not established by opening the session.</td>
<td>Open the requested session before attempting this command again.</td>
</tr>
<tr>
<td>123 Not Marked Inoperative</td>
<td>Case 1: The specified Continuous Access group cannot complete the operation until the disk group is marked permanently data lost. Case 2: The specified virtual disk is not in the thin provisioned overcommit state.</td>
<td>Case 1: Resolve the RAID inoperative condition in the disk group. Case 2: Command is unnecessary on a non thin provisioned overcommit virtual disk.</td>
</tr>
<tr>
<td>124 Media Not Available</td>
<td>Drive activity prevents the operation from being completed at this time.</td>
<td>Retry the operation later. If the error persists, report the error to product support.</td>
</tr>
<tr>
<td>125 Battery System Failed</td>
<td>The batteries do not allow the warm plug of a controller.</td>
<td>Resolve degraded battery situation.</td>
</tr>
<tr>
<td>126 Member is Cache Data Lost</td>
<td>The virtual disk is cache data lost.</td>
<td>Resolve the cache data lost situation on the virtual disk.</td>
</tr>
<tr>
<td>127 Internal Lock Collision</td>
<td>The resource needed to execute the request is in use by internal DRM process. The operation can be retried later.</td>
<td>Retry the operation later. If the error persists, report the error to product support.</td>
</tr>
</tbody>
</table>
### Table 27 Error Messages (continued)

<table>
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<tr>
<th>Status code value</th>
<th>Meaning</th>
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</tr>
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<tbody>
<tr>
<td>128 OCP Error</td>
<td>EVA 6400/8400 only. A generic error was detected with the OCP interface.</td>
<td>Ensure other OCP is on and try again. If the problem persists, report the error to product support.</td>
</tr>
<tr>
<td>129 Mirror Temporarily Offline</td>
<td>The virtual disk is not mirrored to the other controller.</td>
<td>Ensure other controller is operative.</td>
</tr>
<tr>
<td>130 Failsafe Mode Enabled</td>
<td>Cannot perform operation because FAILSAFE is enabled on Group.</td>
<td>Disable Failsafe mode on Group.</td>
</tr>
<tr>
<td>131 Drive FW Load Abort Due to VRaid0 Vdisk</td>
<td>The drive firmware cannot be downloaded to the drive because it is being used for RAID0 data. One or more RAID0 virtual disks would be inoperable if the drive were to be loaded.</td>
<td>Migrate RAID0 data to another disk group or a more protective redundancy before retrying the drive update.</td>
</tr>
<tr>
<td>132 FC Ports Unavailable</td>
<td>There is a diagnostic problem with the indicated port.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>133 Only Two Remote Relations Are Allowed</td>
<td>Only two remote relationships are allowed.</td>
<td>Need to reconfigure configuration to only have two remote destinations.</td>
</tr>
<tr>
<td>134 The Requested SRC Mode is Not Possible</td>
<td>The existing drive configuration does not support the requested SRC mode.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>135 Source Group Discarded, but the Destination Group NOT Discarded</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>136 Invalid DRM Group Tunnel Specified</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>137 Specified DRM Log Size Too Small</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>138 Invalid Disk Group Specified</td>
<td>The disk group requested for the attempted command is not valid.</td>
<td>Retry command using an appropriate disk group identifier.</td>
</tr>
<tr>
<td>139 DRM Group is Already Read-Only</td>
<td>Data replication group is already read-only.</td>
<td>Disable read-only mode in group.</td>
</tr>
<tr>
<td>140 DRM Group is Already Active-Active</td>
<td>Data replication group is already active-active.</td>
<td>Disable active-active mode in group.</td>
</tr>
<tr>
<td>141 DILX Is Already Running</td>
<td>The requested operation cannot be completed while Disk In Line Exerciser is in progress.</td>
<td>Retry command after DILX is complete.</td>
</tr>
<tr>
<td>142 DILX Is Not Running</td>
<td>Disk In Line Exerciser cannot be stopped because it is not running.</td>
<td>No corrective action required.</td>
</tr>
<tr>
<td>143 Invalid User Defined Log Size</td>
<td>Invalid user defined log size.</td>
<td>Reissue operation with a valid log size</td>
</tr>
<tr>
<td>144 Invalid Second Handle Parameter</td>
<td>Invalid data replication group identifier specified.</td>
<td>Retry the command with an existing data replication group.</td>
</tr>
<tr>
<td>145 DRM Group Already Auto Suspended</td>
<td>Data replication group already auto suspended.</td>
<td>Unsuspend group and reissue operation.</td>
</tr>
</tbody>
</table>
### Table 27 Error Messages (continued)

<table>
<thead>
<tr>
<th>Status code value</th>
<th>Meaning</th>
<th>How to correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>146</td>
<td>Specified Option Iis Not Yet Implemented</td>
<td>An unsupported code load attempt was made.</td>
</tr>
<tr>
<td>147</td>
<td>DRM Group Is Already “Present Only”</td>
<td>Data replication group is already present_only.</td>
</tr>
<tr>
<td>148</td>
<td>The Presented Unit Identifier Is Invalid</td>
<td>This error is no longer supported.</td>
</tr>
<tr>
<td>149</td>
<td>Internal SCS Error</td>
<td>This is an internal error.</td>
</tr>
<tr>
<td>150</td>
<td>Invalid SCS Function Code</td>
<td>This is an internal error.</td>
</tr>
<tr>
<td>151</td>
<td>Unsupported SCS Function Code</td>
<td>The command is not supported.</td>
</tr>
<tr>
<td>152</td>
<td>Init PS Failed</td>
<td>The requested command cannot be completed because a physical drive is failed.</td>
</tr>
<tr>
<td>153</td>
<td>Target Bad Identifier</td>
<td>The object identifier included with the command is invalid. This can indicate a user or program error.</td>
</tr>
<tr>
<td>154</td>
<td>Physical Store Is Volume</td>
<td>This error is no longer supported.</td>
</tr>
<tr>
<td>155</td>
<td>Bad Volume Usage</td>
<td>The requested “usage” of the volume is not a valid value. This can indicate a user or program error.</td>
</tr>
<tr>
<td>156</td>
<td>Bad LDAD Usage</td>
<td>The requested “usage” of the volume is not consistent with the disk group indicated. This can indicate a user or program error.</td>
</tr>
<tr>
<td>157</td>
<td>No LDAD Handle</td>
<td>The disk group requested for the attempted command is not valid.</td>
</tr>
<tr>
<td>158</td>
<td>Bad Quorum Flag</td>
<td>This error is no longer supported.</td>
</tr>
<tr>
<td>159</td>
<td>Internal Tag Invalid</td>
<td>The command parameters do not correlate to an object in the system. This can indicate a user or program error.</td>
</tr>
<tr>
<td>160</td>
<td>Internal Tag Bad UUID</td>
<td>The command parameters do not correlate to an object in the system. This can indicate a user or program error.</td>
</tr>
<tr>
<td>161</td>
<td>Too Many Physical Store Tags</td>
<td>When attempting to initialize the storage cell, either the command is attempted with too many drives, or the drive list has duplicate entries.</td>
</tr>
<tr>
<td>162</td>
<td>Bad Routine</td>
<td>This error indicates that a product support command is invalid or no longer supported.</td>
</tr>
<tr>
<td>163</td>
<td>No Tag For Identifier</td>
<td>The identifier supplied with the command does not correspond to an object in the system.</td>
</tr>
<tr>
<td>164</td>
<td>Bad Loop Number</td>
<td>This error only applies to product support commands.</td>
</tr>
</tbody>
</table>
Table 27 Error Messages (continued)

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</thead>
<tbody>
<tr>
<td>165</td>
<td>Too Many Port WWNs</td>
<td>Remove an adapter connection before attempting the command again.</td>
</tr>
<tr>
<td></td>
<td>The system has reached the limit of client adapters, so the command attempted cannot add another.</td>
<td></td>
</tr>
<tr>
<td>166</td>
<td>Port WWN Not Found</td>
<td>Retry the command with an accurate port WWN.</td>
</tr>
<tr>
<td></td>
<td>The port WWN supplied with the command is not correct.</td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>No Virtual Disk For Presented Unit</td>
<td>Retry the command with an accurate virtual disk identifier.</td>
</tr>
<tr>
<td></td>
<td>The virtual disk identifier supplied with the command is not correct.</td>
<td></td>
</tr>
<tr>
<td>168</td>
<td>No Client For Presented Unit</td>
<td>Retry the command with an accurate client identifier.</td>
</tr>
<tr>
<td></td>
<td>The client identifier supplied with the command is not correct.</td>
<td></td>
</tr>
<tr>
<td>169</td>
<td>Unsupported</td>
<td>Either the data replication destination is a different version that does not support the command, or the command is only executable by product support.</td>
</tr>
<tr>
<td></td>
<td>The command is not supported.</td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>SCS Operation Failed</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td></td>
<td>This is an internal error.</td>
<td></td>
</tr>
<tr>
<td>171</td>
<td>Has Members</td>
<td>Remove members from group and retry operation.</td>
</tr>
<tr>
<td></td>
<td>Operation cannot be completed because it’s group has members.</td>
<td></td>
</tr>
<tr>
<td>172</td>
<td>Incompatible Preferred Mask</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td></td>
<td>This error is no longer supported.</td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>Too Few Volume Tags</td>
<td>Retry operation with more available drives.</td>
</tr>
<tr>
<td></td>
<td>Not enough volumes have been selected for creation of a disk group or addition to a disk group.</td>
<td></td>
</tr>
<tr>
<td>174</td>
<td>ILF Debug Flag Not Set</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td></td>
<td>This error relates to the ILF product support feature.</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>Invalid Physical Object Identifier</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td></td>
<td>The drive is not valid for the specified command.</td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>Too Few Drives</td>
<td>Add more disks to the array and retry.</td>
</tr>
<tr>
<td></td>
<td>There are not enough available drives to create the requested storage cell.</td>
<td></td>
</tr>
<tr>
<td>177</td>
<td>Too Few Physical Store Tags</td>
<td>Add more disks to the tag list and retry.</td>
</tr>
<tr>
<td></td>
<td>Supplied tag list contains fewer than the minimum required number of drives.</td>
<td></td>
</tr>
<tr>
<td>178</td>
<td>Unexpected SCS Error</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td></td>
<td>This is an internal error.</td>
<td></td>
</tr>
<tr>
<td>179</td>
<td>Unsupported Capacity</td>
<td>Case 1: Remove the unsupported drive and retry operation.</td>
</tr>
<tr>
<td></td>
<td>Case 1: A physical disk whose capacity is larger than the maximum supported physical disk capacity was detected.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case 2: A shrink operation on an existing virtual disk would shrink the virtual disk beneath the minimum supported virtual disk capacity.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case 3: An expand operation on an existing virtual disk or the creation of a new virtual disk results in a virtual disk larger than the maximum supported virtual disk capacity.</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>Insufficient Memory</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td></td>
<td>This error is no longer supported.</td>
<td></td>
</tr>
<tr>
<td>181</td>
<td>Insufficient Drive Type</td>
<td>Add more drives of the requested type or change the requested drive type.</td>
</tr>
<tr>
<td></td>
<td>There were not enough available drives of the requested type to complete the operation.</td>
<td></td>
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<tr>
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<td>----------------</td>
</tr>
<tr>
<td>182 Mixed Drive Types</td>
<td>The supplied list of drives contained multiple drive types.</td>
<td>Correct the list such that only one type of drive is used.</td>
</tr>
<tr>
<td>183 Already On</td>
<td>An attempt to enable the OCP Locate LED failed because the LED is already enabled.</td>
<td>No corrective action required.</td>
</tr>
<tr>
<td>184 Already Off</td>
<td>An attempt to disable the OCP Locate LED failed because the LED is already disabled.</td>
<td>No corrective action required.</td>
</tr>
<tr>
<td>185 Virtual Disk Info Failed</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>186 No Derived Unit for Virtual Disk</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>187 Invalid on DRM Mixed Configurations</td>
<td>A data replication configuration is using an unsupported mix of firmware versions on the source and destination side.</td>
<td>Upgrade the source and/or destination arrays to bring the mix into compliance.</td>
</tr>
<tr>
<td>188 Invalid Port Specified</td>
<td>The supplied port number is invalid.</td>
<td>Correct the port parameter and retry command.</td>
</tr>
<tr>
<td>189 Unknown Group</td>
<td>Specified data replication group not found.</td>
<td>Check the data replication group parameter and retry.</td>
</tr>
<tr>
<td>190 Target Object Is Inoperative</td>
<td>The empty container being converted to a snapshot or snapclone is inoperative.</td>
<td>Heal the inoperative condition and then retry the attach operation.</td>
</tr>
<tr>
<td>191 Invalid Read16 Operand</td>
<td>A reserved opcode was passed via SCMI command.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>192 Invalid Controller</td>
<td>A SCMI command was passed with an invalid destination controller.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>193 Invalid Read16 Special Page</td>
<td>An invalid page code was requested via SCMI command.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>194 Cannot Set Failsafe</td>
<td>Cannot set Failsafe mode while the group is in asynchronous mode.</td>
<td>Change asynchronous mode and retry operation.</td>
</tr>
<tr>
<td>195 Invalid Logical Disk</td>
<td>Case 1: An attach operation was attempted using a non-empty container. Case 2: A mirror clone operation was attempted using a virtual disk that was not a mirror clone.</td>
<td>Case 1: Retry operation using an empty container. Case 2: Retry operation using a mirror clone.</td>
</tr>
<tr>
<td>196 LDAD Mismatch</td>
<td>An attachment operation attempted to attach an empty container from one disk group to the target virtual disk from a different disk group.</td>
<td>Retry the attach, using an empty container in the same disk group as the target virtual disk.</td>
</tr>
<tr>
<td>197 Empty Container</td>
<td>An operation was attempted on an empty container.</td>
<td>Retry with an non-empty virtual disk.</td>
</tr>
<tr>
<td>198 Unsupported for Active-Active Mode</td>
<td>A non-mirrored caching policy was requested in Active-Active mode.</td>
<td>Select a different caching policy.</td>
</tr>
<tr>
<td>199 Incompatible Redundancy</td>
<td>A snapshot or snapclone was requested with a RAID type greater than the original virtual disk.</td>
<td>Retry operation using a RAID type less than or equal to the RAID type of the original virtual disk.</td>
</tr>
<tr>
<td>200 Unsupported Snap Tree</td>
<td>A snapshot or snapclone was requested with a different RAID type different from the existing snapshots or snapclones.</td>
<td>Retry operation using the same RAID type as the existing snapshots or snapclones.</td>
</tr>
<tr>
<td>Status code value</td>
<td>Meaning</td>
<td>How to correct</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>201 No Path To DR Destination</td>
<td>Attempt to create a data replication group failed because of a loss of communication with the remote site.</td>
<td>Verify/re-establish communication to the remote site.</td>
</tr>
<tr>
<td>202 Nonexistent Group</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>203 Invalid Asynch Log Size</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>204 Reserve Asynch Log Capacity</td>
<td>Failed to reserve additional space for data replication log disk capacity.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>205 Not In Synchronous Mode</td>
<td>Data replication operation attempted while in asynchronous mode.</td>
<td>Change data replication group asynchronous mode and retry operation.</td>
</tr>
<tr>
<td>206 Instant Restore In Progress</td>
<td>An instant restore operation is in progress on this virtual disk (or another related virtual disk).</td>
<td>Retry request later (after instant restore has completed).</td>
</tr>
<tr>
<td>207 Mirror Clone</td>
<td>Cannot perform this operation on a mirror clone device.</td>
<td>No action required.</td>
</tr>
<tr>
<td>208 Mirror Clone Synchronizing</td>
<td>Cannot perform operation while mirror clone is resynchronizing.</td>
<td>No action required.</td>
</tr>
<tr>
<td>209 Has Mirror Clone</td>
<td>Cannot perform operation because device or associated device is a mirror clone.</td>
<td>No action required.</td>
</tr>
<tr>
<td>210 Invalid Remote Node</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>211 Incompatible Instant Restore Node</td>
<td>Cannot perform Instant Restore operation because device or associated device is a mirror clone.</td>
<td>No action required.</td>
</tr>
<tr>
<td>212 The DR Group Is Not Suspended</td>
<td>Cannot perform an Instant Restore operation because data replication group is NOT suspended.</td>
<td>Suspend data replication group and retry operation.</td>
</tr>
<tr>
<td>213 Snap Tree Mismatch</td>
<td>Cannot start an Instant Restore operation because the virtual disks are not in a Business Copy sharing relationship.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>214 Original Logical Disk</td>
<td>Cannot start an Instant Restore operation on the original virtual disk.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>215 LDAD Downgraded</td>
<td>The drive is in the process of regenerating, reverting, or missing.</td>
<td>Retry the request later.</td>
</tr>
<tr>
<td>216 Insufficient Quorums</td>
<td>Not enough quorum disks for redundancy to do drive code load.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>217 Already Complete</td>
<td>The requested operation has already been completed.</td>
<td>No action required.</td>
</tr>
<tr>
<td>218 Maintenance Mode</td>
<td>A drive is in maintenance mode.</td>
<td>Take drive out of maintenance mode and retry command.</td>
</tr>
<tr>
<td>219 Deleting Invalid Snapshots</td>
<td>A drive or associated drive in the tree which is a snapshot is being deleted.</td>
<td>Retry the request later.</td>
</tr>
<tr>
<td>220 Temporary Sync Set</td>
<td>A data replication device is transitioning from async/sync or sync/async.</td>
<td>Retry the request later.</td>
</tr>
<tr>
<td>221 Max Instant Restores</td>
<td>Maximum Instant Restores in progress. Need to wait for one to finish.</td>
<td>Wait for an Instant Restore to finish then retry the request.</td>
</tr>
<tr>
<td>Status code value</td>
<td>Meaning</td>
<td>How to correct</td>
</tr>
<tr>
<td>------------------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>222 Fail Not Locked</td>
<td>Storage Cell Not Locked. The requestor must have a valid command lock before attempting this command.</td>
<td>Retry the operation later. If the error persists, report the error to product support.</td>
</tr>
<tr>
<td>223 Fail Lock Busy</td>
<td>Storage Cell Lock Busy. The requestor does not have the command lock to perform this command.</td>
<td>Retry the operation later. If the error persists, report the error to product support.</td>
</tr>
<tr>
<td>224 “Is Defer Copy” Set</td>
<td>Command not allowed while data replication group is set to DEFER COPY mode.</td>
<td>Take data replication group out of DEFER COPY mode and retry command.</td>
</tr>
<tr>
<td>225 Related Operation Failed</td>
<td>This operation failed because of another operation error occurring on the user supplied command list.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>226 Log Shrink In Progress</td>
<td>A log disk shrink is in progress.</td>
<td>Retry the request later.</td>
</tr>
<tr>
<td>227 Log Deallocation In Progress</td>
<td>A log disk deallocation is in progress.</td>
<td>Retry the request later.</td>
</tr>
<tr>
<td>228 Reserved WWN</td>
<td>A host adapter could not be added.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>229 Incompatible LDAD Type</td>
<td>The disk group is of improper redundancy type.</td>
<td>Change the disk group to the proper redundancy and retry the command.</td>
</tr>
<tr>
<td>230 Cannot Clear Multiple Inoperatives</td>
<td>The system needs to resynchronize in order to clear multiple inoperable conditions.</td>
<td>Perform a resynchronization or restart of the controllers.</td>
</tr>
<tr>
<td>231 DR Group Async Operation</td>
<td>The data replication group is performing an add, remove, or shrink operation.</td>
<td>Wait until the operation is done then retry.</td>
</tr>
<tr>
<td>232 Remove Log Full</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>233 DR Groups Exist</td>
<td>The operation cannot proceed because an active data replication group exists.</td>
<td>Delete the data replication group and retry.</td>
</tr>
<tr>
<td>234 Cannot Resolve a Raid6 Inoperative</td>
<td>This error is no longer supported.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>235 Invalid DR Destination Redundancy Type</td>
<td>Data replication destination does not support the source requested RAID type.</td>
<td>Ensure both sides of the data replication system are the same firmware and retry.</td>
</tr>
<tr>
<td>236 Unsupported Large Virtual Disk</td>
<td>This operation is not supported on large virtual disks.</td>
<td>The virtual disk must be smaller than 2 TB to proceed.</td>
</tr>
<tr>
<td>237 Unsupported Thin Provisioning</td>
<td>This operation is not supported on thin provision virtual disks.</td>
<td>The operation is not supported on this firmware.</td>
</tr>
<tr>
<td>238 SCSI Sensebyte Check Condition</td>
<td>The operation caused a check condition.</td>
<td>Ensure the EVA is in a good state and retry.</td>
</tr>
<tr>
<td>239 Virtual Disk Thin Provision Overcommit</td>
<td>The EVA ran out of space and a thin provision virtual disk needs to expand.</td>
<td>Add more disks and retry.</td>
</tr>
<tr>
<td>240 Same Disk Group and Redundancy</td>
<td>The virtual disks have the same disk group and raid redundancy.</td>
<td>Review the supported process of online LUN migration and retry.</td>
</tr>
<tr>
<td>241 Unstable Device Configuration</td>
<td>Some disk drives are in exception processing or the back-end is unstable.</td>
<td>Ensure the EVA is in a good state and retry.</td>
</tr>
<tr>
<td>Status code value</td>
<td>Meaning</td>
<td>How to correct</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>242 Event Not Found</td>
<td>The event was not found.</td>
<td>Report the error to product support.</td>
</tr>
<tr>
<td>243 Unsupported Drive</td>
<td>There were not enough drives to complete the operation and some unsupported drives were detected.</td>
<td>Replace the unsupported drives with supported drives and retry.</td>
</tr>
</tbody>
</table>
9 Support and other resources

Contacting HP

HP technical support

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

Subscription service

HP recommends that you register your product at the Subscriber’s Choice for Business website:

http://www.hp.com/go/e-updates

After registering, you will receive e-mail notification of product enhancements, new driver versions, firmware updates, and other product resources.

Documentation feedback

HP welcomes your feedback.

To make comments and suggestions about product documentation, please send a message to storedocsfeedback@hp.com. All submissions become the property of HP.

Related documentation

Documents

For documents referenced in this guide, see the Manuals page on the Business Support Center website:

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

In the Storage section, click Disk Storage Systems and then select HP P6300/P6500 Enterprise Virtual Array Systems under P6000/EVA Disk Arrays.

Websites

• HP:
  http://www.hp.com
• HP Storage:
  http://www.hp.com/go/storage
• HP Partner Locator:
  http://www.hp.com/service_locator
HP Software Downloads:  
http://www.hp.com/support/manuals

HP Software Depot:  
http://www.software.hp.com

HP Single Point of Connectivity Knowledge (SPOCK):  
http://www.hp.com/storage/spock

HP SAN manuals:  
http://www.hp.com/go/sdgmanuals

Typographic conventions

<table>
<thead>
<tr>
<th>Table 28 Document conventions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Convention</strong></td>
</tr>
<tr>
<td>Blue text: Table 28 (page 198)</td>
</tr>
<tr>
<td>Blue, underlined text: <a href="http://www.hp.com">http://www.hp.com</a></td>
</tr>
</tbody>
</table>
| **Bold** text | • Keys that are pressed  
| &nbsp;&n...
parts do not qualify for CSR. Your HP-authorized service provider will determine whether a repair can be accomplished by CSR.
For more information about CSR, contact your local service provider, or see the CSR website: http://www.hp.com/go/selfrepair

**Rack stability**

Rack stability protects personnel and equipment.

⚠️ **WARNING!** To reduce the risk of personal injury or damage to equipment:

- Extend leveling jacks to the floor.
- Ensure that the full weight of the rack rests on the leveling jacks.
- Install stabilizing feet on the rack.
- In multiple-rack installations, fasten racks together securely.
- Extend only one rack component at a time. Racks can become unstable if more than one component is extended.
A Regulatory compliance notices

Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, this product has been assigned a unique regulatory model number. The regulatory model number can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this regulatory model number. The regulatory model number is not the marketing name or model number of the product.

Product specific information:
HP ________________
Regulatory model number: _____________
FCC and CISPR classification: _____________

These products contain laser components. See Class 1 laser statement in the “Laser compliance notices” (page 204) section.

Federal Communications Commission notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

FCC rating label

The FCC rating label on the device shows the classification (A or B) of the equipment. Class B devices have an FCC logo or ID on the label. Class A devices do not have an FCC logo or ID on the label. After you determine the class of the device, refer to the corresponding statement.

Class A equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Class B equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment
off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit that is different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

Declaration of Conformity for products marked with the FCC logo, United States only

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding this FCC declaration, contact us by mail or telephone:

- Hewlett-Packard Company P.O. Box 692000, Mail Stop 510101 Houston, Texas 77269-2000
- Or call 1-281-514-3333

Modification

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user’s authority to operate the equipment.

Cables

When provided, connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Canadian notice (Avis Canadien)

Class A equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la class A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Class B equipment

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la class B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union notice

This product complies with the following EU directives:

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.
This compliance is indicated by the following conformity marking placed on the product:

![CE](image)

This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g., Bluetooth).

Certificates can be obtained from [http://www.hp.com/go/certificates](http://www.hp.com/go/certificates).
Hewlett-Packard GmbH, HQ-TRE, Herrenberger Strasse 140, 71034 Boeblingen, Germany

**Japanese notices**

**Japanese VCCI-A notice**

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

**Japanese VCCI-B notice**

この装置は、クラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。

取扱説明書に従って正しい取り扱いをして下さい。 VCCI-B

**Japanese VCCI marking**

![VCCI](image)

**Japanese power cord statement**

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

Please use the attached power cord.
The attached power cord is not allowed to use with other product.

**Korean notices**

**Class A equipment**

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.
Class B equipment

Class B equipment

Taiwanese notices

BSMI Class A notice

警告使用者:

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Taiwan battery recycle statement

Turkish recycling notice

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

Vietnamese Information Technology and Communications compliance marking

HP

ICT
Laser compliance notices

English laser notice

This device may contain a laser that is classified as a Class 1 Laser Product in accordance with U.S. FDA regulations and the IEC 60825-1. The product does not emit hazardous laser radiation.

⚠️ **WARNING!** Use of controls or adjustments or performance of procedures other than those specified herein or in the laser product’s installation guide may result in hazardous radiation exposure. To reduce the risk of exposure to hazardous radiation:

- Do not try to open the module enclosure. There are no user-serviceable components inside.
- Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
- Allow only HP Authorized Service technicians to repair the unit.

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States.

Dutch laser notice

⚠️ **WAARSCHUWING:** dit apparaat bevat mogelijk een laser die is geclassificeerd als een laserproduct van Klasse 1, eveneens konform de bepalingen van de Amerikaanse FDA en de richtlijn IEC 60825-1. Dit product geeft geen gevaarlijke lasertaling af.

Als u bedieningselementen gebruikt, instellingen, omstandigheden of procedures uitvoert op een andere manier dan in deze publicatie of in de installatiehandleiding van het laserproduct wordt aangegeven, loopt u het risico te worden blootgesteld aan gevaarlijke straling.

Het risico van blootstelling aan gevaarlijke straling beperkt u als volgt:

- Probeer de behuizing van de module niet te openen. U mag zelf geen onderdelen repareren.
- Gebruik voor de laserapparatuur geen andere knoppen of instellingen en volg geen andere omstandigheden of procedures uit dan die in deze handleiding worden beschreven.
- Alleen door HP geautoriseerde technici mogen het apparaat repareren.

French laser notice

⚠️ **AVERTISSEMENT** : cet appareil peut être équipé d’un laser classé en tant que Produit laser de classe 1 et conforme à la réglementation de la FDA américaine et à la norme 60825-1 de l’IEC. Ce produit n’émet pas de rayonnement dangereux.

L’utilisation de commandes, de réglages ou de procédures autres que ceux qui sont indiqués ici ou dans le manuel d’installation du produit laser peut exposer l’utilisateur à des rayonnements dangereux. Pour réduire le risque d’exposition à des rayonnements dangereux :

- Ne tentez pas d’ouvrir le boîtier renfermant l’appareil laser. Il ne contient aucune pièce dont la maintenance puisse être effectuée par l’utilisateur.
- Tout contrôle, réglage ou procédure autre que ceux décrits dans ce chapitre ne doivent pas être effectués par l’utilisateur.
- Seuls les Mainteneurs Agrées HP sont habilités à réparer l’appareil laser.
German laser notice


Die Anleitungen in diesem Dokument müssen befolgt werden. Bei Einstellungen oder Durchführung sonstiger Verfahren, die über die Anleitungen in diesem Dokument bzw. im Installationshandbuch des Lasergeräts hinausgehen, kann es zum Austritt gefährlicher Strahlung kommen. Zur Vermeidung der Freisetzung gefährlicher Strahlungen sind die folgenden Punkte zu beachten:

- Versuchen Sie nicht, die Abdeckung des Lasermoduls zu öffnen. Im Inneren befinden sich keine Komponenten, die vom Benutzer gewartet werden können.
- Benutzen Sie das Lasergerät ausschließlich gemäß den Anleitungen und Hinweisen in diesem Dokument.
- Lassen Sie das Gerät nur von einem HP Servicepartner reparieren.

Italian laser notice

**AVVERTENZA**: AVVERTENZA Questo dispositivo può contenere un laser classificato come prodotto laser di Classe 1 in conformità alle normative US FDA e IEC 60825-1. Questo prodotto non emette radiazioni laser pericolose.

L’eventuale esecuzione di comandi, regolazioni o procedure diverse o quanto specificato nella presente documentazione e nella guida di installazione del prodotto può causare l’esposizione a radiazioni nocive. Per ridurre i rischi di esposizione a radiazioni pericolose, attenersi alle seguenti precauzioni:

- Non cercare di aprire il contenitore del modulo. All’interno non vi sono componenti soggetti a manutenzione da parte dell’utente.
- Non eseguire operazioni di controllo, regolazione o di altro genere su un dispositivo laser ad eccezione di quelle specificate da queste istruzioni.
- Affidare gli interventi di riparazione dell’unità esclusivamente ai tecnici dell’Assistenza autorizzata HP.

Japanese laser notice

警告: 本製品には、US FDA規則およびIEC 60825-1に基づくClass 1レーザー製品が含まれている場合があります。本製品は人体に危険なレーザー光を発しません。

本書およびレーザー製品のインストール・ガイドに示されている以外の方法で制御、調整、使用した場合、人体に危険な光線にさらされる場合があります。人体に危険な光線にさらされないため、以下の項目を守ってください。

- モジュール エンクロージャを開けないでください。ユーザーが取り扱えるコンポーネントは含まれていません。
- 本書に示されている以外の方法で、レーザー デバイスを制御、調整、使用しないでください。
- HPの正規サービス技術者のみが本ユニットの修理を許可されています。
Disposal of waste equipment by users in private household in the European Union

This symbol means do not dispose of your product with your other household waste. Instead, you should protect human health and the environment by handing over your waste equipment to a designated collection point for the recycling of waste electrical and electronic equipment. For more information, please contact your household waste disposal service.

Изхвърляне на отпадъчно оборудване от потребители в частни домакинства в Европейския съюз

Този символ върху продукта или опаковката му показва, че продуктът не трябва да се изхвърля заедно с другите битови отпадъци. Вместо това, трябва да предадете човешкото здраве и околната среда, като предадете отпадъчното оборудване в предназначен за събирането му пункт за рециклиране на неизползвано електрическо и електронно оборудване. За допълнителна информация се свържете с фирмата по чистота, чиито услуги използвате.

Likvidace zařízení v domácnostech v Evropské unii

Tento symbol znamená, že nesmíte tento produkt likvidovat spolu s jiným domovním odpadem. Místo toho byste měli chránit lidské zdraví a životní prostředí, kde se zabývají recyklaci elektrického a elektronického vybavení. Kontaktujte společnost zabývající společnost zabývající se sběrem a svozem domovního odpadu pro více informací.

Bortskaffelse af brugt udstyr hos brugere i private hjem i EU

Dette symbol betyder, at produktet ikke må bortskaffes sammen med andet husholdningsaffald. Du skal i stedet den menneskelige sundhed og miljøet ved at altid vare dit brugte udstyr på et dertil beregnet insamlingssted for af brugt, elektrisk og elektronisk udstyr. Kontakt nærmeste renovationsafdeling for yderligere oplysninger.
**Dutch recycling notice**

**Inzameling van afgedankte apparatuur van particuliere huishoudens in de Europese Unie**

Dit symbool betekent dat het product niet mag worden gedeporteerd bij het overige huishoudelijke afval. Bescherm de gezondheid en het milieu door afgedankte apparatuur in te leveren bij een hiervoor bestemd inzamelpunt voor recycling van afgedankte elektrische en elektronische apparatuur. Neem voor meer informatie contact op met uw gemeentereinigingsdienst.

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**Estonian recycling notice**

**Äravisatavate seadmete likvideerimine Euroopa Liidu eramajapidamistes**


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**Finnish recycling notice**

**Kotitalousjätteiden hävittäminen Euroopan unionin alueella**

Tämä symboli merkitsee, että laitetta ei saa hävittää muiden kotitalousjätteiden mukana. Sen sijaan sinun on suojattava ihmisten terveyttä ja ympäristöä toimittamalla käytöstä poistettu laite sähkö- tai elektroniikkajätteen kierrätyspisteeseen. Lisätietoja saat jätehuoltoyhtiöltä.

---

**French recycling notice**

**Mise au rebut d’équipement par les utilisateurs privés dans l’Union Européenne**

Ce symbole indique que vous ne devez pas jeter votre produit avec les ordures ménagères. Il est de votre responsabilité de protéger la santé et l’environnement et de vous débarrasser de votre équipement en le remettant à une déchetterie effectuant le recyclage des équipements électriques et électroniques. Pour de plus amples informations, prenez contact avec votre service d’élimination des ordures ménagères.

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**German recycling notice**

**Entsorgung von Altgeräten von Benutzern in privaten Haushalten in der EU**


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**Greek recycling notice**

**Απόρριψη άχρηστου εξοπλισμού από ιδιώτες χρήστες στην Ευρωπαϊκή Ένωση**

Αυτό το σύμβολο σημαίνει ότι δεν πρέπει να απορρίπτετε το προϊόν με τα λοιπά οικιακά απορρίμματα. Αντίθετα, πρέπει να προστατέψετε την ανθρώπινη υγεία και το περιβάλλον παραδίδοντας τον άχρηστο εξοπλισμό σας σε ξεχωριστό σημείο συλλογής για τις ανακύκλωση άχρηστου ηλεκτρικού και ηλεκτρονικού εξοπλισμού. Για περισσότερες πληροφορίες, επικοινωνήστε με την υπηρεσία απόρριψης απορριμμάτων της περιοχής σας.
Hungarian recycling notice

A hulladék anyagok megsemmisítése az Európai Unió háztartásaiban

Ez a szimbólum azt jelzi, hogy a készüléket nem szabad a háztartási hulladékkal együtt kidobni. Ehelyett a leselejtezett berendezéseknek az elektromos vagy elektronikus hulladék átvételére kijelölt helyen történő beszolgáltatásával megóvja az emberi egészséget és a környezetet. További információt a helyi köztisztasági vállalattól kaphat.

Italian recycling notice

Smaltimento di apparecchiature usate da parte di utenti privati nell’Unione Europea

Questo simbolo avvisa di non smaltire il prodotto con i normali rifiuti domestici. Rispettare la salute umana e l’ambiente conferendo l’apparecchiatura dismessa a un centro di raccolta designato per il riciclo di apparecchiature elettroniche ed elettriche. Per ulteriori informazioni, rivolgersi al servizio per lo smaltimento dei rifiuti domestici.

Latvian recycling notice

Europos Sąjungos namų ūkio vartotojų įrangos atliekų šalinimas

Šis simbolis nurodo, kad gaminio negalima išmesti kartu su kitomis buitinėmis atliekomis. Kad apsaugotumėte žmonių sveikatą ir aplinką, pasenusią nenaudojamą įranga turite nuvežti į elektrinių ir elektroninių atliekų surinkimo punktą. Daugiau informacijos teiraukitės buitinės atliekų surinkimo tarnybos.

Lithuanian recycling notice

Nolietotu iekārtu iznīcināšanas noteikumi lietotājiem Eiropas Savienības privātajās mājsaimniecībās

Šis simbols norāda, ka ierīci nedrīkst utilizēt kopā ar citiem mājsaimniecības atkritumiem. Jums jārūpējas par cilvēku veselību un vides aizsardzību, nododot lietoto aprikojumu atbrīvojai pārstrādei iepādā lietotu elektrisko un elektronisko ierīci savākšanas punktā. Lai iegūtu plašāku informāciju, lūdzu, sazinieties ar savu mājsaimniecības atkritumu likvidēšanas dienestu.

Polish recycling notice

Utylizacja zużytego sprzętu przez użytkowników w prywatnych gospodarstwach domowych w krajach Unii Europejskiej

Ten symbol oznacza, że nie wolno wyrzucać produktu wraz z innymi domowymi odpadkami. Obowiązkiem użytkownika jest ochrona zdrowia ludzkiego i środowiska przez przekazanie zużytego sprzętu do wyznaczonego punktu zajmującego się recyklingiem odpadów powstałych ze sprzętu elektrycznego i elektronicznego. Więcej informacji można uzyskać od lokalnej firmy zajmującej wywozem nieczystości.
Portuguese recycling notice

Descarte de equipamentos usados por utilizadores domésticos na União Europeia

Este símbolo indica que não deve descartar o seu produto juntamente com os outros lixos domiciliares. Ao invés disso, deve proteger a saúde humana e o meio ambiente levando o seu equipamento para descarte em um ponto de recolha destinado à reciclagem de resíduos de equipamentos eléctricos e electrónicos. Para obter mais informações, contacte o seu serviço de tratamento de resíduos domésticos.

Romanian recycling notice

Casarea echipamentului uzat de către utilizatorii casnici din Uniunea Europeană

Acest simbol înseamnă să nu se arunce produsul cu alte deşeuri menajere. În schimb, trebuie să protejaţi sănătatea umană şi mediul predând echipamentul uzat la un punct de colectare desemnat pentru reciclarea echipamentelor electrice şi electronice uzate. Pentru informaţii suplimentare, vă rugăm să contactaţi serviciul de eliminare a deşeurilor menajere local.

Slovak recycling notice

Likvidácia vyradených zariadení používateľmi v domácnostiach v Európskej únii

Tento symbol znamená, že tento produkt sa nemá likvidovať s ostatným domovým odpadom. Namiesto toho by ste mali chrániť ľudské zdravie a životné prostredie odovzdaním odpadového zariadenia na zbernom mieste, ktoré je určené na recykláciu odpadových elektrických a elektronických zariadení. Ďalšie informácie získate od spoločnosti zaoberajúcej sa likvidáciou domového odpadu.

Spanish recycling notice

Eliminación de los equipos que ya no se utilizan en entornos domésticos de la Unión Europea

Este símbolo indica que este producto no debe eliminarse con los residuos domésticos. En lugar de ello, debe evitar causar daños a la salud de las personas y al medio ambiente llevando los equipos que no utilice a un punto de recogida designado para el reciclaje de equipos eléctricos y electrónicos que ya no se utilizan. Para obtener más información, póngase en contacto con el servicio de recogida de residuos domésticos.

Swedish recycling notice

Hantering av elektroniskt avfall för hemanvändare inom EU

Battery replacement notices

Dutch battery notice

Verklaring betreffende de batterij

⚠️ WAARSCHUWING: dit apparaat bevat mogelijk een batterij.

- Probeer de batterijen na het verwijderen niet op te laden.
- Stel de batterijen niet bloot aan water of temperaturen boven 60° C.
- De batterijen mogen niet worden beschadigd, gedeondeerd, geplet of doorboord.
- Zorg dat u geen kortsluiting veroorzaakt tussen de externe contactpunten en laat de batterijen niet in aanraking komen met water of vuur.
- Gebruik ter vervanging alleen door HP goedgekeurde batterijen.

Batterijen, accu’s en accumulators mogen niet worden gedeponeerd bij het normale huishoudelijke afval. Als u de batterijen/accu’s wilt inleveren voor hergebruik of op de juiste manier wilt vernietigen, kunt u gebruik maken van het openbare inzamelingsysteem voor klein chemisch afval of ze retourstore naar HP of een geautoriseerde HP Business of Service Partner.

Neem contact op met een geautoriseerde leverancier of een Business of Service Partner voor meer informatie over het vervangen of op de juiste manier vernietigen van accu’s.

French battery notice

Avis relatif aux piles

⚠️ AVERTISSEMENT : cet appareil peut contenir des piles.

- N’essayez pas de recharger les piles après les avoir retirées.
- Évitez de les mettre en contact avec de l’eau ou de les soumettre à des températures supérieures à 60°C.
- N’essayez pas de démonter, d’écaser ou de percer les piles.
- N’essayez pas de court-circuiter les bornes de la pile ou de jeter cette dernière dans le feu ou l’eau.
- Remplacez les piles exclusivement par des pièces de rechange HP prévues pour ce produit.

Les piles, modules de batteries et accumulatoires ne doivent pas être jetés avec les déchets ménagers. Pour permettre leur recyclage ou leur élimination, veuillez utiliser les systèmes de collecte publique ou renvoyez-les à HP, à votre Partenaire Agréé HP ou aux agents agréés.

Contactez un Revendeur Agréé ou Mainteneur Agréé pour savoir comment remplacer et jeter vos piles.
Hinweise zu Batterien und Akkus

⚠️ VORSICHT: Dieses Produkt enthält unter Umständen eine Batterie oder einen Akku.

- Versuchen Sie nicht, Batterien und Akkus außerhalb des Gerätes wieder aufzuladen.
- Schützen Sie Batterien und Akkus vor Feuchtigkeit und Temperaturen über 60°.
- Verwenden Sie Batterien und Akkus nicht missbräuchlich, nehmen Sie sie nicht auseinander und vermeiden Sie mechanische Beschädigungen jeglicher Art.
- Vermeiden Sie Kurzschlüsse, und setzen Sie Batterien und Akkus weder Wasser noch Feuer aus.
- Ersetzen Sie Batterien und Akkus nur durch die von HP vorgesehenen Ersatzteile.

Batterien und Akkus dürfen nicht über den normalen Hausmüll entsorgt werden. Um sie der Wiederverwertung oder dem Sondermüll zuzuführen, nutzen Sie die öffentlichen Sammelstellen, oder setzen Sie sich bezüglich der Entsorgung mit einem HP Partner in Verbindung.

Weitere Informationen zum Austausch von Batterien und Akkus oder zur sachgemäßen Entsorgung erhalten Sie bei Ihrem HP Partner oder Servicepartner.

Italian battery notice

Istruzioni per la batteria

⚠️ AVVERTENZA: Questo dispositivo può contenere una batteria.

- Non tentare di ricaricare le batterie se rimosse.
- Evitare che le batterie entrino in contatto con l’acqua o siano esposte a temperature superiori a 60° C.
- Non smontare, schiacciare, forare o utilizzare in modo improprio la batteria.
- Non accendere i contatti esterni o gettare in acqua o sul fuoco la batteria.
- Sostituire la batteria solo con i ricambi HP provvisti a questo scopo.

Le batterie e gli accumulatori non devono essere smaltiti insieme ai rifiuti domestici. Per procedere al riciclaggio o al corretto smaltimento, utilizzare il sistema di raccolta pubblico dei rifiuti o restituirli a HP, ai Partner Ufficiali HP o ai relativi rappresentanti.

Per ulteriori informazioni sulla sostituzione e sullo smaltimento delle batterie, contattare un Partner Ufficiale o un Centro di assistenza autorizzato.
Japanese battery notice

バッテリに関する注意

警告: 本製品はバッテリを内蔵している場合があります。

- バッテリを取り外している場合は、充電しないでください。
- バッテリを水にさらしたり、60°C (140°F) 以上の温度にさらさないでください。
- バッテリを誤用、分解、破壊したり、穴をあけたりしないでください。
- 外部極を短絡させたり、火や水に投棄しないでください。
- バッテリを交換する際は、HP指定の製品と交換してください。

バッテリ、バッテリ パック、蓄電池は一般の家庭廃棄物と一緒に廃棄しないでください。
リサイクルまたは適切に廃棄するため、公共の収集システム、HP、HPパートナー、または
HPパートナーの代理店にお送りください。

バッテリ交換および適切な廃棄方法についての情報は、HPのサポート窓口にお問い合わせください。

Spanish battery notice

Declaración sobre las baterías

Advertencia: Este dispositivo podría contener una batería.

- No intente recargar las baterías si las extrae.
- Evite el contacto de las baterías con agua y no las exponga a temperaturas superiores
  a los 60 °C (140 °F).
- No utilice incorrectamente, ni desmonte, aplaste o pinche las baterías.
- No cortocircuite los contactos externos ni la arroje al fuego o al agua.
- Sustituya las baterías sólo por el repuesto designado por HP.

Las baterías, los paquetes de baterías y los acumuladores no se deben eliminar junto con
los desperdicios generales de la casa. Con el fin de tirarlos al contenedor de
reciclaje adecuado, utilice los sistemas públicos de recogida o devuélvalas a HP,
un distribuidor autorizado de HP o sus agentes.

Para obtener más información sobre la sustitución de la batería o su eliminación
correcta, consulte con su distribuidor o servicio técnico autorizado.
B Non-standard rack specifications

The appendix provides information on the requirements when installing the P63x0/P65x0 EVA in a non-standard rack. All the requirements must be met to ensure proper operation of the storage system.

Internal component envelope

EVA component mounting brackets require space to be mounted behind the vertical mounting rails. Room for the mounting of the brackets includes the width of the mounting rails and needed room for any mounting hardware, such as screws, clip nuts, etc. Figure 92 (page 213) shows the dimensions required for the mounting space for the EVA product line. It does not show required space for additional HP components such as servers.

Figure 92 Mounting space dimensions

EIA310-D standards

The rack must meet the Electronic Industries Association, (EIA), Standard 310-D, Cabinets, Racks and Associated Equipment. The standard defines rack mount spacing and component dimensions specified in U units.

Copies of the standard are available for purchase at http://www.eia.org/.

EVA cabinet measures and tolerances

EVA component rack mount brackets are designed to fit cabinets with mounting rails set at depths from 27.5 inches to 29.6 inches, inside rails to inside rails.
Weights, dimensions and component CG measurements

Cabinet CG dimensions are reported as measured from the inside bottom of the cabinet (Z), the leading edge of the vertical mounting rails (Y), and the centerline of the cabinet mounting space (X). Component CG measurements are measured from the bottom of the U space the component is to occupy (Z), the mounting surface of the mounting flanges (Y), and the centerline of the component (X).

Determining the CG of a configuration may be necessary for safety considerations. CG considerations for CG calculations do not include cables, PDU’s and other peripheral components. Some consideration should be made to allow for some margin of safety when estimating configuration CG.

Estimating the configuration CG requires measuring the CG of the cabinet the product will be installed in. Use the following formula:

\[ \sum_{\text{component}} d_{\text{component}} \times W = d_{\text{system cg}} \times W \]

where \( d_{\text{component}} \) = the distance of interest and \( W = \) Weight

The distance of a component is its CG’s distance from the inside base of the cabinet. For example, if a loaded disk enclosure is to be installed into the cabinet with its bottom at 10U, the distance for the enclosure would be (10*1.75)+2.7 inches.

Airflow and Recirculation

Component Airflow Requirements

Component airflow must be directed from the front of the cabinet to the rear. Components vented to discharge airflow from the sides must discharge to the rear of the cabinet.

Rack Airflow Requirements

The following requirements must be met to ensure adequate airflow and to prevent damage to the equipment:

- If the rack includes closing front and rear doors, allow 830 square inches (5,350 sq cm) of hole evenly distributed from top to bottom to permit adequate airflow (equivalent to the required 64 percent open area for ventilation).
- For side vented components, the clearance between the installed rack component and the side panels of the rack must be a minimum of 2.75 inches (7 cm).
- Always use blanking panels to fill all empty front panel U-spaces in the rack. This ensures proper airflow. Using a rack without blanking panels results in improper cooling that can lead to thermal damage.

Configuration Standards

EVA configurations are designed considering cable length, configuration CG, serviceability and accessibility, and to allow for easy expansion of the system. If at all possible, it is best to configure non HP cabinets in a like manner.

UPS Selection

This section provides information that can be used when selecting a UPS for use with the EVA. The four HP UPS products listed in Table 29 (page 215) are available for use with the EVA and are included in this comparison. Table 30 (page 215) identifies the amount of time each UPS can sustain power under varying loads and with various UPS ERM (Extended Runtime Module) options.

NOTE: The specified power requirements reflect fully loaded enclosures (14 disks).
### Table 29 HP UPS models and capacities

<table>
<thead>
<tr>
<th>UPS Model</th>
<th>Capacity (in watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1500</td>
<td>1340</td>
</tr>
<tr>
<td>R3000</td>
<td>2700</td>
</tr>
<tr>
<td>R5500</td>
<td>4500</td>
</tr>
<tr>
<td>R12000</td>
<td>12000</td>
</tr>
</tbody>
</table>

### Table 30 UPS operating time limits

<table>
<thead>
<tr>
<th>Load (percent)</th>
<th>Minutes of operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With standby battery</td>
</tr>
<tr>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>80</td>
<td>6</td>
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<tr>
<td>50</td>
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<tr>
<td>50</td>
<td>14</td>
</tr>
<tr>
<td>20</td>
<td>43</td>
</tr>
</tbody>
</table>

### Shock and vibration specifications

Table 31 (page 216) lists the product operating shock and vibration specifications. This information applies to products weighing 45 Kg (100 lbs) or less.

**NOTE:** HP EVA products are designed and tested to withstand the operational shock and vibration limits specified in Table 31 (page 216). Transmission of site vibrations through non-HP racks exceeding these limits could cause operational failures of the system components.
<table>
<thead>
<tr>
<th><strong>Table 31 Operating Shock/Vibration</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock test with half sine pulses of 10 G magnitude and 10 ms duration applied in all three axes (both positive and negative directions).</td>
</tr>
<tr>
<td>Sine sweep vibration from 5 Hz to 500 Hz to 5 Hz at 0.1 G peak, with 0.020” displacement limitation below 10 Hz. Sweep rate of 1 octave/minute. Test performed in all three axes.</td>
</tr>
<tr>
<td>Random vibration at 0.25 G rms level with uniform spectrum in the frequency range of 10 to 500 Hz. Test performed for two minutes each in all three axes.</td>
</tr>
<tr>
<td>Drives and other items exercised and monitored running appropriate exerciser (UIOX, P-Suite, etc.) with appropriate operating system and hardware.</td>
</tr>
</tbody>
</table>
C Command reference

This chapter lists and describes the P6000 iSCSI and iSCSI/FCoE module's CLI commands in alphabetical order. Each command description includes its syntax, keywords, notes, and examples.

Command syntax

The HP P6000 iSCSI or iSCSI/FCoE module's CLI command syntax uses the following format:

Command  keyword
  keyword [value]
  keyword [value1] [value2]

The command is followed by one or more keywords. Consider the following rules and conventions:

- Commands and keywords are case insensitive.
- Required keyword values appear in standard font within brackets; for example, [value].
- Optional keyword values appear in italics within brackets; for example, [value].
- In command prompts, <1> or <2> indicates which module, 01 or 02, is being managed.

Command line completion

The command line completion feature makes entering and repeating commands easier. Table 32 (page 217) describes the command line completion keystrokes.

Table 32 Command line completion keystrokes

<table>
<thead>
<tr>
<th>Keystroke</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAB</td>
<td>Completes the command line. Enter at least one character and press the TAB key to complete the command line. If more than one possibility exists, press the TAB key again to display all possibilities.</td>
</tr>
<tr>
<td>UP ARROW</td>
<td>Scrolls backward through the list of previously entered commands.</td>
</tr>
<tr>
<td>DOWN ARROW</td>
<td>Scrolls forward through the list of previously entered commands.</td>
</tr>
<tr>
<td>CTRL+A</td>
<td>Moves the cursor to the beginning of the command line.</td>
</tr>
<tr>
<td>CTRL+B</td>
<td>Moves the cursor to the end of the command line.</td>
</tr>
</tbody>
</table>

Authority requirements

The various set commands perform tasks that may require you to be in an administrator session. Note that:

- Commands related to monitoring tasks are available to all account names.
- Commands related to configuration tasks are available only within an Admin session. An account must have admin authority to enter the admin start command, which opens an admin session (see admin command).

Commands

This section lists and describes the HP P6000 iSCSI and iSCSI/FCoE module's CLI commands in alphabetical order. Each command description includes its syntax, keywords, notes, and examples.
Admin

Opens and closes an administrator (admin) session. Any command that changes the iSCSI or iSCSI/FCoE module’s configuration must be entered in an Admin session. An inactive Admin session times out after 15 minutes.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>start (or begin)</td>
</tr>
<tr>
<td></td>
<td>end (or stop)</td>
</tr>
<tr>
<td></td>
<td>cancel</td>
</tr>
</tbody>
</table>

**Keywords**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>start (or begin)</td>
<td>Opens the Admin session.</td>
<td></td>
</tr>
<tr>
<td>end (or stop)</td>
<td>Closes the Admin session. The logout, shutdown, and reset commands also end an Admin session.</td>
<td></td>
</tr>
<tr>
<td>cancel</td>
<td>Terminates an Admin session opened by another user. Use this keyword with care because it terminates the Admin session without warning the other user and without saving pending changes.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Closing a Telnet window during an Admin session does not release the session. When using Telnet, you must either wait for the Admin session to time out, or use the admin cancel command.

**Example:** The following example shows how to open and close an Admin session:

```
MEZ50 <1>#> admin start
Password : config
MEZ50 <1> (admin) #>
.
.
.
MEZ50 <1> (admin) #> admin end
MEZ50 <1> #>
```

Beacon

Enables or disables the flashing of the blue UID beacon LED.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>beacon on</td>
</tr>
<tr>
<td></td>
<td>beacon off</td>
</tr>
<tr>
<td>Keywords</td>
<td>on</td>
</tr>
<tr>
<td></td>
<td>Turns on the flashing of the controller blue UID beacon.</td>
</tr>
<tr>
<td></td>
<td>off</td>
</tr>
<tr>
<td></td>
<td>Turns off the flashing of the controller blue UID beacon.</td>
</tr>
</tbody>
</table>

**Example:** The following example turns the controller blue UID beacon on and then off.

```
MEZ50 <1>#> beacon on
MEZ50 <1#> beacon off
```

Clear

Removes all entries (events) from the iSCSI or iSCSI/FCoE module’s log file or resets the FC and iSCSI statistic counters.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>clear</td>
</tr>
<tr>
<td></td>
<td>stats</td>
</tr>
</tbody>
</table>
Clears all entries from the module's log file.

**Examples:** The following examples show the clear commands:

MEZ50 <1>(admin) #> clear logs
MEZ50 <1>(admin) #> clear stats

**Date**

Displays or sets the date and time. To set the date and time, you must enter the information in the format `MMDDhhmmCCYY` (numeric representation of month-date-hour-minute-century-year). The new date and time takes effect immediately. Each module has its own independent date set. Properly setting the date ensures that event log entries are dated correctly. The date must be set prior to applying any feature keys or licenses.

**Authority**

Admin session required to set the date and time. No authority is required to display the current date and time.

**Syntax**

date [MMDDhhmmCCYY]

**Keywords**

[MMDDhhmmCCYY] Specifies the date, which requires an Admin session. If you omit [MMDDhhmmCCYY], the command displays the current date, which does not require an Admin session.

**NOTE:** Always set the time using Greenwich Mean Time (GMT) and Universal Transverse Mercator (UTM). You must disable the network time protocol (NTP) to set the time with the date command.

**Examples:** The following examples show the setting and then the display of the date:

MEZ50_02 (admin) #> date

Tue May 24 18:33:41 UTC 2011

MEZ50_02 (admin) #> date ?
Please enter time in Universal (UTC) timezone.
Note that Universal (UTC) time may not be the same as your local time.
Usage: date [MMDDhhmmCCYY]

MEZ50_02 (admin) #> date 052513272011

Wed May 25 13:27:00 UTC 2011

Exit

Exits the command line interface and returns you to the login prompt (same as the `quit` command).

**Authority**

None

**Syntax**

exit

**Example 1:** The `exit` command logs the session out. The following example shows the exit command:

MEZ50 #=>exit
Connection to host lost.
Saves and restores the module’s configuration.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session to restore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>FRU restore save</td>
</tr>
<tr>
<td>Keywords</td>
<td>restore</td>
</tr>
<tr>
<td></td>
<td>The fru restore command requires that you first FTP the tar file containing the configuration to the module. When you issue this command, the system prompts you to enter the restore level. You can fully restore the module’s configuration (all configuration parameters and LUN mappings) or restore only the LUN mappings. The restored configuration does not take effect until the module is rebooted.</td>
</tr>
<tr>
<td></td>
<td>save</td>
</tr>
<tr>
<td></td>
<td>Creates a tar file containing the module’s persistent data, configuration, and LUN mappings. The file is stored in the module’s /var/ftp directory. You must then FTP the tar file from the module.</td>
</tr>
</tbody>
</table>

**Example1:** The following is an example of the fru restore command:

MEZ50 <1>(admin) #> fru restore
A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.
Type of restore (0=full, 1=mappings only) [full]
FRU restore completed.
Please reboot the system for configuration to take affect.

**Example 2:** The following is an example of the fru save command:

MEZ50 <1>(admin) #> fru save
FRU save completed. Configuration File is HP_StorageWorks_MEZnn_FRU.bin
Please use FTP to extract the file out from the System.

**Help**
Displays a list of the commands and their syntax using the basic help command for iSCSI and iSCSI/FCoE modules:

MEZ50 <1>##> help

<table>
<thead>
<tr>
<th>CLI command</th>
<th>iSCSI module CLI command qualifier</th>
<th>iSCSI/FCoE module CLI command qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>admin</td>
<td>[ begin</td>
<td>end</td>
</tr>
<tr>
<td>beacon</td>
<td>[ on</td>
<td>off ]</td>
</tr>
<tr>
<td>date</td>
<td>&lt;MMDDhhmmCCYY&gt;</td>
<td>&lt;MMDDhhmmCCYY&gt;</td>
</tr>
<tr>
<td>clear</td>
<td>[ logs</td>
<td>stats ]</td>
</tr>
<tr>
<td>exit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fru</td>
<td>[ restore</td>
<td>save ]</td>
</tr>
<tr>
<td>help</td>
<td></td>
<td></td>
</tr>
<tr>
<td>history</td>
<td></td>
<td></td>
</tr>
<tr>
<td>image</td>
<td>[ cleanup</td>
<td>list</td>
</tr>
<tr>
<td></td>
<td>image cleanup</td>
<td>image cleanup</td>
</tr>
<tr>
<td>CLI command</td>
<td>iSCSI module CLI command qualifier</td>
<td>iSCSI/FCoE module CLI command qualifier</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>image list</td>
<td>image list</td>
<td>image list</td>
</tr>
<tr>
<td>image unpack</td>
<td>image unpack [ ]</td>
<td>image unpack [ ]</td>
</tr>
<tr>
<td>initiator</td>
<td>[ add</td>
<td>mod</td>
</tr>
<tr>
<td>logout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lunmask</td>
<td>[ add</td>
<td>rm ]</td>
</tr>
<tr>
<td>passwd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>quit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>reboot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>reset</td>
<td>[ capture</td>
<td>mappings ]</td>
</tr>
<tr>
<td>save</td>
<td>[ alias</td>
<td>logs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| set         | [ alias | chap | fc | features | iscsi | isns | mgmt | ntp | properties | smtp | system ]
|             | set alias                       | set alias                             |
|             | set chap                        | set chap                              |
|             | set fc [ <PORT_NUM> ]           | set fc [ <PORT_NUM> ]                 |
|             | set isns                        | set isns                             |
|             | set mgmt                        | set mgmt                             |
|             | set ntp                         | set ntp                              |
|             | set properties                  | set properties                       |
|             | set smtp [ trap_destinations [<DEST_NUM>] ]
|             | set system                       | set system                            |
|             |                                 |                                       |
| show        | [ chap | fc | features | initiators | iniciators_lumask | iscsi | isns | memory | mgmt | ntp | perf | presented_targets | properties | smtp | stats | system | targets ]
|             | show chap                       | show chap                             |
|             | show fc [ <PORT_NUM> ]          | show fc [ <PORT_NUM> ]                |
|             | show features                   | show features                         |
|             | show initiators [ fc | iscsi ] | show initiators [ fc | iscsi ]        |
|             | show iniciators_lumask          | show iniciators_lumask                |
|             | show iscsi [ <PORT_NUM> ]       | show iscsi [ <PORT_NUM> ]             |
|             | show isns                       | show isns                            |
|             | show logs [ <ENTRIES> ]         | show logs [ <ENTRIES> ]              |
|             | show linfo                      | show linfo                           |
|             | show luninfo                    | show luninfo                         |
|             | show lunmask                    | show lunmask                         |
|             | show memory                     | show memory                           |
|             | show mgmt                       | show mgmt                            |
|             | show ntp                        | show ntp                             |
|             | show perf [ byte | init_rbyte | init_wbyte | tgt_rbyte | tgt_wbyte ]
|             | show presented_targets [ fc | iscsi ] | show presented_targets [ fc | iscsi ] |
|             | show properties                 | show properties                      |
|             | show smtp                       | show smtp                            |
|             | show stats                      | show stats                           |
|             | show system                     | show system                          |
|             | show targets [ fc | iscsi ]      | show targets [ fc | iscsi ]          |
|             |                                 |                                       |
| shutdown    |                                 |                                       |
| target      | [ rm ]                          | [ rm ]                               |
| targetmap   | [ add | rm ]                      | [ add | rm ]                           |
### History

Displays a numbered list of the previously entered commands.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>history</td>
</tr>
</tbody>
</table>

**Example:**

```
MEZ50_02 (admin) #> history
1: save capture
2: admin start
3: admin start
4: save logs
5: save fru
6: fru save
7: save traces
8: save capture
9: image list
10: show system
11: show mgmt
12: history
13: history
MEZ50_02 (admin) #>
```

### Image

Updates the iSCSI or iSCSI/FCoE module’s firmware image and cleans up (removes) the image files in the module’s `/var/ftp` directory.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>image</td>
</tr>
<tr>
<td></td>
<td>cleanup</td>
</tr>
<tr>
<td></td>
<td>list [file]</td>
</tr>
<tr>
<td></td>
<td>unpack [file]</td>
</tr>
</tbody>
</table>

**Keywords**

- **cleanup**
  - Removes all firmware image files in the module’s `/var/ftp` directory. These are files transferred by the user when updating the module’s firmware image.

- **list [file]**
  - Displays a list of the firmware image files in the module’s `/var/ftp` directory.

- **unpack [file]**
  - Unpacks the firmware image file specified in the [file] parameter and installs the firmware image on the module. Before using this command, you must first transfer the firmware image file to the module’s `/var/ftp` directory using FTP. To activate the new firmware, you must reboot the module.
Example 1:
MEZ50_02 (admin) #> image cleanup
MEZ50_02 (admin) #> image list
   No images found in system.

Example 2:
MEZ50_02 (admin) #> image list
   mez50-3_0_4_1.bin
Only the file name is displayed as a response to this command.
The software image file is placed using ftp to the iSCSI or iSCSI/FCoE module as shown in Figure 93 (page 223).

Figure 93 FTP to iSCSI or iSCSI/FCoE module

Example 3:
MEZ50_02 (admin) #> image unpack
   Usage:  image unpack   [ <file> ]
MEZ50_02 (admin) #> image unpack mez50-3_0_4_1.bin
   Unpack Completed.  A reboot is required for the FW to take affect.
   Do you wish to reboot the System at the current time (y/n):  y
   System will now be rebooted...
MEZ50_02 #>

Initiator

Adds, modifies, and removes an initiator in the module’s database.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>initiator add mod remove</td>
</tr>
<tr>
<td>Keywords</td>
<td>add Adds an initiator to the module’s database. mod Modifies the settings of an initiator. remove Removes a logged out initiator. You cannot remove an initiator that is currently logged in.</td>
</tr>
</tbody>
</table>

Example 1:
MEZ50 (admin) #> initiator add
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list press ‘q’ or ‘Q’ and the ENTER key
Only valid iSCSI name characters will be accepted. Valid characters include lower-case alphabetical (a-z), numerical (0-9), colon, hyphen, and period.

Example 2:

MEZ50 (admin) #> initiator mod
Index   (WWNN,WWPN/iSCSI Name)  [ ]
0       iqn.1991-05.com.microsoft:perf2.sanbox.com
1       iqn.1991-05.com.microsoft:perf3.sanbox.com
3       iqn.1995.com.microsoft:server1

Please select an Initiator from the list above ("q" to quit): 3
A list of attributes with formatting and current values will follow.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.

Example 3:

MEZ50 (admin) #> initiator rm
Warning: This command will cause the removal of all mappings and maskings
associated with the initiator that is selected. All connections involving the selected
initiator will be dropped.

Example 4:

MEZ75 (admin) #> initiator mod

Please select an Initiator from the list above ("q" to quit): 14
A list of attributes with formatting and current values will follow.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.

All attribute values that have been changed will now be saved.
Logout

Exits the command line interface and returns you to the login prompt.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>logout</td>
</tr>
</tbody>
</table>

Example:
MEZ50 <1>(admin) #> logout
(none) login:

Lunmask

Maps a target LUN to an initiator, and also removes mappings. The CLI prompts you to select from a list of virtual port groups, targets, LUNs, and initiators.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>lunmask</td>
</tr>
<tr>
<td>Keywords add</td>
<td></td>
</tr>
<tr>
<td>Keywords remove</td>
<td></td>
</tr>
</tbody>
</table>

Example 1: The following example shows the lunmask add command.
MEZ50 (admin) #> lunmask add

<table>
<thead>
<tr>
<th>Index</th>
<th>Mapped (WWNN, WWPN/iSCSI Name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>0</td>
<td>Yes iqnn.1991-05.com.microsoft:perf2.sanbox.com</td>
</tr>
<tr>
<td>1</td>
<td>Yes iqnn.1991-05.com.microsoft:perf3.sanbox.com</td>
</tr>
</tbody>
</table>

Please select an Initiator from the list above ('q' to quit): 1

<table>
<thead>
<tr>
<th>Index</th>
<th>(WWNN, WWPN/iSCSI Name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----</td>
<td>------------------------</td>
</tr>
</tbody>
</table>

Please select a Target from the list above ('q' to quit): 0

LUN

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-----</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
</tbody>
</table>
Please select a LUN to present to the initiator ('q' to quit): 12

All attribute values that have been changed will now be saved.

MEZ50 (admin) #> lunmask rm

```
Index   (WWNN,WWPN/iSCSI Name)
-----   ----------------------
```

Please select a Target from the list above ('q' to quit): 0

```
LUN
----
0
1
2
3
4
5
6
7
8
9
10
11
12
13
```

Please select a LUN presented to the initiator ('q' to quit): 12

```
Index   Initiator
-----   -----------------
0       iqn.1991-05.com.microsoft:perf3.sanbox.com
```

Please select an Initiator to remove ('a' to remove all, 'q' to quit): 0

All attribute values that have been changed will now be saved.

Example 2: The following shows an example of the lunmask add command with virtual port groups.

MEZ75 (admin) #> lunmask add

```
Index   Type    Mapped   (WWNN,WWPN/iSCSI Name)
-----   ----    ------  ----------------------
0       FCOE    Yes     20:00:00:00:c9:95:b5:77,10:00:00:00:c9:95:b5:77
1       FCOE    Yes     20:00:00:00:c9:95:b5:73,10:00:00:00:c9:95:b5:73
2       FCOE    No      20:00:00:00:c9:95:b5:74,21:00:00:00:c9:95:b5:74
3       FCOE    No      20:00:00:00:c9:95:b5:75,21:00:00:00:c9:95:b5:75
4       FCOE    No      20:00:00:00:c9:95:b5:76,21:00:00:00:c9:95:b5:76
5       FCOE    No      20:00:00:00:c9:95:b5:77,21:00:00:00:c9:95:b5:77
6       FCOE    Yes     20:00:00:00:c9:95:b5:78,10:00:00:00:c9:95:b5:78
7       FCOE    Yes     20:00:00:00:c9:95:b5:79,10:00:00:00:c9:95:b5:79
8       FCOE    No      20:00:00:00:c9:95:b5:80,21:00:00:00:c9:95:b5:80
9       FCOE    Yes     20:00:00:00:c9:95:b5:81,10:00:00:00:c9:95:b5:81
10      FCOE    Yes     20:00:00:00:c9:95:b5:82,10:00:00:00:c9:95:b5:82
11      FCOE    No      20:00:00:00:c9:95:b5:83,21:00:00:00:c9:95:b5:83
```

Please select an Initiator from the list above ('q' to quit): 10

```
Index   (VpGroup Name)
-----   -------------
1       VPGROUP_1
2       VPGROUP_2
```
Multiple VpGroups are currently 'ENABLED'.
Please select a VpGroup from the list above ('q' to quit):  1

Index   (WWNN,WWPN/iSCSI Name)
-----   ----------------------

Please select a Target from the list above ('q' to quit):  0

Index  (LUN/VpGroup)
-----  -------------
0      0/VPGROUP_1
1      1/VPGROUP_1
2      2/VPGROUP_1
3      3/VPGROUP_1
4      4/VPGROUP_1
5      5/VPGROUP_1
6      6/VPGROUP_1
7      7/VPGROUP_1
8      8/VPGROUP_1
9      9/VPGROUP_1
10     10/VPGROUP_1
11     11/VPGROUP_1
12     12/VPGROUP_1

Please select a LUN to present to the initiator ('q' to quit):  12

Index   (IP/WWNN)                 (MAC/WWPN)
-----   -----------               ------------
0       20:00:f4:ce:46:fb:0a:43   21:00:f4:ce:46:fb:0a:43
1       20:00:f4:ce:46:fb:0a:44   21:00:f4:ce:46:fb:0a:44

Please select a portal to map the target from the list above ('q' to quit):  0
Target Device is already mapped on selected portal.

Example 3: The following example shows the lunmask rm (remove) command.

MEZ50 (admin) #> lunmask rm

Index   (WWNN,WWPN/iSCSI Name)
-----   ----------------------

Please select a Target from the list above ('q' to quit):  1

LUN
-----
0
1
2
3
4
5
6
7
8
9
10
11
12
13

Please select a LUN presented to the initiator ('q' to quit):  12
Index   Initiator
-----   -----------------
0     iqn.1991-05.com.microsoft:perf3.sanbox.com

Please select an Initiator to remove ('a' to remove all, 'q' to quit): 0

All attribute values that have been changed will now be saved.

Example 4: The following shows an example of the lunmask rm command with virtual port groups.

MEZ75 (admin) #> lunmask rm

Index   (WWNN,WWPN/iSCSI Name)
-----   ----------------------

Please select a Target from the list above ('q' to quit): 0

Index   (VpGroup Name)
-----   ---------------
1     VPGROUP_1
2     VPGROUP_2
3     VPGROUP_3
4     VPGROUP_4

Multiple VpGroups are currently 'ENABLED'.

Please select a VpGroup from the list above ('q' to quit): 1

Index   (LUN/VpGroup)
-----   ---------------
0     0/VPGROUP_1
1     1/VPGROUP_1
2     2/VPGROUP_1
3     3/VPGROUP_1
4     4/VPGROUP_1
5     5/VPGROUP_1
6     6/VPGROUP_1
7     7/VPGROUP_1
8     8/VPGROUP_1
9     9/VPGROUP_1
10     10/VPGROUP_1
11     11/VPGROUP_1
12     12/VPGROUP_1

Please select a LUN presented to the initiator ('q' to quit): 12

Index   Type    Initiator
-----   ----    -----------------
0     FC      20:00:00:c0:dd:10:f7:0d
1     FC      20:00:00:c0:dd:10:f7:0f
2     FCOE    20:00:f4:ce:46:fe:62:6d

Please select an Initiator to remove ('a' to remove all, 'q' to quit): 2

All attribute values that have been changed will now be saved.

Passwd

Changes the guest and administrator passwords.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>passwd</td>
</tr>
</tbody>
</table>
Example:
MEZ50 <i>(admin) #> passwd
Press 'q' and the ENTER key to abort this command.
Select password to change (0=guest, 1=admin) : 1
account OLD password : ******
account NEW password (6-128 chars) : ******
please confirm account NEW password : ******
Password has been changed.

Ping

Verifies the connectivity of management and GE ports. This command works with both IPv4 and IPv6.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>ping</td>
</tr>
</tbody>
</table>

Example 1: Ping through an iSCSI data port to another iSCSI data port.
MEZ50_02 (admin) #> ping

A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.

IP Address (IPv4 or IPv6) [0.0.0.0] 33.33.52.91
Invalid IP Address.
IP Address (IPv4 or IPv6) [0.0.0.0] 33.33.52.91
Iteration Count (0=Continuously) [0 ] 8
Outbound Port (0=Mgmt, 1=GE1, 2=GE2, ...) [Mgmt ] 1
Size Of Packet (Min=1, Max=1472 Bytes) [56 ]

Pinging 33.33.52.91 with 56 bytes of data:
Reply from 33.33.52.91: bytes=64 time=0.1ms
Reply from 33.33.52.91: bytes=64 time=<0.1ms
Reply from 33.33.52.91: bytes=64 time=<0.1ms
Reply from 33.33.52.91: bytes=64 time=<0.1ms
Reply from 33.33.52.91: bytes=64 time=<0.1ms
Reply from 33.33.52.91: bytes=64 time=<0.1ms
Reply from 33.33.52.91: bytes=64 time=<0.1ms
Reply from 33.33.52.91: bytes=64 time=<0.1ms

Ping Statistics for 33.33.52.91:
Packets: Sent = 8, Received = 8, Lost = 0
Approximate round trip times in milli-seconds:
Minimum = 0.0ms, Maximum = 0.1ms, Average = 0.0ms

Example 2: Ping through the mgmt port to another mgmt port.
MEZ75 (admin) #> ping

A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.

IP Address (IPv4 or IPv6) [0.0.0.0] 10.6.0.194
Iteration Count (0=Continuously) [0 ] 8
Outbound Port (0=Mgmt, 1=GE1, 2=GE2, ...) [Mgmt ] 0
Size Of Packet (Min=1, Max=1472 Bytes) [56 ]

Pinging 10.6.0.194 with 56 bytes of data:
Reply from 10.6.0.194: bytes=56 time=1.3ms
Reply from 10.6.0.194: bytes=56 time=0.1ms
Reply from 10.6.0.194: bytes=56 time=0.1ms
Reply from 10.6.0.194: bytes=56 time=0.1ms
Reply from 10.6.0.194: bytes=56 time=0.1ms
Reply from 10.6.0.194: bytes=56 time=0.1ms
Reply from 10.6.0.194: bytes=56 time=0.1ms
Reply from 10.6.0.194: bytes=56 time=0.1ms

Ping Statistics for 10.6.0.194:
Packets: Sent = 8, Received = 8, Lost = 0
Approximate round trip times in milliseconds:
Minimum = 0.1ms, Maximum = 1.3ms, Average = 0.2ms

Quit

Exits the command line interface and returns you to the login prompt (same as the exit command).

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>quit</td>
</tr>
</tbody>
</table>

Example 1: The following example shows the quit command for the iSCSI or iSCSI/FCoE module:

MEZ50 <1>(admin) #> quit
MEZ50 login:

Reboot

Restarts the module firmware.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>reboot</td>
</tr>
</tbody>
</table>

Example:

MEZ50 <1>(admin) #> reboot
Are you sure you want to reboot the System (y/n): y
System will now be rebooted...

Reset

Restores the module configuration parameters to the factory default values. The reset factory command deletes all LUN mappings, as well as all persistent data regarding targets, LUNs, initiators, virtual port group settings, log files, iSCSI and MGMT IP addresses, FC and Ethernet port statistics, and passwords. This command also restores the factory default IP addresses. The reset mappings command clears only the LUN mappings.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>reset</td>
</tr>
<tr>
<td>Keywords</td>
<td>factory</td>
</tr>
<tr>
<td></td>
<td>mappings</td>
</tr>
</tbody>
</table>

Example 1:

MEZ50 <1>(admin) #> reset factory
Are you sure you want to restore to factory default settings (y/n): y
Please reboot the System for the settings to take affect

Example 2:

MEZ50 <1>(admin) #> reset mappings
Are you sure you want to reset the mappings in the system (y/n): y
Please reboot the System for the settings to take affect.
Saves logs and traces.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>save</td>
</tr>
<tr>
<td></td>
<td>capture</td>
</tr>
<tr>
<td></td>
<td>logs</td>
</tr>
<tr>
<td></td>
<td>traces</td>
</tr>
<tr>
<td>Syntax</td>
<td>save</td>
</tr>
<tr>
<td>Keywords</td>
<td>capture</td>
</tr>
<tr>
<td></td>
<td>The save capture command creates a debug file that captures all debug dump data. After the command completes, you must FTP the debug capture file from the module.</td>
</tr>
<tr>
<td>Keywords</td>
<td>logs</td>
</tr>
<tr>
<td></td>
<td>The save logs command creates a tar file that contains the module’s log data, storing the file in the module’s /var/ftp directory. After the command completes, you must FTP the log’s tar file from the module.</td>
</tr>
<tr>
<td>Keywords</td>
<td>traces</td>
</tr>
<tr>
<td></td>
<td>The save traces command creates a tar file that contains the module’s dump data, storing the tar file in the module’s /var/ftp directory. After the command completes, you must FTP the trace’s tar file from the module. After executing this command, the system notifies you if the module does not have any dump data. Each time it generates dump data, the system adds an event log entry.</td>
</tr>
</tbody>
</table>

**Example 1:**

MEZ50 <1>(admin) #> save capture
Debug capture completed. Package is System_Capture.tar.gz
Please use FTP to extract the file out from the System.

**Example 2:**

MEZ50 <1>(admin) #> save logs
Save Event Logs completed. Package is System_Evl.tar.gz
Please use FTP to extract the file out from the System.

**Example 3:** Save traces is not supported by the iSCSI or iSCSI/FCoE modules.

MEZ50 (admin) #> save traces
Save ASIC Traces failed.

Set

Configures general iSCSI or iSCSI/FCoE parameters, as well as parameters that are specific to the FC, iSCSI, and management ports.

<table>
<thead>
<tr>
<th>Command</th>
<th>iSCSI module</th>
<th>iSCSI/FCoE module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set</td>
<td>alias, chap, fc [&lt;PORT_NUM&gt;], features, iscsi [&lt;PORT_NUM&gt;], isns, mgmt, ntp, properties, snmp [trap_destinations [&lt;DEST_NUM&gt;]], system</td>
<td>alias, chap, chassis, fc [&lt;PORT_NUM&gt;], features, iscsi [&lt;PORT_NUM&gt;], isns, mgmt, ntp, properties, snmp [trap_destinations [&lt;DEST_NUM&gt;]], system, vpgroups [vpgroup index]</td>
</tr>
</tbody>
</table>
Assigns alias name to a presented iSCSI target. See the "set alias command" (page 232)

chap
Sets the CHAP secrets. See the “set CHAP command” (page 233)

fc [<PORT_NUM>]
Sets the FC port parameters. “set FC command” (page 233)

features
Applies license keys to the module. See the “set features command” (page 234)

iscsi [<PORT_NUM>]
Sets the iSCSI port parameters. See the “set iSCSI command” (page 235)

isns
Sets the Internet simple name service (iSNS) parameters. See the “set iSNS command” (page 236)

mgmt
Sets the management port parameters. See the “set mgmt command” (page 236)

ntp
Sets the network time protocol (NTP) parameters. See the “set NTP command” (page 237)

properties
Configures CLI properties for the module. See the “set properties command” (page 237)

snmp [trap_destinations [<DEST_NUM>]]
Sets the simple network management protocol (SNMP) parameters. Sets system parameters such as symbolic name and log level. See the “set SNMP command” (page 238)

system
Sets system parameters such as symbolic name and log level. See the “set system command” (page 239)

vpgroups [vpgroup index]
Sets virtual port groups (VPGs) on the module. See the “set VPGroups command” (page 239)

---

**Set alias**

Allows an alias name to be assigned to a presented iSCSI target.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set alias</td>
</tr>
</tbody>
</table>

**Example:**

MEZ50 <2> (admin) #> set alias
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.
Index (WWNN, WWPN/iSCSI Name)

<table>
<thead>
<tr>
<th>Index</th>
<th>WWNN</th>
<th>WWPN</th>
<th>iSCSI Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>iqn.1986-03.com:fcgw.MEZ50.0834e00025.b1.01.50001fe150070ce9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>iqn.1986-03.com:fcgw.MEZ50.0834e00025.b1.02.50001fe150070ce9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>iqn.1986-03.com:fcgw.MEZ50.0834e00025.b1.03.50001fe150070ce9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>iqn.1986-03.com:fcgw.MEZ50.0834e00025.b1.04.50001fe150070ce9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>iqn.1986-03.com:fcgw.MEZ50.0834e00025.b1.01.50001fe150070ce9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>iqn.1986-03.com:fcgw.MEZ50.0834e00025.b1.02.50001fe150070ce9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>iqn.1986-03.com:fcgw.MEZ50.0834e00025.b1.03.50001fe150070ce9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>iqn.1986-03.com:fcgw.MEZ50.0834e00025.b1.04.50001fe150070ce9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please select a iSCSI node from the list above ('q' to quit): 0
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.
Set CHAP

Provides for the configuration of the challenge handshake authentication protocol (CHAP).

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set chap</td>
</tr>
</tbody>
</table>

Example:

MEZ50 <1>(admin) #> set chap

A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.

Index iSCSI Name
----- ----------
0       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.0
1       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.1
2       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.01.50001fe150070ce9
3       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.02.50001fe150070ce9
4       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.03.50001fe150070ce9
5       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.04.50001fe150070ce9
6       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.01.50001fe150070cec
7       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.02.50001fe150070cec
8       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.03.50001fe150070cec
9       iqn.1986-03.com.hp:fcgw.MEZ50.0834e00025.b1.04.50001fe150070cec

Please select a presented target from the list above ('q' to quit): 2

A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.

CHAP (0=Enable, 1=Disable) [Disabled] 0
CHAP Secret (Max = 100 characters) [ ] ****

All attribute values for that have been changed will now be saved.

Set FC

Configures an FC port.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set fc</td>
</tr>
</tbody>
</table>

Example 1:

MEZ50 (admin) #> set fc

A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.

WARNING:
The following command might cause a loss of connections to both ports.

Configuring FC Port: 1
-------------------------
Port Status (0=Enable, 1=Disable) [Enabled ]
Link Rate (0=Auto, 1=1Gb, 2=2Gb, 4=4Gb, 8=8GB) [Auto ]
Frame Size (0=512B, 1=1024B, 2=2048B) [2048 ]
Execution Throttle (Min=16, Max=65535) [256 ]

All attribute values for Port 1 that have been changed will now be saved.

Configuring FC Port: 2
-------------------------
Port Status (0=Enable, 1=Disable) [Enabled ]
Link Rate (0=Auto, 1=1Gb, 2=2Gb, 4=4Gb, 8=8GB) [Auto ]
Frame Size  (0=512B, 1=1024B, 2=2048B) [2048]
Execution Throttle (Min=16, Max=65535) [256]

All attribute values for Port 2 that have been changed will now be saved.

Example 2:
MEZ75 (admin) #> set fc

A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.

WARNING:
The following command might cause a loss of connections to both ports.

Configuring FC Port: 1
-------------------------
Port Status (0=Enable, 1=Disable) [Enabled ]
Link Rate (0=Auto, 1=1Gb, 2=2Gb, 4=4Gb, 8=8GB) [Auto ]
Frame Size  (0=512B, 1=1024B, 2=2048B) [2048]
Execution Throttle (Min=16, Max=65535) [256]

All attribute values for Port 1 that have been changed will now be saved.

Configuring FC Port: 2
-------------------------
Port Status (0=Enable, 1=Disable) [Enabled ]
Link Rate (0=Auto, 1=1Gb, 2=2Gb, 4=4Gb, 8=8GB) [Auto ]
Frame Size  (0=512B, 1=1024B, 2=2048B) [2048]
Execution Throttle (Min=16, Max=65535) [256]

All attribute values for Port 2 that have been changed will now be saved.

Configuring FC Port: 3
-------------------------
Port Status (0=Enable, 1=Disable) [Enabled ]
Frame Size  (0=512B, 1=1024B, 2=2048B) [2048]
Execution Throttle (Min=16, Max=65535) [256]

All attribute values for Port 3 that have been changed will now be saved.

Configuring FC Port: 4
-------------------------
Port Status (0=Enable, 1=Disable) [Enabled ]
Frame Size  (0=512B, 1=1024B, 2=2048B) [2048]
Execution Throttle (Min=16, Max=65535) [256]

All attribute values for Port 4 that have been changed will now be saved.

Set features

Applies license keys to the module. The date and time must be set on the module prior to applying
a new feature key. (This option is not currently supported. It will be supported in a future release.)

<table>
<thead>
<tr>
<th>Authority</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admin session</td>
<td>set features</td>
</tr>
</tbody>
</table>

Example:
MEZ75 (admin) #> set features

A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.
Enter feature key to be saved/activated:

**Set iSCSI**

Configures an iSCSI port.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set iscsi</td>
</tr>
<tr>
<td>Keywords</td>
<td>[&lt;PORT_NUM&gt;]</td>
</tr>
</tbody>
</table>

**Example:**

ME250 (admin) #> set iscsi

A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.

**WARNING:**
The following command might cause a loss of connections to both ports.

Configuring iSCSI Port: 1

```
Port Status (0=Enable, 1=Disable)           [Enabled         ]
Port Speed (0=Auto, 1=100Mb, 2=1Gb)         [Auto            ]
MTU Size (0=Normal, 1=Jumbo, 2=Other)       [Normal          ]
Window Size (Min=8192B, Max=1048576B)       [32768          ]
IPv4 Address                                [33.33.52.96    ]
IPv4 Subnet Mask                            [255.255.0.0    ]
IPv4 Gateway Address                        [0.0.0.0        ]
IPv4 TCP Port No. (Min=1024, Max=65535)     [3260           ]
IPv4 VLAN (0=Enable, 1=Disable)             [Disabled       ]
IPv6 Address 1                               [::             ]
IPv6 Address 2                               [::             ]
IPv6 Default Router                         [:              ]
IPv6 TCP Port No. (Min=1024, Max=65535)     [3260           ]
iSCSI Header Digests (0=Enable, 1=Disable)  [Disabled       ]
iSCSI Data Digests (0=Enable, 1=Disable)    [Disabled       ]
```

All attribute values for Port 1 that have been changed will now be saved.

Configuring iSCSI Port: 2

```
Port Status (0=Enable, 1=Disable)           [Enabled         ]
Port Speed (0=Auto, 1=100Mb, 2=1Gb)         [Auto            ]
MTU Size (0=Normal, 1=Jumbo, 2=Other)       [Normal          ]
Window Size (Min=8192B, Max=1048576B)       [32768          ]
IPv4 Address                                [33.33.52.97    ]
IPv4 Subnet Mask                            [255.255.0.0    ]
IPv4 Gateway Address                        [0.0.0.0        ]
IPv4 TCP Port No. (Min=1024, Max=65535)     [3260           ]
IPv4 VLAN (0=Enable, 1=Disable)             [Disabled       ]
IPv6 Address 1                               [::             ]
IPv6 Address 2                               [::             ]
IPv6 Default Router                         [:              ]
IPv6 TCP Port No. (Min=1024, Max=65535)     [3260           ]
iSCSI Header Digests (0=Enable, 1=Disable)  [Disabled       ]
iSCSI Data Digests (0=Enable, 1=Disable)    [Disabled       ]
```

All attribute values for Port 2 that have been changed will now be saved.

Configuring iSCSI Port: 3

```
Port Status (0=Enable, 1=Disable)           [Enabled         ]
Port Speed (0=Auto, 1=100Mb, 2=1Gb)         [Auto            ]
MTU Size (0=Normal, 1=Jumbo, 2=Other)       [Normal          ]
Window Size (Min=8192B, Max=1048576B)       [32768          ]
IPv4 Address                                [33.33.52.97    ]
IPv4 Subnet Mask                            [255.255.0.0    ]
IPv4 Gateway Address                        [0.0.0.0        ]
IPv4 TCP Port No. (Min=1024, Max=65535)     [3260           ]
IPv4 VLAN (0=Enable, 1=Disable)             [Disabled       ]
IPv6 Address 1                               [::             ]
IPv6 Address 2                               [::             ]
IPv6 Default Router                         [:              ]
IPv6 TCP Port No. (Min=1024, Max=65535)     [3260           ]
iSCSI Header Digests (0=Enable, 1=Disable)  [Disabled       ]
iSCSI Data Digests (0=Enable, 1=Disable)    [Disabled       ]
```

All attribute values for Port 3 that have been changed will now be saved.
Port Status (0=Enable, 1=Disable) [Enabled ]
Port Speed (0=Auto, 1=100Mb, 2=1Gb) [Auto ]
MTU Size (0=Normal, 1=Jumbo, 2=Other) [Normal ]
Window Size (Min=8192B, Max=1048576B) [32768 ]
IPv4 Address [0.0.0.0 ]
IPv4 Subnet Mask [0.0.0.0 ]
IPv4 Gateway Address [0.0.0.0 ]
IPv4 TCP Port No. (Min=1024, Max=65535) [3260 ]
IPv4 VLAN (0=Enable, 1=Disable) [Disabled ]
IPv6 Address 1 [:: ]
IPv6 Address 2 [:: ]
IPv6 Default Router [:: ]
IPv6 TCP Port No. (Min=1024, Max=65535) [3260 ]
IPv6 VLAN (0=Enable, 1=Disable) [Disabled ]
iSCSI Header Digests (0=Enable, 1=Disable) [Disabled ]
iSCSI Data Digests (0=Enable, 1=Disable) [Disabled ]

All attribute values for Port 3 that have been changed will now be saved.

Configuring iSCSI Port: 4
---------------------------
Port Status (0=Enable, 1=Disable) [Enabled ]
Port Speed (0=Auto, 1=100Mb, 2=1Gb) [Auto ]
MTU Size (0=Normal, 1=Jumbo, 2=Other) [Normal ]
Window Size (Min=8192B, Max=1048576B) [32768 ]
IPv4 Address [0.0.0.0 ]
IPv4 Subnet Mask [0.0.0.0 ]
IPv4 Gateway Address [0.0.0.0 ]
IPv4 TCP Port No. (Min=1024, Max=65535) [3260 ]
IPv4 VLAN (0=Enable, 1=Disable) [Disabled ]
iSCSI Header Digests (0=Enable, 1=Disable) [Disabled ]
iSCSI Data Digests (0=Enable, 1=Disable) [Disabled ]

Set iSNS

Configures iSNS parameters for a module.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set isns</td>
</tr>
</tbody>
</table>

Example:

MEZ50 <2> (admin) #> set isns
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.
iSNS (0=Enable, 1=Disable) [Disabled ] 0
iSNS Address (IPv4 or IPv6) [0.0.0.0 ] 10.3.6.33
TCP Port No. [3205 ]
All attribute values that have been changed will now be saved.

Set Mgmt

Configures the module's management port (10/100).

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set mgmt</td>
</tr>
</tbody>
</table>

Example 1:
MEZ50 <1>(admin) #> set mgmt
A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.
WARNING:
The following command might cause a loss of connections to the MGMT port.
IPv4 Interface (0=Enable, 1=Disable) [Enabled]
IPv4 Mode (0=Static, 1=DHCP, 2=Bootp, 3=Rarp) [Dhcp]
IPv6 Interface (0=Enable, 1=Disable) [Enabled]
IPv6 Mode (0=Manual, 1=AutoConfigure) [Manual] 1
All attribute values that have been changed will now be saved.

Example 2: The following example shows how to use the set mgmt command to set a static address.

MEZ50 <1>(admin) #> set mgmt
A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.
WARNING:
The following command might cause a loss of connections to the MGMT port.
IPv4 Interface (0=Enable, 1=Disable) [Enabled]
IPv4 Mode (0=Static, 1=DHCP, 2=Bootp, 3=Rarp) [Static]
IPv4 Address [172.17.136.86]
IPv4 Subnet Mask [255.255.255.0]
IPv4 Gateway [172.17.136.1]
IPv6 Interface (0=Enable, 1=Disable) [Disabled]
All attribute values that have been changed will now be saved.

Set NTP

Configures the NTP parameters.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set ntp</td>
</tr>
</tbody>
</table>

Example:

MEZ50 <1>(admin) #> set ntp
A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.
NTP (0=Enable, 1=Disable) [Disabled] 0
TimeZone Offset from GMT (Min=-12:00,Max=12:00) [00:00] -8:0
IP Address [1] (IPv4 or IPv6) [0.0.0.0] 207.126.97.57
IP Address [2] (IPv4 or IPv6) [0.0.0.0]
IP Address [3] (IPv4 or IPv6) [0.0.0.0]
All attribute values that have been changed will now be saved.

Set properties

Configures CLI properties for the module.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set properties</td>
</tr>
</tbody>
</table>

Example:
Set properties

A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.

CLI Inactivity Timer (0=Disable, 1=15min, 2=60min)   [Disabled] 0
CLI Prompt (Max=32 Characters)                      [MEZ50 ]

All attribute values that have been changed will now be saved.

Set SNMP

Configures the general simple network management protocol (SNMP) properties, as well as
configuring eight trap destinations.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set snmp</td>
</tr>
<tr>
<td>Keywords</td>
<td>[trap_destinations]&lt;DEST_NUM&gt;]]</td>
</tr>
</tbody>
</table>

Example: The following example shows the set snmp command for setting the general properties.

MEZ50 <1>(admin) #> set snmp
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.
Configuring SNMP :

Read Community [ ] Public
Trap Community [ ] Private
System Location [ ]
System Contact [ ]
Authentication Traps (0=Enable, 1=Disable) [Disabled ]
All attribute values that have been changed will now be saved.
The following example shows configuring an SNMP trap destination:

MEZ50 <1>(admin) #> set snmp trap_destinations
A list of attributes with formatting and current values will follow.
Enter a new value or simply press the ENTER key to accept the current value.
If you wish to terminate this process before reaching the end of the list
press 'q' or 'Q' and the ENTER key to do so.
Configuring SNMP Trap Destination 1 :

Destination enabled (0=Enable, 1=Disable) [Disabled ] 0
IP Address [0.0.0.0 ] 10.0.0.5
Destination Port [0 ] 1024
Trap Version [0 ] 2

Configuring SNMP Trap Destination 2 :

Configuring SNMP Trap Destination 3 :

Configuring SNMP Trap Destination 4 :

Configuring SNMP Trap Destination 5 :

Configuring SNMP Trap Destination 6 :

Configuring SNMP Trap Destination 7 :

238  Command reference
Set system

Configures the module’s system-wide parameters.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set system</td>
</tr>
</tbody>
</table>

Example 1:

MEZ50 (admin) #> set system

A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.

| System Symbolic Name (Max = 64 characters) | MEZ50-1 |
| Controller Lun AutoMap (0=Enable, 1=Disable) | Enabled |
| Target Access Control (0=Enable, 1=Disable) | Disabled |
| Telnet (0=Enable, 1=Disable) | Enabled |
| SSH (0=Enable, 1=Disable) | Enabled |

All attribute values that have been changed will now be saved.

Example 2:

MEZ75 (admin) #> set system

A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.

| System Symbolic Name (Max = 64 characters) | MEZ75-1 |
| Controller Presentation Mode (0=Auto, 1=Manual) | Auto |
| Controller Lun AutoMap (0=Enable, 1=Disable) | Enabled |
| Target Access Control (0=Enable, 1=Disable) | Disabled |
| Telnet (0=Enable, 1=Disable) | Enabled |
| SSH (0=Enable, 1=Disable) | Enabled |
| FTP (0=Enable, 1=Disable) | Enabled |
| System Log Level (Default, Min=0, Max=2) | 0 |

All attribute values that have been changed will now be saved.

Set VPGroups

Sets virtual port groups (VPGs) on the module. Allows you to enable and disable VPGs, and to modify the VPG name.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>set vpgroups [vpgroup index]</td>
</tr>
</tbody>
</table>

Example 1: The following example enables virtual port groups 2 and 3.

MEZ75 (admin) #> set vpgroups
The following wizard will query for attributes before persisting and activating the updated mapping in the system configuration. If you wish to terminate this wizard before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.
Configuring VpGroup: 1
Example 2: The `set vpgroups` command is not presently supported by the iSCSI module

MEZ50_02 (admin) #> set vpgroups
Usage: set [ alias | chap | fc | features | iscsi | isns | mgmt | ntp | properties | snmp | system ]

Show

Displays module operational information

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
</table>

**Syntax**

`show`  
`chap`  
`chassis`  
`features`  
`fc [port_num]`  
`initiators [fc or iscsi]`  
`initiator_lunmask`  
`memory`  
`iscsi [port_num]`  
`isns [port_num]`  
`logs [entries]`  
`luninfo`  
`luns`  
`lunmask`  
`mgmt`  
`ntp`  
`perf [ byte | init_rbyte | init_wbyte | tgt_rbyte | tgt_wbyte ]`  
`presented_targets [fc or iscsi]`  
`properties`  
`snmp`  
`stats`  
`targets [fc or iscsi]`  
`system`  
`vpgroups [vpgroup index]`

**Keywords**

`chap` Displays configured CHAP iSCSI nodes. See the “show CHAP command” (page 242)

`fc [port_num]` Displays FC port information. See the “show FC command” (page 242)

`features` Displays licensed features. See the “show features command” (page 244)
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>initiators [fc or iscsi]</td>
<td>Displays SCSI initiator information: iSCSI or FC. See the “show initiators command” (page 244)</td>
</tr>
<tr>
<td>initiators_lunmask</td>
<td>Displays initiators and the LUNs to which they are mapped. See the “show initiators LUN mask command” (page 246)</td>
</tr>
<tr>
<td>iscsi [port_num]</td>
<td>Displays iSCSI port information and configuration. See the “show iSCSI command” (page 247)</td>
</tr>
<tr>
<td>isns [port_num]</td>
<td>Displays the module’s iSCSI name server (iSNS) configuration. “show iSNS command” (page 249)</td>
</tr>
<tr>
<td>logs</td>
<td>Displays the module’s logging information. See the “show logs command” (page 249)</td>
</tr>
<tr>
<td>luninfo</td>
<td>Displays complete LUN information for a specified target and LUN. See the “show LUNinfo command” (page 250)</td>
</tr>
<tr>
<td>luns</td>
<td>Displays LUN information and their targets. See the “show LUNs command” (page 251)</td>
</tr>
<tr>
<td>system</td>
<td>Sets system parameters such as symbolic name and log level. See the “show system command” (page 261)</td>
</tr>
<tr>
<td>lunmask</td>
<td>Displays LUN mappings. See the “show lunmask command” (page 252)</td>
</tr>
<tr>
<td>memory</td>
<td>Displays memory usage. See the “show memory command” (page 252)</td>
</tr>
<tr>
<td>mgmt</td>
<td>Displays the module’s management port (10/100) configuration. See the “show mgmt command” (page 253)</td>
</tr>
<tr>
<td>ntp</td>
<td>Displays the module’s network time protocol (NTP) configuration. See the “show NTP command” (page 253)</td>
</tr>
<tr>
<td>perf [ byte</td>
<td>init_rbyte</td>
</tr>
<tr>
<td>presented_targets [fc or iscsi]</td>
<td>Displays targets presented by the module: FC, iSCSI, or both. See the “show presented targets command” (page 255)</td>
</tr>
<tr>
<td>properties</td>
<td>Displays module properties. See the “show properties command” (page 258)</td>
</tr>
<tr>
<td>snmp</td>
<td>Displays the module’s simple network management protocol (SNMP) properties and trap configurations. See the “show SNMP command” (page 259)</td>
</tr>
<tr>
<td>stats</td>
<td>Displays the module statistics, both FC and iSCSI. See the “show stats command” (page 259)</td>
</tr>
<tr>
<td>system</td>
<td>Displays module product information including serial number, software version, hardware version, configuration, and temperature. See the “show system command” (page 261)</td>
</tr>
<tr>
<td>targets [fc or iscsi]</td>
<td>Displays targets discovered by the module: FC, iSCSI, or both. See the “show targets command” (page 262)</td>
</tr>
<tr>
<td>vpgroups [vpgroup index]</td>
<td>Displays virtual port groups. See the “show VPGroups command” (page 262)</td>
</tr>
</tbody>
</table>
Show CHAP

Displays CHAP configuration for iSCSI nodes.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show chap</td>
</tr>
</tbody>
</table>

**Example:**

MEZ50 <1>(admin) #> show chap
The following is a list of iSCSI nodes that have been configured with CHAP 'ENABLED':
Type iSCSI Node
---------
Init iqn.1991-05.com.microsoft:server1

Show FC

Displays FC port information for the specified port. If you do not specify a port, this command displays all ports.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show fc [port_num]</td>
</tr>
<tr>
<td>Keywords</td>
<td>[port_num] Identifies the FC or FCoE port to display.</td>
</tr>
</tbody>
</table>

**Example 1:**

MEZ75 (admin) #> show fc

<table>
<thead>
<tr>
<th>PC Port Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC Port</td>
</tr>
<tr>
<td>Port Status</td>
</tr>
<tr>
<td>Port Mode</td>
</tr>
<tr>
<td>Link Status</td>
</tr>
<tr>
<td>Current Link Rate</td>
</tr>
<tr>
<td>Programmed Link Rate</td>
</tr>
<tr>
<td>WWNN</td>
</tr>
<tr>
<td>WWPN</td>
</tr>
<tr>
<td>Port ID</td>
</tr>
<tr>
<td>WWNN</td>
</tr>
<tr>
<td>WWPN</td>
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<td>Port ID</td>
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<td>WWPN</td>
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<tr>
<td>Port ID</td>
</tr>
<tr>
<td>WWNN</td>
</tr>
<tr>
<td>WWPN</td>
</tr>
<tr>
<td>Port ID</td>
</tr>
<tr>
<td>Firmware Revision No.</td>
</tr>
<tr>
<td>Frame Size</td>
</tr>
<tr>
<td>Execution Throttle</td>
</tr>
<tr>
<td>Connection Mode</td>
</tr>
</tbody>
</table>

PC Port | FC2 |
Port Status | Enabled |
Port Mode | FCP |
Link Status | Up |
Current Link Rate | 4Gb |
Programmed Link Rate | Auto |
WWNN    | 20:00:00:c0:dd:00:00:76 (VPGROUP_1) |
WWPN    | 21:00:00:c0:dd:00:00:76 (VPGROUP_1) |
Example 2:

MEZ50_02 (admin) #> show fc

FC Port Information
---------------------
FC Port                1
Port Status            Enabled
Port Mode              FCP
Link Status            Up
Current Link Rate      10Gb
Programmed Link Rate   Auto
WWNN                   20:00:f4:ce:46:fb:0a:43
WWPN                   21:00:f4:ce:46:fb:0a:43
Port ID                ef-09-01
Firmware Revision No.  5.02.03
Frame Size             2048
Execution Throttle     256
Connection Mode        Point-to-Point
SFP Type               10Gb
Enode MAC Address      f4-ce-46-fb-0a-44
Fabric Provided MAC Address 0e-fc-00-ef-09-01
VlanId                 5
Priority Level         3
Priority GroupId       1
Priority GroupPercentage 60
Current Link Rate                4Gb
Programmed Link Rate             Auto
WWNN                             20:00:00:c0:dd:00:01:50
WWPN                             21:00:00:c0:dd:00:01:50
Port ID                          00-00-ef
Firmware Revision No.            5.01.03
Frame Size                       2048
Execution Throttle               256
Connection Mode                  Loop

FC Port                          2
Port Status                      Enabled
Link Status                      Up
Current Link Rate                4Gb
Programmed Link Rate             Auto
WWNN                             20:00:00:c0:dd:00:01:51
WWPN                             21:00:00:c0:dd:00:01:51
Port ID                          00-00-ef
Firmware Revision No.            5.01.03
Frame Size                       2048
Execution Throttle               256
Connection Mode                  Loop

Show features
Displays any features that have been licensed.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show features</td>
</tr>
</tbody>
</table>

Example:
MEZ50 <1>#$ show features
No Feature Keys exist in the system.

Show initiators
Displays SCSI initiator information for iSCSI, FC, or both.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show features fc iscsi</td>
</tr>
<tr>
<td>Keywords</td>
<td>fc Specifies the display of FC initiators. iscsi Specifies the display of iSCSI initiators.</td>
</tr>
</tbody>
</table>

Example 1:
MEZ50_02 (admin) #> show initiators

Initiator Information
---------------------
Initiator Name       iqn.1991-05.com.microsoft:perf10.sanbox.com
Alias                
IP Address           33.33.52.87, 33.33.52.11
Status               Logged In
OS Type              Windows

Initiator Name       iqn.1991-05.com.microsoft:perf2.sanbox.com
Alias                
IP Address           33.33.52.20, 33.33.52.68
Status               Logged In
OS Type          Windows  
Initiator Name   iqn.1991-05.com.microsoft:perf3.sanbox.com  
Alias           
IP Address       33.33.52.17, 33.33.52.16  
Status           Logged In  
OS Type          Windows  
Initiator Name   iqn.1995-12.com.attotech:xtendsan:sanlabmac-s09  
Alias           
IP Address       0.0.0.0  
Status           Logged Out  
OS Type          Mac OS X  

Example 2:

MEZ75 (admin) #> show initiators

Initiator Information  
-----------------------  
WWNN             20:00:00:c0:dd:10:f7:0d  
WWPN             21:00:00:c0:dd:10:f7:0d  
Port ID          ef-0b-01  
Status           Logged In  
Type             FCOE  
OS Type          Windows2008  
WWNN             20:00:00:c0:dd:10:f7:0f  
WWPN             21:00:00:c0:dd:10:f7:0f  
Port ID          ef-0f-01  
Status           Logged In  
Type             FCOE  
OS Type          Windows2008  
WWNN             20:00:00:c0:dd:18:dc:53  
WWPN             21:00:00:c0:dd:18:dc:53  
Port ID          ef-12-01  
Status           Logged In  
Type             FCOE  
OS Type          Windows  
WWNN             20:00:00:c0:dd:18:dc:54  
WWPN             21:00:00:c0:dd:18:dc:54  
Port ID          ef-13-01  
Status           Logged In  
Type             FCOE  
OS Type          Windows  
WWNN             20:00:00:c0:dd:18:dc:5d  
WWPN             21:00:00:c0:dd:18:dc:5d  
Port ID          ef-16-01  
Status           Logged In  
Type             FCOE  
OS Type          Windows  
WWNN             20:00:00:c0:dd:18:dc:5e  
WWPN             21:00:00:c0:dd:18:dc:5e  
Port ID          ef-17-01  
Status           Logged In  
Type             FCOE  
OS Type          Windows  
WWNN             20:00:00:00:c9:95:b5:77  
WWPN             10:00:00:00:c9:95:b5:77  
Port ID          ef-1a-01  
Status           Logged In  

Commands 245
Show initiators LUN mask

Displays all LUNs mapped to a user-selected Initiator.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show initiators_lunmask</td>
</tr>
</tbody>
</table>

**Example 1:**

MEZ75 (admin) #> show initiators_lunmask

<table>
<thead>
<tr>
<th>Index</th>
<th>Type</th>
<th>(WWNN,WWPN/iSCSI Name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>FCOE</td>
<td>20:00:00:00:c0:dd:10:f7:0d,21:00:00:c0:dd:10:f7:0d</td>
</tr>
<tr>
<td>1</td>
<td>FCOE</td>
<td>20:00:00:00:c0:dd:10:f7:0f,21:00:00:c0:dd:10:f7:0f</td>
</tr>
<tr>
<td>2</td>
<td>FCOE</td>
<td>20:00:00:00:c0:dd:18:dc:53,21:00:00:00:c0:dd:18:dc:53</td>
</tr>
<tr>
<td>3</td>
<td>FCOE</td>
<td>20:00:00:00:c0:dd:18:dc:54,21:00:00:00:c0:dd:18:dc:54</td>
</tr>
<tr>
<td>4</td>
<td>FCOE</td>
<td>20:00:00:00:c0:dd:18:dc:5d,21:00:00:00:c0:dd:18:dc:5d</td>
</tr>
<tr>
<td>5</td>
<td>FCOE</td>
<td>20:00:00:00:c0:dd:18:dc:5e,21:00:00:00:c0:dd:18:dc:5e</td>
</tr>
<tr>
<td>6</td>
<td>FCOE</td>
<td>20:00:00:00:c9:95:b5:77,10:00:00:00:c9:95:b5:77</td>
</tr>
<tr>
<td>7</td>
<td>FCOE</td>
<td>20:00:00:00:c9:95:b5:73,10:00:00:00:c9:95:b5:73</td>
</tr>
<tr>
<td>8</td>
<td>FCOE</td>
<td>20:00:f4:ce:46:fb:0a:4b,21:00:f4:ce:46:fb:0a:4b</td>
</tr>
<tr>
<td>11</td>
<td>FCOE</td>
<td>20:00:f4:ce:46:fb:0a:4c,21:00:f4:ce:46:fb:0a:4c</td>
</tr>
</tbody>
</table>
Please select an Initiator from the list above ('q' to quit): 0

<table>
<thead>
<tr>
<th>Target (WWPN)</th>
<th>(LUN/VpGroup)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50:01:43:80:04:c6:89:68</td>
<td>0/VPGROUP_1</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:68</td>
<td>9/VPGROUP_1</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:68</td>
<td>10/VPGROUP_1</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:68</td>
<td>11/VPGROUP_1</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:68</td>
<td>12/VPGROUP_1</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:6c</td>
<td>0/VPGROUP_1</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:6c</td>
<td>9/VPGROUP_1</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:6c</td>
<td>10/VPGROUP_1</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:6c</td>
<td>11/VPGROUP_1</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:6c</td>
<td>12/VPGROUP_1</td>
</tr>
</tbody>
</table>

Example 2:
MEZ50 (admin) #> show initiators_lunmask

<table>
<thead>
<tr>
<th>Index</th>
<th>(WWNN,WWPN/iSCSI Name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>iqn.1991-05.com.microsoft:perf2.sanbox.com</td>
</tr>
<tr>
<td>1</td>
<td>iqn.1991-05.com.microsoft:perf3.sanbox.com</td>
</tr>
</tbody>
</table>

Please select an Initiator from the list above ('q' to quit): 1

<table>
<thead>
<tr>
<th>Target (WWNN,WWPN)</th>
<th>LUN Number</th>
</tr>
</thead>
</table>

Show iSCSI

Displays iSCSI information for the specified port. If you do not specify the port, this command displays all ports.

```
Authority | None
Syntax    | show iscsi [port_num]
Keywords   | [port_num] The number of the iSCSI port to be displayed.
```

Example:
MEZ50 (admin) #> show iscsi

```
iSCSI Port Information
------------------------
iSCSI Port              GE1
Port Status             Enabled
Link Status             Up
iSCSI Name              iqn.2004-09.com.hp:fcgw.mez50.1.0
Firmware Revision       1.0.0.0
Current Port Speed       1Gb/FDX
Programmed Port Speed    Auto
MTU Size                Normal
Window Size             32768
MAC Address             00-23-7d-f4-15-a5
```
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv4 Address</td>
<td>33.33.52.96</td>
</tr>
<tr>
<td>IPv4 Subnet Mask</td>
<td>255.255.0.0</td>
</tr>
<tr>
<td>IPv4 Gateway Address</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IPv4 Target TCP Port No.</td>
<td>3260</td>
</tr>
<tr>
<td>IPv4 VLAN</td>
<td>Disabled</td>
</tr>
<tr>
<td>IPv6 Address 1</td>
<td>::</td>
</tr>
<tr>
<td>IPv6 Address 2</td>
<td>::</td>
</tr>
<tr>
<td>IPv6 Link Local</td>
<td>fe80::223:7dff:fe4:15a5</td>
</tr>
<tr>
<td>IPv6 Default Router</td>
<td>::</td>
</tr>
<tr>
<td>IPv6 Target TCP Port No.</td>
<td>3260</td>
</tr>
<tr>
<td>IPv6 VLAN</td>
<td>Disabled</td>
</tr>
<tr>
<td>iSCSI Max First Burst</td>
<td>65536</td>
</tr>
<tr>
<td>iSCSI Max Burst</td>
<td>262144</td>
</tr>
<tr>
<td>iSCSI Header Digests</td>
<td>Disabled</td>
</tr>
<tr>
<td>iSCSI Data Digests</td>
<td>Disabled</td>
</tr>
<tr>
<td>iSCSI Port</td>
<td>GE2</td>
</tr>
<tr>
<td>Port Status</td>
<td>Enabled</td>
</tr>
<tr>
<td>Link Status</td>
<td>Up</td>
</tr>
<tr>
<td>iSCSI Name</td>
<td>iqn.2004-09.com.hp:fcgw.mez50.1.1</td>
</tr>
<tr>
<td>Firmware Revision</td>
<td>1.0.0.0</td>
</tr>
<tr>
<td>Current Port Speed</td>
<td>1Gb/FDX</td>
</tr>
<tr>
<td>Programmed Port Speed</td>
<td>Auto</td>
</tr>
<tr>
<td>MTU Size</td>
<td>Normal</td>
</tr>
<tr>
<td>Window Size</td>
<td>32768</td>
</tr>
<tr>
<td>MAC Address</td>
<td>00-23-7d-f4-15-a6</td>
</tr>
<tr>
<td>IPv4 Address</td>
<td>33.33.52.97</td>
</tr>
<tr>
<td>IPv4 Subnet Mask</td>
<td>255.255.0.0</td>
</tr>
<tr>
<td>IPv4 Gateway Address</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IPv4 Target TCP Port No.</td>
<td>3260</td>
</tr>
<tr>
<td>IPv4 VLAN</td>
<td>Disabled</td>
</tr>
<tr>
<td>IPv6 Address 1</td>
<td>::</td>
</tr>
<tr>
<td>IPv6 Address 2</td>
<td>::</td>
</tr>
<tr>
<td>IPv6 Link Local</td>
<td>fe80::223:7dff:fe4:15a6</td>
</tr>
<tr>
<td>IPv6 Default Router</td>
<td>::</td>
</tr>
<tr>
<td>IPv6 Target TCP Port No.</td>
<td>3260</td>
</tr>
<tr>
<td>IPv6 VLAN</td>
<td>Disabled</td>
</tr>
<tr>
<td>iSCSI Max First Burst</td>
<td>65536</td>
</tr>
<tr>
<td>iSCSI Max Burst</td>
<td>262144</td>
</tr>
<tr>
<td>iSCSI Header Digests</td>
<td>Disabled</td>
</tr>
<tr>
<td>iSCSI Data Digests</td>
<td>Disabled</td>
</tr>
<tr>
<td>iSCSI Port</td>
<td>GE3</td>
</tr>
<tr>
<td>Port Status</td>
<td>Enabled</td>
</tr>
<tr>
<td>Link Status</td>
<td>Up</td>
</tr>
<tr>
<td>iSCSI Name</td>
<td>iqn.2004-09.com.hp:fcgw.mez50.1.2</td>
</tr>
<tr>
<td>Firmware Revision</td>
<td>1.0.0.0</td>
</tr>
<tr>
<td>Current Port Speed</td>
<td>1Gb/FDX</td>
</tr>
<tr>
<td>Programmed Port Speed</td>
<td>Auto</td>
</tr>
<tr>
<td>MTU Size</td>
<td>Normal</td>
</tr>
<tr>
<td>Window Size</td>
<td>32768</td>
</tr>
<tr>
<td>MAC Address</td>
<td>00-23-7d-f4-15-a7</td>
</tr>
<tr>
<td>IPv4 Address</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IPv4 Subnet Mask</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IPv4 Gateway Address</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>IPv4 Target TCP Port No.</td>
<td>3260</td>
</tr>
<tr>
<td>IPv4 VLAN</td>
<td>Disabled</td>
</tr>
<tr>
<td>IPv6 Address 1</td>
<td>::</td>
</tr>
<tr>
<td>IPv6 Address 2</td>
<td>::</td>
</tr>
<tr>
<td>IPv6 Link Local</td>
<td>fe80::223:7dff:fe4:15a7</td>
</tr>
<tr>
<td>IPv6 Default Router</td>
<td>::</td>
</tr>
<tr>
<td>IPv6 Target TCP Port No.</td>
<td>3260</td>
</tr>
<tr>
<td>IPv6 VLAN</td>
<td>Disabled</td>
</tr>
<tr>
<td>iSCSI Max First Burst</td>
<td>65536</td>
</tr>
<tr>
<td>iSCSI Max Burst</td>
<td>262144</td>
</tr>
</tbody>
</table>
Show iSNS

Displays Internet simple name service (iSNS) configuration information for the specified iSCSI port. If you do not specify the port, this command displays the iSNS configuration information for all iSCSI ports.

Authority

<table>
<thead>
<tr>
<th>Syntax</th>
<th>show isns [port_num]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keywords</td>
<td>[port_num] The iSCSI port number whose iSNS configuration is to be displayed.</td>
</tr>
</tbody>
</table>

Example:
MEZ75 (admin) #> show isns

iSNS Information
-----------------
iSNS Enabled
IP Address 10.3.6.33
TCP Port No. 3205

Show logs

Displays either all or a portion of the module's event log.

Authority

<table>
<thead>
<tr>
<th>Syntax</th>
<th>show logs [last_x_entries]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keywords</td>
<td>[last_x_entries] Shows only the last x number of module's log entries. For example, show logs 10 displays the last ten entries in the module event log. The show logs command (not specifying number of entries) displays the entire module event log.</td>
</tr>
</tbody>
</table>
**Example:**

MEZ75 (admin) #> show logs

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>User</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/11/2011</td>
<td>22:18:42</td>
<td>UserApp</td>
<td>User has cleared the logs</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:29:23</td>
<td>UserApp</td>
<td>qapisetpresentedtargetchapinfo_1_svc: Chap Configuration Changed</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:31:22</td>
<td>UserApp</td>
<td>qapisetfcinterfaceparams_1_svc: FC port configuration changed</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:31:25</td>
<td>UserApp</td>
<td>qapisetfcinterfaceparams_1_svc: FC port configuration changed</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:31:26</td>
<td>UserApp</td>
<td>qapisetfcinterfaceparams_1_svc: FC port configuration changed</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:31:28</td>
<td>UserApp</td>
<td>qapisetfcinterfaceparams_1_svc: FC port configuration changed</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:35:28</td>
<td>UserApp</td>
<td>qapisetsmsns_1_svc;iSNS configuration changed</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:35:36</td>
<td>BridgeApp</td>
<td>QLIS_HandleTeb: iSNS Connection Failed</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:35:44</td>
<td>BridgeApp</td>
<td>QLIS_HandleTeb: iSNS Connection Failed</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:35:55</td>
<td>UserApp</td>
<td>qapisetmgmintfcparsmsns_1_svc: Management port configuration changed</td>
</tr>
<tr>
<td>03/11/2011</td>
<td>22:44:18</td>
<td>UserApp</td>
<td>qapisetbridgebasicinfo_1_svc: Bridge configuration changed</td>
</tr>
</tbody>
</table>

---

**Show LUNinfo**

Displays complete information for a specified LUN and target.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show luninfo</td>
</tr>
</tbody>
</table>

**Example:**

MEZ75 (admin) #> show luninfo

<table>
<thead>
<tr>
<th>Index</th>
<th>(WWNN,WWPN/iSCSI Name)</th>
</tr>
</thead>
</table>

Please select a Target from the list above ('q' to quit): 1

<table>
<thead>
<tr>
<th>Index</th>
<th>(LUN/VpGroup)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0/VPGROUP_1</td>
</tr>
<tr>
<td>1</td>
<td>1/VPGROUP_1</td>
</tr>
<tr>
<td>2</td>
<td>2/VPGROUP_1</td>
</tr>
<tr>
<td>3</td>
<td>3/VPGROUP_1</td>
</tr>
<tr>
<td>4</td>
<td>4/VPGROUP_1</td>
</tr>
<tr>
<td>5</td>
<td>5/VPGROUP_1</td>
</tr>
<tr>
<td>6</td>
<td>6/VPGROUP_1</td>
</tr>
<tr>
<td>7</td>
<td>7/VPGROUP_1</td>
</tr>
<tr>
<td>8</td>
<td>8/VPGROUP_1</td>
</tr>
<tr>
<td>9</td>
<td>9/VPGROUP_1</td>
</tr>
<tr>
<td>10</td>
<td>10/VPGROUP_1</td>
</tr>
<tr>
<td>11</td>
<td>11/VPGROUP_1</td>
</tr>
<tr>
<td>12</td>
<td>12/VPGROUP_1</td>
</tr>
<tr>
<td>13</td>
<td>0/VPGROUP_2</td>
</tr>
<tr>
<td>14</td>
<td>0/VPGROUP_3</td>
</tr>
<tr>
<td>15</td>
<td>0/VPGROUP_4</td>
</tr>
</tbody>
</table>
Please select a LUN from the list above ('q' to quit):  10

LUN Information
-----------------
WWULN             60:05:08:b4:00:0f:1d:4f:00:01:50:00:00:cf:00:00
LUN Number        10
VendorId          HP
ProductId         HSV340
ProdRevLevel      0005
Portal            0
Lun Size          22528 MB
Lun State         Online

LUN Path Information
---------------------

Show LUNs
Displays LUN information for each target.

Authority
None
Syntax
show luns

Example:
MEZ75 (admin) #> show luns

<table>
<thead>
<tr>
<th>Target (WWPN)</th>
<th>VpGroup</th>
<th>LUN</th>
</tr>
</thead>
<tbody>
<tr>
<td>50:01:43:80:04:c6:89:68</td>
<td>VPGROUP_1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_4</td>
<td>0</td>
</tr>
<tr>
<td>50:01:43:80:04:c6:89:6c</td>
<td>VPGROUP_1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_1</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>VPGROUP_2</td>
<td>0</td>
</tr>
</tbody>
</table>

Commands 251
Show lunmask

Displays all initiators mapped to a user-specified LUN.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show lunmask</td>
</tr>
</tbody>
</table>

Example:
MEZ75 (admin) #> show lunmask

Index   (WWNN,WWPN/iSCSI Name)
-----   ----------------------

Please select a Target from the list above ('q' to quit): 1

Index   (LUN/VpGroup)
-----   -------------
0       0/VPGROUP_1
1       1/VPGROUP_1
2       2/VPGROUP_1
3       3/VPGROUP_1
4       4/VPGROUP_1
5       5/VPGROUP_1
6       6/VPGROUP_1
7       7/VPGROUP_1
8       8/VPGROUP_1
9       9/VPGROUP_1
10      10/VPGROUP_1
11      11/VPGROUP_1
12      12/VPGROUP_1
13      0/VPGROUP_2
14      0/VPGROUP_3
15      0/VPGROUP_4

Please select a LUN from the list above ('q' to quit): 7

LUN     Initiator
---     -----------------
7       10:00:00:00:c9:95:b5:73

Show memory

Displays free and total physical system memory and GE port connections. Does not display information about free space in /var/ftp/.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show memory</td>
</tr>
</tbody>
</table>

Example:
MEZ75 (admin) #> show memory

<table>
<thead>
<tr>
<th>Memory Units</th>
<th>Free/Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>85MB/916MB</td>
</tr>
</tbody>
</table>
Buffer Pool          9812/9856
Nic Buffer Pool      53427/81920
Process Blocks       8181/8192
Request Blocks       8181/8192
Event Blocks         4096/4096
Control Blocks       1024/1024
1K Buffer Pool       4096/4096
4K Buffer Pool       512/512
Sessions             4096/4096

Connections:
10GE1                2048/2048
10GE2                2048/2048

Show mgmt
Displays the module’s management port (10/100) configuration.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show mgmt</td>
</tr>
</tbody>
</table>

**Example:**
MEZ75 (admin) #> show mgmt

Management Port Information
----------------------------
IPv4 Interface           Enabled
IPv4 Mode                Static
IPv4 IP Address          10.6.6.130
IPv4 Subnet Mask         255.255.240.0
IPv4 Gateway             10.6.4.201
IPv6 Interface           Disabled
Link Status              Up
MAC Address              f4-ce-46-fb-0a-40

Show NTP
Displays the module’s network time protocol (NTP) configuration.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show ntp</td>
</tr>
</tbody>
</table>

**Example:**
MEZ50_02 (admin) #> show ntp

NTP Information
-----------------
Mode                     Disabled
Status                   Offline
TimeZone Offset          00:00

MEZ50_02 (admin) #>
Show perf

Displays the port, read, write, initiator, or target performance in bytes per second.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show perf [byte</td>
</tr>
<tr>
<td>Keywords</td>
<td>byte</td>
</tr>
<tr>
<td></td>
<td>init_rbyte</td>
</tr>
<tr>
<td></td>
<td>init_wbyte</td>
</tr>
<tr>
<td></td>
<td>tgt_rbyte</td>
</tr>
<tr>
<td></td>
<td>tgt_wbyte</td>
</tr>
</tbody>
</table>

**Example 1:**

MEZ50 (admin) #> show perf

WARNING: Valid data is only displayed for port(s) that are not associated with any configured FCIP routes.

<table>
<thead>
<tr>
<th>Port Number</th>
<th>Bytes/s (init_r)</th>
<th>Bytes/s (init_w)</th>
<th>Bytes/s (tgt_r)</th>
<th>Bytes/s (tgt_w)</th>
<th>Bytes/s (total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE1</td>
<td>0</td>
<td>0</td>
<td>6M</td>
<td>6M</td>
<td>12M</td>
</tr>
<tr>
<td>GE2</td>
<td>0</td>
<td>0</td>
<td>5M</td>
<td>5M</td>
<td>11M</td>
</tr>
<tr>
<td>GE3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>GE4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FC1</td>
<td>6M</td>
<td>6M</td>
<td>0</td>
<td>0</td>
<td>12M</td>
</tr>
<tr>
<td>FC2</td>
<td>5M</td>
<td>5M</td>
<td>0</td>
<td>0</td>
<td>11M</td>
</tr>
</tbody>
</table>

**Example 2:**

MEZ50 (admin) #> show perf byte

WARNING: Valid data is only displayed for port(s) that are not associated with any configured FCIP routes.

Displaying bytes/sec (total)... (Press any key to stop display)

<table>
<thead>
<tr>
<th>GE1</th>
<th>GE2</th>
<th>GE3</th>
<th>GE4</th>
<th>FC1</th>
<th>FC2</th>
</tr>
</thead>
<tbody>
<tr>
<td>11M</td>
<td>10M</td>
<td>0</td>
<td>0</td>
<td>11M</td>
<td>10M</td>
</tr>
<tr>
<td>12M</td>
<td>11M</td>
<td>0</td>
<td>0</td>
<td>12M</td>
<td>11M</td>
</tr>
<tr>
<td>12M</td>
<td>12M</td>
<td>0</td>
<td>0</td>
<td>12M</td>
<td>12M</td>
</tr>
<tr>
<td>12M</td>
<td>12M</td>
<td>0</td>
<td>0</td>
<td>12M</td>
<td>12M</td>
</tr>
<tr>
<td>11M</td>
<td>11M</td>
<td>0</td>
<td>0</td>
<td>12M</td>
<td>11M</td>
</tr>
<tr>
<td>12M</td>
<td>11M</td>
<td>0</td>
<td>0</td>
<td>12M</td>
<td>11M</td>
</tr>
<tr>
<td>11M</td>
<td>10M</td>
<td>0</td>
<td>0</td>
<td>11M</td>
<td>10M</td>
</tr>
<tr>
<td>12M</td>
<td>12M</td>
<td>0</td>
<td>0</td>
<td>12M</td>
<td>12M</td>
</tr>
</tbody>
</table>
# Show presented targets

Displays targets presented by the module’s FC, FCoE, or iSCSI or for all.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Syntax</th>
<th>show presented targets</th>
<th>fc</th>
<th>iscsi</th>
</tr>
</thead>
</table>

**Keywords**
- **fc** Specifies the display of FC presented targets.
- **iscsi** Specifies the display of iSCSI presented targets.

**Example 1:**

```plaintext
MEZ50 (admin) #> show presented_targets

Presented Target Information
-------------------------------

iSCSI Presented Targets
------------------------
Name: iqn.2004-09.com.hp:fcgw.mez50.1.01.50014380025da538
Alias: <MAPS TO>
WWNN: 50:01:43:80:02:5d:a5:30
WWPN: 50:01:43:80:02:5d:a5:38

Name: iqn.2004-09.com.hp:fcgw.mez50.1.01.50014380025da53c
Alias: eva4k50
<MAPS TO>
WWNN: 50:01:43:80:02:5d:a5:30
WWPN: 50:01:43:80:02:5d:a5:3c
```

**Example 2:**

```plaintext
MEZ75 (admin) #> show presented_targets

Presented Target Information
-------------------------------

FC/FCOE Presented Targets
--------------------------
WWNN: 20:04:f4:ce:46:fb:0a:43
Port ID: ef-0d-02
Port: FC3
Type: FCOE
<MAPS TO>
WWNN: 50:01:43:80:04:69:60
WWPN: 50:01:43:80:04:69:68
VPGroup: 1

WWNN: 20:04:f4:ce:46:fb:0a:44
Port ID: ef-09-02
Port: FC4
Type: FCOE
<MAPS TO>
WWNN: 50:01:43:80:04:69:60
WWPN: 50:01:43:80:04:69:68
VPGroup: 1

WWNN: 20:05:f4:ce:46:fb:0a:43
Port ID: ef-0d-03
```
Port      FC3
Type      FCOE
<MAPS TO>
WWNN      50:01:43:80:04:c6:89:60
WWPN      50:01:43:80:04:c6:89:6c
VPGroup   1

WWNN      20:05:f4:ce:46:fb:0a:44
WWPN      21:05:f4:ce:46:fb:0a:44
Port ID   ef-09-03
Port      FC4
Type      FCOE
<MAPS TO>
WWNN      50:01:43:80:04:c6:89:60
WWPN      50:01:43:80:04:c6:89:6c
VPGroup   1

WWNN      20:06:f4:ce:46:fb:0a:43
WWPN      21:06:f4:ce:46:fb:0a:43
Port ID   ef-09-04
Port      FC3
Type      FCOE
<MAPS TO>
WWNN      50:01:43:80:04:c6:89:60
WWPN      50:01:43:80:04:c6:89:68
VPGroup   2

WWNN      20:06:f4:ce:46:fb:0a:44
WWPN      21:06:f4:ce:46:fb:0a:44
Port ID   ef-09-04
Port      FC4
Type      FCOE
<MAPS TO>
WWNN      50:01:43:80:04:c6:89:60
WWPN      50:01:43:80:04:c6:89:68
VPGroup   2

WWNN      20:09:f4:ce:46:fb:0a:43
WWPN      21:09:f4:ce:46:fb:0a:43
Port ID   ef-0d-05
Port      FC3
Type      FCOE
<MAPS TO>
WWNN      50:01:43:80:04:c6:89:60
WWPN      50:01:43:80:04:c6:89:68
VPGroup   3

WWNN      20:09:f4:ce:46:fb:0a:44
WWPN      21:09:f4:ce:46:fb:0a:44
Port ID   ef-09-05
Port      FC4
Type      FCOE
<MAPS TO>
WWNN      50:01:43:80:04:c6:89:60
WWPN      50:01:43:80:04:c6:89:68
VPGroup   3

WWNN      20:0b:f4:ce:46:fb:0a:43
WWPN      21:0b:f4:ce:46:fb:0a:43
Port ID   ef-0d-06
Port      FC3
Type      FCOE
<MAPS TO>
WWNN      50:01:43:80:04:c6:89:60
WWPN      50:01:43:80:04:c6:89:68

256  Command reference
VPGroup  4
WWNN    20:0b:f4:ce:46:fb:0a:44
WWPN    21:0b:f4:ce:46:fb:0a:44
Port ID ef-09-06
Port    FC4
Type    FCOE
<MAPS TO>
WWNN    50:01:43:80:04:c6:89:60
WWPN    50:01:43:80:04:c6:89:68
VPGroup  4
WWNN    20:07:f4:ce:46:fb:0a:44
WWPN    21:07:f4:ce:46:fb:0a:44
Port ID ef-0d-07
Port    FC3
Type    FCOE
<MAPS TO>
WWNN    50:01:43:80:04:c6:89:60
WWPN    50:01:43:80:04:c6:89:6c
VPGroup  2
WWNN    20:0a:f4:ce:46:fb:0a:44
WWPN    21:0a:f4:ce:46:fb:0a:44
Port ID ef-09-08
Port    FC4
Type    FCOE
<MAPS TO>
WWNN    50:01:43:80:04:c6:89:60
WWPN    50:01:43:80:04:c6:89:6c
VPGroup  3
WWNN    20:0c:f4:ce:46:fb:0a:44
WWPN    21:0c:f4:ce:46:fb:0a:44
Port ID ef-0d-09
Port    FC3
Type    FCOE
<MAPS TO>
WWNN    50:01:43:80:04:c6:89:60
WWPN    50:01:43:80:04:c6:89:6c
VPGroup  3
WWNN    20:0c:f4:ce:46:fb:0a:44
WWPN    21:0c:f4:ce:46:fb:0a:44
Port ID ef-0d-09
Port    FC3
Type    FCOE
<MAPS TO>
WWNN    50:01:43:80:04:c6:89:60
WWPN    50:01:43:80:04:c6:89:6c
VPGroup  4
WWNN    20:0c:f4:ce:46:fb:0a:44
WWPN    21:0c:f4:ce:46:fb:0a:44
Port ID ef-09-09
Port FC4
Type FCOE

WWNN 50:01:43:80:04:c6:89:60
WWPN 50:01:43:80:04:c6:89:6c
VPG 4

iSCSI Presented Targets
-------------------------
Name iqn.2004-09.com.hp:fcgw.mez75.1.01.5001438004c68968
Alias foo2

Name iqn.2004-09.com.hp:fcgw.mez75.1.01.5001438004c6896c
Alias foo2

Name iqn.2004-09.com.hp:fcgw.mez75.1.02.5001438004c6896c
Alias

Name iqn.2004-09.com.hp:fcgw.mez75.1.03.5001438004c6896c
Alias

Name iqn.2004-09.com.hp:fcgw.mez75.1.04.5001438004c6896c
Alias

Authority None
Syntax show properties

Example:
MEZ75 (admin) #> show properties

CLI Properties
----------------
Inactivity Timer   Disabled
Prompt String     MEZ75

Show SNMP
Displays the module’s simple network management protocol (SNMP) and any configured traps.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show snmp</td>
</tr>
</tbody>
</table>

Example:
MEZ75 (admin) #> show snmp

SNMP Configuration
------------------
Read Community               public
Trap Community               private
System Location
System Contact
Authentication traps         Disabled
System OID                   1.3.6.1.4.1.3873.1.20
System Description           HP StorageWorks MEZ75

Show stats
Displays the module statistics: FC and iSCSI.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show stats</td>
</tr>
</tbody>
</table>

Example:
MEZ75 (admin) #> show stats

FC Port Statistics
-------------------
FC Port        FC1
Interrupt Count 101689711
Target Command Count 0
Initiator Command Count 125680315
Link Failure Count 0
Loss of Sync Count 0
Loss of Signal Count 0
Primitive Sequence Error Count 0
Invalid Transmission Word Count 35
Invalid CRC Error Count 0

FC Port        FC2
Interrupt Count 122918453
Target Command Count 0
Initiator Command Count 124846653
Link Failure Count 0
Loss of Sync Count 0
Loss of Signal Count 0
Primitive Sequence Error Count 0
Invalid Transmission Word Count 9
Invalid CRC Error Count 0
<table>
<thead>
<tr>
<th>FC Port</th>
<th>FC3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrupt Count</td>
<td>292953354</td>
</tr>
<tr>
<td>Target Command Count</td>
<td>129313203</td>
</tr>
<tr>
<td>Initiator Command Count</td>
<td>0</td>
</tr>
<tr>
<td>Link Failure Count</td>
<td>0</td>
</tr>
<tr>
<td>Loss of Sync Count</td>
<td>0</td>
</tr>
<tr>
<td>Loss of Signal Count</td>
<td>0</td>
</tr>
<tr>
<td>Primitive Sequence Error Count</td>
<td>0</td>
</tr>
<tr>
<td>Invalid Transmission Word Count</td>
<td>0</td>
</tr>
<tr>
<td>Invalid CRC Error Count</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FC Port</th>
<th>FC4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrupt Count</td>
<td>268764874</td>
</tr>
<tr>
<td>Target Command Count</td>
<td>121869815</td>
</tr>
<tr>
<td>Initiator Command Count</td>
<td>0</td>
</tr>
<tr>
<td>Link Failure Count</td>
<td>0</td>
</tr>
<tr>
<td>Loss of Sync Count</td>
<td>0</td>
</tr>
<tr>
<td>Loss of Signal Count</td>
<td>0</td>
</tr>
<tr>
<td>Primitive Sequence Error Count</td>
<td>0</td>
</tr>
<tr>
<td>Invalid Transmission Word Count</td>
<td>0</td>
</tr>
<tr>
<td>Invalid CRC Error Count</td>
<td>0</td>
</tr>
</tbody>
</table>

**iSCSI Port Statistics**

<table>
<thead>
<tr>
<th>iSCSI Port</th>
<th>10GE1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrupt Count</td>
<td>0</td>
</tr>
<tr>
<td>Target Command Count</td>
<td>0</td>
</tr>
<tr>
<td>Initiator Command Count</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Frames</td>
<td>10</td>
</tr>
<tr>
<td>MAC Xmit Byte Count</td>
<td>780</td>
</tr>
<tr>
<td>MAC Xmit Multicast Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Broadcast Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Pause Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Control Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Deferrals</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Late Collisions</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Aborted</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Single Collisions</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Multiple Collisions</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Collisions</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Dropped Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Xmit Jumbo Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Frames</td>
<td>686069</td>
</tr>
<tr>
<td>MAC Rcvd Byte Count</td>
<td>74913437</td>
</tr>
<tr>
<td>MAC Rcvd Unknown Control Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Pause Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Control Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Dribbles</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Frame Length Errors</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Jabbers</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Carrier Sense Errors</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Dropped Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd CRC Errors</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Encoding Errors</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Length Errors Large</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Length Errors Small</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Multicast Frames</td>
<td>0</td>
</tr>
<tr>
<td>MAC Rcvd Broadcast Frames</td>
<td>0</td>
</tr>
</tbody>
</table>

| PDUs Xmitted | 0 |
| Data Bytes Xmitted | 780 |
| PDUs Rcvd | 0 |
| Data Bytes Rcvd | 74913437 |
| I/O Completed | 0 |
Unexpected I/O Rcvd              0
iSCSI Format Errors             0
Header Digest Errors            0
Data Digest Errors              0
Sequence Errors                 0
IP Xmit Packets                 0
IP Xmit Byte Count              0
IP Xmit Fragments               0
IP Rcvd Packets                 0
IP Rcvd Byte Count              0
IP Rcvd Fragments               0
IP Datagram Reassembly Count    0
IP Error Packets                0
IP Fragment Rcvd Overlap        0
IP Fragment Rcvd Out of Order   0
IP Datagram Reassembly Timeouts 0
TCP Xmit Segment Count          10
TCP Xmit Byte Count             0
TCP Rcvd Segment Count          686069
TCP Rcvd Byte Count             74913437
TCP Persist Timer Expirations   0
TCP Rxmit Timer Expired         0
TCP Rcvd Duplicate Acks         0
TCP Rcvd Pure Acks              0
TCP Xmit Delayed Acks           0
TCP Xmit Pure Acks              0
TCP Rcvd Segment Errors         0
TCP Rcvd Segment Out of Order   0
TCP Rcvd Window Probes          0
TCP Rcvd Window Updates         0
TCP ECC Error Corections        0

iSCSI Port Statistics
-----------------------
iSCSI Port                        10GE2
Interrupt Count                  0
Target Command Count             0
Initiator Command Count          0
MAC Xmit Frames                  5
MAC Xmit Byte Count              390
MAC Xmit Multicast Frames        0
MAC Xmit Broadcast Frames        0
MAC Xmit Pause Frames            0
MAC Xmit Control Frames          0
MAC Xmit Deferrals               0
MAC Xmit Late Collisions         0
MAC Xmit Aborted                 0
MAC Xmit Single Collisions       0
MAC Xmit Multiple Collisions     0
MAC Xmit Collisions              0
MAC Xmit Dropped Frames          0

Show system

Displays module product information, including the serial number, hardware and software versions, port quantities, and temperature.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show system</td>
</tr>
</tbody>
</table>

Example:

MEZ75 (admin) #> show system
Show targets

Displays targets discovered by the module’s FC, FCoE, or iSCSI ports or by all ports.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show targets fc iscsi</td>
</tr>
<tr>
<td>Keywords</td>
<td>fc Specifies the display of FC targets.</td>
</tr>
<tr>
<td></td>
<td>iscsi Specifies the display of iSCSI targets.</td>
</tr>
</tbody>
</table>

Example:

MEZ75 (admin) #> show targets

Target Information
-------------------
| WWNN    | 50:01:43:80:04:c6:89:60 |
| WWPN    | 50:01:43:80:04:c6:89:68 |
| Port ID | 00-00-aa |
| State   | Online |
| WWNN    | 50:01:43:80:04:c6:89:60 |
| WWPN    | 50:01:43:80:04:c6:89:6c |
| Port ID | 00-00-b1 |
| State   | Online |

Show VPGroups

Displays information about the modules’s configured virtual port groups.

<table>
<thead>
<tr>
<th>Authority</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>show vpgroups [vp index]</td>
</tr>
<tr>
<td>Keywords</td>
<td>vp index The number (1–4) of the virtual port group to be displayed.</td>
</tr>
</tbody>
</table>

Example 1:

MEZ75 (admin) #> show vpgroups
VpGroup Information
---------------------
Index 1
VpGroup Name VPGROUP_1
Status Enabled
WWPNs
21:00:00:c0:dd:00:00:75
21:00:00:c0:dd:00:00:76

Index 2
VpGroup Name VPGROUP_2
Status Enabled
WWPNs
21:01:00:c0:dd:00:00:75
21:01:00:c0:dd:00:00:76

Index 3
VpGroup Name VPGROUP_3
Status Enabled
WWPNs
21:02:00:c0:dd:00:00:75
21:02:00:c0:dd:00:00:76

Index 4
VpGroup Name VPGROUP_4
Status Enabled
WWPNs
21:03:00:c0:dd:00:00:75
21:03:00:c0:dd:00:00:76

Example 2: The iSCSI module does not presently support VPgroups.

MEZ50 (admin) #> show vpgroups
Usage: show [ chap | fc | features | initiators |
initiators_lunmask | iscsi |
isns | logs |
luns | luninfo |
lunmask | memory |
mgmt | ntp |
perf | presented_targets |
properties | snmp |
stats | system |
targets | |

Shutdown

Shuts down the module.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>shutdown</td>
</tr>
</tbody>
</table>

Example: This operation disables the iSCSI or iSCSI/FCoE module, a controller power cycle is required to reactivate the iSCSI or iSCSI/FCoE module.

MEZ75 (admin) #> shutdown

Are you sure you want to shutdown the System (y/n):

Target

Removes an offline target from the module’s database. Typically, you will use this command to remove targets from the database that are no longer connected to the module or to add a target that was offline. However, these commands are not needed by the iSCSI and iSCSI/FCoE modules.
because the targets are auto detected and the show targets displayed information can be a helpful debug aid.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>target</td>
</tr>
<tr>
<td></td>
<td>add</td>
</tr>
<tr>
<td></td>
<td>rm</td>
</tr>
<tr>
<td>Keywords</td>
<td>rm</td>
</tr>
<tr>
<td></td>
<td>Removes a target from the module’s target database.</td>
</tr>
</tbody>
</table>

**Example:**

MEZ75 (admin) #> **target rm**

Warning: This command will cause the removal of all mappings and maskings associated with the target that is selected.

<table>
<thead>
<tr>
<th>Index</th>
<th>State</th>
<th>(WWNN,WWPN/iSCSI Name)</th>
</tr>
</thead>
</table>

Please select an 'OFFLINE' Target from the list above ('q' to quit):

**Traceroute**

Prints the route a network packet takes to reach the destination specified by the user.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>traceroute</td>
</tr>
</tbody>
</table>

**Example:**

MEZ75 (admin) #> **traceroute**

A list of attributes with formatting and current values will follow. Enter a new value or simply press the ENTER key to accept the current value. If you wish to terminate this process before reaching the end of the list press 'q' or 'Q' and the ENTER key to do so.

IP Address (IPv4 or IPv6) [0.0.0.0] 10.6.6.131
Outbound Port (0=Mgmt, 1=GE1, 2=GE2, ...) [Mgmt ] 0

Tracing route to 10.6.6.131 over a maximum of 30 hops:

1 10.6.6.131 0.1ms 0.1ms 0.1ms

Traceroute completed in 1 hops.
The CLI enables you to perform a variety of iSCSI or iSCSI/FCoE module management tasks through an Ethernet or serial port connection. However, HP P6000 Command View should be the primary management tool for the iSCSI and ISCSI/FCoE modules. The CLI is a supplemental interface.

Logging on to an iSCSI or iSCSI/FCoE module

You can either use Telnet or Secure SHell (SSH) to log on to a module, or you can log on to the switch through the serial port. To log on to the module using Telnet:

1. On the workstation, open a command line window.
2. Enter the telnet command followed by the IP address:
   
   ```
   telnet <ip address>
   ```

   **NOTE:** This is the management port IP address of either iSCSI controller 01 or 02, and may be a static IP, a DHCP provided IP, or a default static IP.

   A Telnet window opens and prompts you to log in.
3. Enter an account name and password.

   To log on to a module using SSH:

   **NOTE:** SSH works in a way similar to Telnet, except it uses ROSA to encode transmissions to and from your workstation and the HP iSCSI or iSCSI/FCoE module.

   1. On the workstation, open a command line window.
   2. Enter the `ssh` command followed by the module mgmt port IP address:
      
      ```
      ssh <ip address>
      ```

      An SSH window opens and prompts you to log in.
3. Enter an account name and password.

To log on to a switch through the serial port:

1. Configure the workstation port with the following settings, using an RJ45 to DB9 dongle (HP spares part number 663678–001) and a standard RJ45 Ethernet cable:

   - 115200 baud
   - 8-bit character
   - 1 stop bit
   - No parity, and flow control—none

2. When prompted, enter an account name and password (typically, `guest` and `password`).

Understanding the guest account

iSCSI and iSCSI/FCoE modules come from the factory with the guest account already defined. This guest account provides access to the module and its configuration. After planning your management needs, consider changing the password for this account. For information about changing passwords, see the “passwd command” (page 228). The guest account is automatically closed after 15 minutes of inactivity. For example:

```
login as: guest
guest@172.17.136.86's password: *******
```

```
* *******************************************************
* HP StorageWorks MEZ50 *
* *******************************************************
MEZ50 (admin) #> show system
```
Working with iSCSI or iSCSI/FCoE module configurations

Successfully managing iSCSI and iSCSI/FCoE modules with the CLI depends on effective module configurations. Key module management tasks include modifying configurations, backing up configurations, and restoring configurations.

Status viewing through the use of the show commands can be quite helpful in collecting information needed to resolve problems.

- show fc
- show iscsi
- show perf
- show stats
- show lun
- show luninfo
- show initiators
- show initiators_lunmask
- show targets
- show presented_targets
- show system
- show logs nn

**NOTE:** Mapping and unmapping LUNs through the CLI is likely to result in inconsistencies with HP P6000 Command View and is not recommended by HP. There may be cases where a CLI reset mappings is a more effective method of addressing these inconsistencies than using the CLI lunmask add or lunmask rm commands.
Modifying a configuration

The module has the following major areas of configuration:

- **Management port configuration** requires the use of the following commands:
  - The “set mgmt command” (page 236)
  - The “show mgmt command” (page 253)

- **iSCSI port configuration** requires using the following commands:
  - The “set iSCSI command” (page 235)
  - The “show iSCSI command” (page 247)

- **Virtual port groups configuration** requires the following commands:
  - The “set VPGroups command” (page 239)
  - The “show VPGroups command” (page 262)

- **LUN mapping** requires the use of the “show lunmask command” (page 252).

Saving and restoring iSCSI or iSCSI/FCoE controller configurations

Saving and restoring a configuration helps protect your work. You can also use a saved configuration as a template for configuring other modules.

Persistent data consists of system settings, virtual port group settings, LUN mappings, discovered FC targets, and discovered iSCSI initiators. To save a module’s configuration and persistent data:

1. Generate a file (HP_StorageWorks_MEZ50_FRU.bin) containing the saved data (see page 2-12), by entering the fru save CLI command. This command stores the file locally on the module in an FTP directory.

2. Transfer the saved data from the iSCSI or iSCSI/FCoE module to a workstation by executing an FTP utility on a workstation.

The following example shows an FTP transfer to get the saved module configuration data:

```
c:\> ftp 172.17.137.102
Connected to 172.17.137.102.
220 (none) FTP server (GNU inetutils 1.4.2) ready.
User (172.17.137.102:(none)) : ftp
331 Guest login ok, type your name as password.
Password: ftp
230 Guest login ok, access restrictions apply.
ftp> bin
200 Type set to I.
ftp> get HP_StorageWorks_MEZ50_FRU.bin
200 PORT command successful.
150 Opening BINARY mode data connection for 'HP_StorageWorks_MEZ50_FRU.bin' (6168 bytes).
226 Transfer complete.
ftp: 6168 bytes received in 0.00 Seconds 6168000.00 Kbytes/sec.
ftp> quit
221 Goodbye.
```

Restoring iSCSI or iSCSI/FCoE module configuration and persistent data

1. Transfer the saved data from a workstation to the iSCSI or iSCSI/FCoE module by executing an FTP utility on the workstation.

   The following example shows an FTP transfer to put previously saved module configuration data on the module:

   ```
c:\> ftp 172.17.137.102
Connected to 172.17.137.102.
```
220 (none) FTP server (GNU inetutils 1.4.2) ready.
User (172.17.137.102:(none)):
User login ok, type your name as password.
Password: ftp
230 Guest login ok, access restrictions apply.
ftp> bin

NOTE: Use of the CLI fru save does not capture all required P6000 information and a fru restore is likely to result in HP P6000 Command View inconsistencies which prevent normal operations. Use HP P6000 Command View for all normal save and restore operations.

200 Type set to I.
ftp> put HP StorageWorks MEZ50_FRU.bin
200 PORT command successful.
150 Opening BINARY mode data connection for 'HP StorageWorks MEZ50_FRU.bin'.
226 Transfer complete.
ftp: 6168 bytes sent in 0.00 Seconds 6168000.00 Kbytes/sec.
ftp> quit
221 Goodbye.

2. Update an iSCSI or iSCSI/FCoE module with the saved configuration data (see page 2-12) by executing the fru restore CLI command. The fru restore command has the following two options:
   - **Full restore** restores all module configuration parameters, including IP addresses, subnet masks, gateways, virtual port group settings, LUN mappings, and all other persistent data.
   - **Partial restore** restores only the LUN mappings and persistent data, such as discovered FC targets and iSCSI initiators.
E Simple Network Management Protocol

Simple network management protocol (SNMP) provides monitoring and trap functions for managing the module through third-party applications that support SNMP. The module firmware supports SNMP versions 1 and 2 and a QLogic management information base (MIB) (see “Management Information Base” (page 270)). You may format traps using SNMP version 1 or 2.

SNMP parameters

You can set the SNMP parameters using the CLI. (For command details, see the “set SNMP command” (page 238))

Table 33 (page 269) describes the SNMP parameters.

Table 33 SNMP parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read community</td>
<td>A password that authorizes an SNMP management server to read information from the module. This is a write-only field. The value on the module and the SNMP management server must be the same. The read community password can be up to 32 characters, excluding the number sign (#), semicolon (;), and comma (,). The default is password is private.</td>
</tr>
<tr>
<td>Trap community</td>
<td>A password that authorizes an SNMP management server to receive traps. This is a write-only field. The value on the module and the SNMP management server must be the same. The trap community password can be up to 32 characters, excluding the number sign (#), semicolon (;), and comma (,). The default password is private.</td>
</tr>
<tr>
<td>System location</td>
<td>Specifies the name of the module location. The name can be up to 64 characters, excluding the number sign (#), semicolon (;), and comma (,). The default is undefined.</td>
</tr>
<tr>
<td>System contact</td>
<td>Specifies the name of the person to be contacted to respond to trap events. The name can be up to 64 characters, excluding the number sign (#), semicolon (;), and comma (,). The default is undefined.</td>
</tr>
<tr>
<td>Authentication traps</td>
<td>Enables or disables the generation of authentication traps in response to authentication failures. The default is disabled.</td>
</tr>
</tbody>
</table>

SNMP trap configuration parameters

SNMP trap configuration lets you set up to eight trap destinations. Choose from Traps 1–Trap 8 to configure each trap. Table 34 (page 269) describes the parameters for configuring an SNMP trap.

Table 34 SNMP trap configuration parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trap n enabled</td>
<td>Enables or disables trap n. If disabled, the trap is not configured.</td>
</tr>
<tr>
<td>Trap address*</td>
<td>Specifies the IP address to which the SNMP traps are sent. A maximum of eight trap addresses are supported. The default address for traps is 0.0.0.0.</td>
</tr>
<tr>
<td>Trap port*</td>
<td>Port number on which the trap is sent. The default is 162. If the trap destination is not enabled, then this value is 0 (zero). Most SNMP managers and management software listen on this port for SNMP traps.</td>
</tr>
<tr>
<td>Trap version</td>
<td>Specifies the SNMP version (1 or 2) with which to format traps.</td>
</tr>
</tbody>
</table>

* Trap address (other than 0.0.0.0.) and trap port combinations must be unique. For example, if trap 1 and trap 2 have the same address, then they must have different port values. Similarly, if trap 1 and trap 2 have the same port value, they must have different addresses.
Management Information Base

This section describes the QLogic management information base (MIB).

Network port table

The network port table contains a list of network ports that are operational on the module. The entries in this table include the management port (labeled MGMT), and the Gigabit Ethernet ports (labeled GE1 and GE2).

<table>
<thead>
<tr>
<th>qsrNwPortTable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td><strong>Access</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>qsrNwPortEntry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td><strong>Access</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

A network port entry consists of the following sequence of objects:

- `qsrNwPortRole` (QsrPortRole)
- `qsrNwPortIndex` (unsigned32)
- `qsrNwPortAddressMode` (INTEGER)
- `qsrIPAddressType` (InetAddressType)
- `qsrIPAddress` (InetAddress)
- `qsrNetMask` (InetAddress)
- `qsrGateway` (InetAddress)
- `qsrMacAddress` (MacAddress)
- `qsrNwLinkStatus` (QsrLinkStatus)
- `qsrNwLinkRate` (QsrLinkRate)

<table>
<thead>
<tr>
<th>qsrNwPortRole</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td><strong>Access</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>qsrNwPortIndex</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td><strong>Access</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>qsrNwPortAddressMode</strong></td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td>1 = Static</td>
</tr>
<tr>
<td>2 = DHCP</td>
</tr>
<tr>
<td>3 = Bootp</td>
</tr>
<tr>
<td>4 = RARP</td>
</tr>
<tr>
<td><strong>Access</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>qsrIPAddressType</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
<td>InetAddressType</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>Read-only</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>IP address type: ipv4 or ipv6.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>qsrIPAddress</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
<td>InetAddress</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>Read-only</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>IP address of the port.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>qsrNetMask</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
<td>InetAddress</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>Read-only</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Subnet mask for this port.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>qsrGateway</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
<td>InetAddress</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>Read-only</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Gateway for this port.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>qsrMacAddress</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
<td>IMacAddress</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>Read-only</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>MAC address for this port.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>qstNwLinkStatus</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
<td>QsrLinkStatus</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>Read-only</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Operational link status for this port.</td>
</tr>
</tbody>
</table>
### qsrNwLinkRate

<table>
<thead>
<tr>
<th>Syntax</th>
<th>QsrLinkRate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>Operational link rate for this port.</td>
</tr>
</tbody>
</table>

### FC port table

This table contains a list of the Fibre Channel (FC) ports on the module. There are as many entries in this table as there are FC ports on the module.

<table>
<thead>
<tr>
<th>qsrFcPortTable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
</tr>
<tr>
<td>Access</td>
</tr>
<tr>
<td>Description</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>qsrFcPortEntry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
</tr>
<tr>
<td>Access</td>
</tr>
<tr>
<td>Description</td>
</tr>
</tbody>
</table>

An FC port entry consists of the following sequence of objects:

- `qsrFcPortRole` (QsrPortRole)
- `qsrFcPortIndex` (unsigned32)
- `qsrFcPortNodeWwn` (PhysAddress)
- `qsrFcPortWwn` (PhysAddress)
- `qsrFcPortId` (PhysAddress)
- `qsrFcPortType` (Unsigned32)
- `qsrFcLinkStatus` (QsrLinkStatus)
- `qsrFcLinkRate` (QsrLinkRate)

### qsrFcPortRole

<table>
<thead>
<tr>
<th>Syntax</th>
<th>QsrPortRole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Not accessible</td>
</tr>
<tr>
<td>Description</td>
<td>Operational role of this port: FCP mode or frame shuttle mode.</td>
</tr>
</tbody>
</table>

### qsrFcPortIndex

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Unsigned32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Not accessible</td>
</tr>
<tr>
<td>Description</td>
<td>A positive integer indexing each FC port in a given role.</td>
</tr>
</tbody>
</table>
### qsrFcPortNodeWwn

**Syntax**  
PhysAddress

**Access**  
Read-only

**Description**  
World wide name of the node that contains this port.

### qsrFcPortWwn

**Syntax**  
PhysAddress

**Access**  
Read-only

**Description**  
World wide name for this port.

### qsrFcPortId

**Syntax**  
PhysAddress

**Access**  
Read-only

**Description**  
Interface’s 24-bit FC address identifier.

### qsrFcPortType

**Syntax**  
Unsigned32

**Access**  
Read-only

**Description**  
Type of FC port, as indicated by the use of the appropriate value assigned by IANA. The IANA-maintained registry for FC port types is located here:  
www.iana.org/assignments/fc-port-types

### qsrFcLinkStatus

**Syntax**  
QsrLinkStatus

**Access**  
Read-only

**Description**  
Current link status for this port.

### qsrFcLinkRate

**Syntax**  
QsrLinkRate

**Access**  
Read-only

**Description**  
Current link rate for this port.

---

**Initiator object table**

The initiator object table is a list of the iSCSI initiators that have been discovered by the module. There are as many entries in this table as there are iSCSI initiators on the module.

### qsrIsInitTable

**Syntax**  
SEQUENCE OF QsrIsInitEntry

**Access**  
Not accessible

**Description**  
Entries in this table contain information about initiators.
An iSCSI initiator information entry consists of the following sequence of the object:

- **qsrIsInitIndex**: Unsigned32
- **qsrIsInitName**: SnmpAdminString
- **qsrIsInitAlias**: SnmpAdminString
- **qsrIsInitAddressType**: InetAddressType
- **qsrIsInitAddress**: InetAddress
- **qsrIsInitStatus**: INTEGER
- **qsrIsInitOsType**: SnmpAdminString
- **qsrIsInitChapEnabled**: INTEGER

### qsrIsInitIndex
- **Syntax**: Unsigned32
- **Access**: Not accessible
- **Description**: An arbitrary positive integer denoting each iSCSI initiator discovered by the module.

### qsrIsInitName OBJECT-TYPE
- **Syntax**: SnmpAdminString
- **Access**: Not accessible
- **Description**: iSCSI name of the initiator.

### qsrIsInitAlias OBJECT-TYPE
- **Syntax**: SnmpAdminString
- **Access**: Read-only
- **Description**: Alias for the iSCSI initiator.

### qsrIsInitAddressType
- **Syntax**: InetAddressType
- **Access**: Read-only
- **Description**: Type of iSCSI initiator’s IP address (IPv4 or IPv6).

### qsrIsInitAddress
- **Syntax**: InetAddress
- **Access**: Read-only
- **Description**: IP address of the iSCSI initiator.
### qsrIsInitStatus

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Integer: 1 = unknown, 2 = loggedIn, 3 = loggedOut, 4 = recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>Status of the iSCSI initiator, that is, whether or not it is logged in to the module.</td>
</tr>
</tbody>
</table>

### qsrIsInitOsType

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SnmpAdminString</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>The type of the iSCSI initiator’s operating system.</td>
</tr>
</tbody>
</table>

### qsrIsInitChapEnabled

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Integer: 0 = enabled; 2 = disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>A value indicating whether CHAP is enabled or not for this iSCSI initiator.</td>
</tr>
</tbody>
</table>

## LUN table

These tables contain information about the logical unit number (LUN) list.

### qsrLunTable

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SEQUENCE OF QsrLunEntry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Not accessible</td>
</tr>
<tr>
<td>Description</td>
<td>A list of the LUNs on the FC targets discovered by the module. There are as many entries in this table as there are FC targets on the module.</td>
</tr>
</tbody>
</table>

### qsrLunEntry

<table>
<thead>
<tr>
<th>Syntax</th>
<th>QsrLunEntry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Not accessible</td>
</tr>
<tr>
<td>Description</td>
<td>Each entry (row) contains information about a specific LUN. This table extends scsiDscLunTable in QLOGIC-SCSI-MIB. The entries in this table show other attributes of the LUN.</td>
</tr>
</tbody>
</table>

The QsrLunEntry contains of following sequences of objects.

- `qsrLunWwuln`  : PhysAddress
- `qsrLunVendorId`  : SnmpAdminString
- `qsrLunProductId`  : SnmpAdminString
- `qsrLunProdRevLevel`  : SnmpAdminString
- `qsrLunSize`  : Unsigned32
- `qsrLunState`  : INTEGER
### qsrLunWwuln

<table>
<thead>
<tr>
<th>Syntax</th>
<th>PhysAddress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>The worldwide unique LUN name (WWULN) for the LUN.</td>
</tr>
</tbody>
</table>

### qsrLunVendorId

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SnmpAdminString</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>Vendor ID for the LUN.</td>
</tr>
</tbody>
</table>

### qsrLunProductId

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SnmpAdminString</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>Product ID for the LUN</td>
</tr>
</tbody>
</table>

### qsrLunProdRevLevel

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SnmpAdminString</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>Product revision level for the LUN</td>
</tr>
</tbody>
</table>

### qsrLunSize OBJECT-TYPE

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Unsigned32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>Size of the LUN (in megabytes)</td>
</tr>
</tbody>
</table>

### qsrLunState

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Integer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>State of the LUN (online or offline)</td>
</tr>
</tbody>
</table>

### qsrLunVPGroupid

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Integer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Read-only</td>
</tr>
<tr>
<td>Description</td>
<td>ID of the VP group to which this LUN belongs</td>
</tr>
</tbody>
</table>
VP group table

This table contains a list of virtual port groups (VPGs). There are four entries in this table at any point of time.

The QsrVPGroupEntry contains the following sequence of objects:

- **qsrVPGroupIndex** (Unsigned32)
- **qsrVPGroupId** (Integer)
- **qsrVPGroupName** (SnmpAdminString)
- **qsrVPGroupWWNN** (VpGroupWwnnAndWwpn)
- **qsrVPGroupWWPN** (VpGroupWwnnAndWwpn)
- **qsrVPGroupStatus** (INTEGER)
Sensor table

The sensor table lists all the sensors on the module. Each table row specifies a single sensor.

<table>
<thead>
<tr>
<th>qsrSensorTable</th>
<th>SEQUENCE OF QsrSensorEntry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>Not accessible</td>
</tr>
<tr>
<td>Access</td>
<td>Not accessible</td>
</tr>
<tr>
<td>Description</td>
<td>List of all the sensors on the module. The table contains as many entries (rows) as there are sensors.</td>
</tr>
</tbody>
</table>

A sensor entry consists of the following sequence of objects:

- qsrSensorType : INTEGER
- qsrSensorIndex : Unsigned32
- qsrSensorUnits : INTEGER
- qsrSensorValue : Integer32
- qsrUpperThreshold : Integer32
- qsrLowerThreshold : Integer32
- qsrSensorState : INTEGER

<table>
<thead>
<tr>
<th>qsrSensorType</th>
<th>INTEGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>Temperature = 1</td>
</tr>
<tr>
<td>Access</td>
<td>Not accessible</td>
</tr>
<tr>
<td>Description</td>
<td>Type of data being measured by this sensor.</td>
</tr>
</tbody>
</table>
### qsrSensorIndex

**Syntax**  
Unsigned32

**Access**  
Not accessible

**Description**  
A positive integer identifying each sensor of a given type.

### qsrSensorUnits

**Syntax**  
INTEGER  
Celsius = 1

**Access**  
Read-only

**Description**  
Unit of measurement for the sensor.

### qsrSensorValue

**Syntax**  
Integer32

**Access**  
Read-only

**Description**  
Current value of the sensor.

### qsrUpperThreshold

**Syntax**  
Integer32

**Access**  
Read-only

**Description**  
Upper-level threshold for this sensor.

### qsrLowerThreshold

**Syntax**  
Integer32

**Access**  
Read-only

**Description**  
Lower-level threshold for this sensor.

### qsrSensorState

**Syntax**  
INTEGER

**Access**  
Read-only

**Description**  
State of this sensor, indicating the health of the system:  
Unknown = The sensor value/thresholds cannot be determined.  
Normal = The sensor value is within normal operational limits.  
Warning = The sensor value is approaching a threshold.  
Critical = The sensor value has crossed a threshold.

## Notifications

The module provides the notification types described in this section.

**NOTE:** Every notification uses qsrBladeSlot as one of the objects. This determines the originator module for the same notification.
System information objects

System information objects provide the system serial number, version numbers (hardware/software/agent), and number of ports (FC/GE).

<table>
<thead>
<tr>
<th>Name</th>
<th>Syntax</th>
<th>Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>qsrSerialNumber</td>
<td>SnmpAdminString</td>
<td>Read-only</td>
<td>System serial number.</td>
</tr>
<tr>
<td>qsrHwVersion</td>
<td>SnmpAdminString</td>
<td>Read-only</td>
<td>System hardware version number.</td>
</tr>
<tr>
<td>qsrSwVersion</td>
<td>SnmpAdminString</td>
<td>Read-only</td>
<td>System software (firmware) version number.</td>
</tr>
<tr>
<td>qsrNoOfFcPorts</td>
<td>Unsigned32</td>
<td>Read-only</td>
<td>Quantity of FC ports on the system.</td>
</tr>
<tr>
<td>qsrNoOfGbEPorts</td>
<td>Unsigned32</td>
<td>Read-only</td>
<td>Quantity of gigabit Ethernet ports on the system.</td>
</tr>
<tr>
<td>qsrAgentVersion</td>
<td>SnmpAdminString</td>
<td>Read-only</td>
<td>Version number of the agent software on the system.</td>
</tr>
</tbody>
</table>

Notification objects

This section defines the objects used in notifications.

<table>
<thead>
<tr>
<th>Name</th>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>qsrEventSeverity</td>
<td>INTEGER</td>
<td></td>
</tr>
</tbody>
</table>
### Accessible for notify Access

<table>
<thead>
<tr>
<th>Description</th>
<th>Accessible for notify</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate the severity of the event. The value clear specifies that a condition that caused an earlier trap is no longer present.</td>
<td></td>
</tr>
</tbody>
</table>

### qsrEventDescription

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SnmpAdminString</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Accessible for notify</td>
</tr>
<tr>
<td>Description</td>
<td>A textual description of the event that occurred.</td>
</tr>
</tbody>
</table>

### qsrEventTimeStamp

<table>
<thead>
<tr>
<th>Syntax</th>
<th>DateAndTime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Accessible for notify</td>
</tr>
<tr>
<td>Description</td>
<td>Indicates when the event occurred.</td>
</tr>
</tbody>
</table>

#### Agent startup notification

The agent startup notification indicates that the agent on the module has started running. qsrAgentStartup uses the qsrEventTimeStamp object.

#### Agent shutdown notification

The agent shutdown notification indicates that the agent on the module is shutting down. qsrAgentShutdown uses the qsrEventTimeStamp object.

#### Network port down notification

The network port down notification indicates that the specified network port is down. The next time the port comes up, this event is sent with the qsrEventSeverity object set to clear. qsrNwPortDown uses the following objects:

- qsrNwLinkStatus
- qsrEventTimeStamp
- qsrEventSeverity

Network notifications are sent for the following events:

- Management port: down or up
- iSCSI port: down or up
- Port number (1–4)

#### FC port down notification

The FC port down notification indicates that the specified FC port is down. The next time the port comes up, this event is sent with the qsrEventSeverity object set to clear. qsrFcPortDown uses the following objects:

- qsrFcLinkStatus
- qsrEventTimeStamp
- qsrEventSeverity
FC notifications are sent for the following events:
- Fibre Channel port: down or up
- down or up Port number (1–4)

**Target device discovery**

The Fibre Channel target device discovery notification indicates that the specified Fibre Channel target is online or offline.

`qsrDscTgtStatusChanged` uses the following objects:
- `qsrBladeSlot`
- `qsrEventTimeStamp`
- `qsrFcTgtState`
- `qsrEventSeverity`

FC target device discovery notifications are sent for the following event:
- FC Target
  - State: Discovered, went offline, or went online
  - Target WWPN

**Target presentation (mapping)**

The target presentation notification indicates that the specified target has been presented (mapped) or unpresented (unmapped).

`qsrPresTgtMapped` uses the following objects:
- `qsrBladeSlot`
- `qsrEventTimeStamp`
- `qsrPresTgtMapped`
- `qsrPresTgtUnmapped`
- `qsrEventSeverity`

Target presentation notifications are sent for the following event:
- Target Presentation
  - State: Presented (mapped) or unpresented (unmapped)
  - Target name

**VP group notification**

The VP group notification indicates that the specified VP group is enabled or disabled. It also represents change in the name of the VP group.

`qsrVPGroupStatusChanged` uses the following objects:
- `qsrBladeSlot`
- `qsrVPGroupIndex`
- `qsrVPGroupStatus`
- `qsrEventTimeStamp`
- `qsrEventSeverity`
VP group notifications are sent for the following events:
- Change in name of a VP group
- Enabling and disabling a VP group

Sensor notification
The sensor notification indicates that the state for the specified sensor is not normal. When the sensor returns to the normal state, this event is sent with the qsrEventSeverity object set to clear.
qsrSensorNotification uses the following objects:
- qsrSensorValue
- qsrSensorState
- qsrEventTimeStamp
- qsrEventSeverity

Sensor notifications are sent for the following events:
- Over Temperature; sensor number (1 of 1)
- Temperature returned to normal; sensor number (1 of 1)

Generic notification
The generic notification reports events other than the defined event types. It provides a description object that identifies the event in clear text.
qsrGenericEvent uses the following objects:
- qsrEventTimeStamp
- qsrEventSeverity
- qsrEventDescription

Generic notifications are sent for the following events:
- FC port configuration change; port number (1 of 4)
- iSCSI port configuration change; port number (1 of 4)
- iSNS configuration change
- NTP configuration change
- Module configuration change
- Management port configuration change
- Firmware upgrade complete
- Reboot module
This appendix provides details about messages logged to a file. The message log is persistent because it is maintained across module power cycles and reboots. Information in Table 35 (page 284) is organized as follows:

- The **ID** column specifies the message identification numbers in ascending order.
- The **Log Message** column indicates the message text displayed in the iSCSI or iSCSI/FCoE module’s CLI. Note that:
  - Log messages for the iSCSI driver module are common to both iSCSI ports. Log messages beginning with #0 denote iSCSI port 1 (GE1) and log messages beginning with #1 denote iSCSI port 2 (GE2).
  - Log messages for the FC driver module are common to both FC ports. Log messages beginning with #0 denote FC port 1 (FC1) and log messages beginning with #1 denote FC port 2 (FC2).
- The **Module Type** column specifies the message reporting module, where:
  - **App** = Application module
  - **FC** = FC driver
  - **iSCSI** = iSCSI driver
  - **System** = System module
  - **TOE** = TCP/IP offload engine module
  - **User** = User module
- The **Msg. Type** column specifies the log message type, where:
  - **Error** = Error log message
  - **Fatal** = Fatal log message
  - **Info** = Informational log message
- The **Description** column provides additional information about the log message.

### Table 35 iSCSI or iSCSI/FCoE module log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>Module Type</th>
<th>Msg Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>40967</td>
<td>QLBA_NullDoorbell: driver unloaded, port disabled</td>
<td>App</td>
<td>Error</td>
<td>NULL doorbell routine for unloaded drivers. When a driver is unloaded, the doorbell routine is redirected to this NULL routine.</td>
</tr>
<tr>
<td>40996</td>
<td>QLBA_ProcessTrb: Processing unsupported ordered tag command</td>
<td>App</td>
<td>Error</td>
<td>Processing unsupported ordered tag task management command.</td>
</tr>
<tr>
<td>41004</td>
<td>QLBA_ProcessTrb: Processing unsupported head of queue tag command</td>
<td>App</td>
<td>Error</td>
<td>Processing unsupported head-of-queue task management command.</td>
</tr>
<tr>
<td>41058</td>
<td>QLBA_CreateTargetDeviceObject: Too many devices</td>
<td>App</td>
<td>Error</td>
<td>Unable to create an object for the target device; exceeded the maximum number of target devices.</td>
</tr>
<tr>
<td>41060</td>
<td>QLBA_CreateTargetNodeObject: Too many devices</td>
<td>App</td>
<td>Error</td>
<td>Unable to create an object for the target node; exceeded the maximum number of target devices.</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Category</td>
<td>Error</td>
<td>Additional Information</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------</td>
<td>-------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>41067</td>
<td>QLBA_CreateLunObject: LunObject memory unavailable</td>
<td>App</td>
<td>Error</td>
<td>Memory unavailable for LUN object.</td>
</tr>
<tr>
<td>41077</td>
<td>QLBA_CreateInitiatorObject: Too many initiators</td>
<td>App</td>
<td>Error</td>
<td>Unable to create an object for initiator object; exceeded the maximum number of initiators.</td>
</tr>
<tr>
<td>41096</td>
<td>QLBA_DisplayTargetOperationStatus: PCI Error, Status 0x%.2x</td>
<td>App</td>
<td>Error</td>
<td>Process control block status indicates that a peripheral component interface/interconnect (PCI) error occurred during a target operation.</td>
</tr>
<tr>
<td>41096</td>
<td>QLBA_DisplayInitiatorOperationStatus: DMA Error, Status 0x%.2x</td>
<td>App</td>
<td>Error</td>
<td>Process control block status indicates that a direct memory access (DMA) error occurred during an initiator operation.</td>
</tr>
<tr>
<td>41107</td>
<td>QLBA_DisplayInitiatorOperationStatus: Transport Error, Status 0x%.2x</td>
<td>App</td>
<td>Error</td>
<td>Process control block status indicates that a transport error (protocol) occurred during an initiator operation.</td>
</tr>
<tr>
<td>41111</td>
<td>QLBA_DisplayInitiatorOperationStatus: Data Overrun, Status 0x%.2x</td>
<td>App</td>
<td>Error</td>
<td>Process control block status indicates that a data overrun error occurred during an initiator operation.</td>
</tr>
<tr>
<td>41234</td>
<td>QLIS_LoginPduContinue: Operation failed. Initiator 0x%x, TPB status 0x%x</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login failed between receipt of protocol data unit (PDU) and request for the data segment.</td>
</tr>
<tr>
<td>41238</td>
<td>QLIS_ValidateLoginTransitOrgNameVersion failed (status 0x%x)</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login failed due to unsupported version number in received login PDU.</td>
</tr>
<tr>
<td>41257</td>
<td>QLIS_LoginPduContinue: Invalid initiator name. Initiator:</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login PDU contains invalid initiator name. The format and character set used to form the initiator name is invalid.</td>
</tr>
<tr>
<td>41265</td>
<td>QLIS_LoginPduContinue: Target not configured for Portal</td>
<td>App</td>
<td>Error</td>
<td>iSCSI target login was attempted to a portal (iSCSI1 or iSCSI2) on which the target is not presented.</td>
</tr>
<tr>
<td>41267</td>
<td>QLIS_LoginPduContinue: Target not found. Target name:</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login PDU received for a target with a target name unknown to the module.</td>
</tr>
<tr>
<td>41268</td>
<td>QLIS_LoginPduContinue: Missing target name</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login PDU received without a target name for a normal session.</td>
</tr>
<tr>
<td>41270</td>
<td>QLIS_LoginPduContinue: TSIH is 0 but InitiatorName key/value not provided</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login PDU received without an initiator name key/value.</td>
</tr>
<tr>
<td>41272</td>
<td>QLIS_LoginPduContinue: CONN_STATE_IN_LOGIN, Unknown InitTaskTag</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login PDU received with an incorrect initiator task tag for a session which is partially logged in. This would occur if a login PDU other than the initial login PDU used an initiator task tag which was different than the initiator task tag provided in the initial login PDU.</td>
</tr>
<tr>
<td>41283</td>
<td>QLIS_LoginPduContinue: TSIH 0x%x out of range</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login PDU was received with a target session identifying handle (TSIH) out of range. This would occur if the iSCSI initiator attempting the login failed to use the TSIH value provided in the Target Login Response PDU (module is target) in subsequent login PDUs.</td>
</tr>
<tr>
<td>41284</td>
<td>QLIS_LoginPduContinue: Session does not exist, invalid TSIH 0x%x</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login PDU was received with an invalid TSIH value. The TSIH is invalid because there is no session with that TSIH value. This would occur if the iSCSI initiator attempting the login failed to use the TSIH value provided in the target login response PDU (module is target) in subsequent login PDUs.</td>
</tr>
<tr>
<td>Log Message</td>
<td>Type</td>
<td>Error</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------</td>
<td>-------</td>
<td>----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>iSCSI login rejected due to a CHAP authentication error.</td>
<td>App</td>
<td>Error</td>
<td>iSCSI login rejected due to a CHAP authentication error.</td>
<td></td>
</tr>
<tr>
<td>Unexpected CHAP key detected.</td>
<td>App</td>
<td>Error</td>
<td>Unexpected CHAP key detected.</td>
<td></td>
</tr>
<tr>
<td>Failed to allocate an object for Set Port Info IOCTL processing:</td>
<td>App</td>
<td>Error</td>
<td>Failed to allocate an object for Set Port Info IOCTL processing:</td>
<td></td>
</tr>
<tr>
<td>Page 83 failed. The Inquiry command was issued by the module as part of</td>
<td></td>
<td></td>
<td>Page 83 failed. The Inquiry command was issued by the module as part of</td>
<td></td>
</tr>
<tr>
<td>its discovery process.</td>
<td></td>
<td></td>
<td>its discovery process.</td>
<td></td>
</tr>
<tr>
<td>The Read Capacity command was issued by the module as part of its</td>
<td></td>
<td></td>
<td>The Read Capacity command was issued by the module as part of its</td>
<td></td>
</tr>
<tr>
<td>discovery process.</td>
<td></td>
<td></td>
<td>discovery process.</td>
<td></td>
</tr>
<tr>
<td>Read Capacity command failed. The Read Capacity command was issued by</td>
<td>App</td>
<td>Error</td>
<td>Read Capacity command failed. The Read Capacity command was issued by</td>
<td></td>
</tr>
<tr>
<td>the module as part of its discovery process.</td>
<td></td>
<td></td>
<td>the module as part of its discovery process.</td>
<td></td>
</tr>
<tr>
<td>Pass-Through command issued by management application (such as GUI) was</td>
<td>App</td>
<td>Error</td>
<td>Pass-Through command issued by management application (such as GUI) was</td>
<td></td>
</tr>
<tr>
<td>aborted.</td>
<td></td>
<td></td>
<td>aborted.</td>
<td></td>
</tr>
<tr>
<td>Pass-Through command issued by management application (such as GUI) failed</td>
<td>App</td>
<td>Error</td>
<td>Pass-Through command issued by management application (such as GUI) failed</td>
<td></td>
</tr>
<tr>
<td>due to invalid command descriptor block (CDB) length.</td>
<td></td>
<td></td>
<td>due to invalid command descriptor block (CDB) length.</td>
<td></td>
</tr>
<tr>
<td>Pass-Through command issued by management application (such as GUI) failed</td>
<td>App</td>
<td>Error</td>
<td>Pass-Through command issued by management application (such as GUI) failed</td>
<td></td>
</tr>
<tr>
<td>due to invalid data length.</td>
<td></td>
<td></td>
<td>due to invalid data length.</td>
<td></td>
</tr>
<tr>
<td>Pass-Through command issued by management application (such as GUI) was</td>
<td>App</td>
<td>Error</td>
<td>Pass-Through command issued by management application (such as GUI) was</td>
<td></td>
</tr>
<tr>
<td>interrupted or timed out.</td>
<td></td>
<td></td>
<td>interrupted or timed out.</td>
<td></td>
</tr>
<tr>
<td>Report LUNs command failed. The Report LUNs command was issued by the</td>
<td>App</td>
<td>Error</td>
<td>Report LUNs command failed. The Report LUNs command was issued by the</td>
<td></td>
</tr>
<tr>
<td>module as part of its discovery process.</td>
<td></td>
<td></td>
<td>module as part of its discovery process.</td>
<td></td>
</tr>
<tr>
<td>command was issued by the module as part of its discovery process.</td>
<td></td>
<td></td>
<td>command was issued by the module as part of its discovery process.</td>
<td></td>
</tr>
<tr>
<td>Failed to allocate LUN object; out of resources.</td>
<td>App</td>
<td>Error</td>
<td>Failed to allocate LUN object; out of resources.</td>
<td></td>
</tr>
<tr>
<td>Login attempted using FC virtual port (VP) index that is out-of-range</td>
<td>App</td>
<td>Error</td>
<td>Login attempted using FC virtual port (VP) index that is out-of-range</td>
<td></td>
</tr>
<tr>
<td>(range = 0–31). Index reported in log message.</td>
<td></td>
<td></td>
<td>(range = 0–31). Index reported in log message.</td>
<td></td>
</tr>
<tr>
<td>Login attempted using FC VP index that has not been configured. Operation</td>
<td>App</td>
<td>Error</td>
<td>Login attempted using FC VP index that has not</td>
<td></td>
</tr>
<tr>
<td>attempted on an unconfigured VP.</td>
<td></td>
<td></td>
<td>attempted on an unconfigured VP.</td>
<td></td>
</tr>
</tbody>
</table>
Table 35 iSCSI or iSCSI/FCoE module log messages (continued)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Type</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>42002</td>
<td>QLFC_Login: Can't open connection</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42024</td>
<td>QLFC_Logout: No active path to device. WWPN: %2X%.2X%.2X%.2X%.2X%.2X%.2X%.2X</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42027</td>
<td>QLFC_Logout: VP Index 0x%x not configured</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42068</td>
<td>QLFC_HandleTeb: System Error</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42069</td>
<td>QLFC_HandleTeb: Driver Fatal Error</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42072</td>
<td>QLFC_HandleTeb: Driver Fatal Error</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42242</td>
<td>QLIS_AllocateSessionObject: Out of session resources</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42252</td>
<td>QLIS_Enqueueiscsipdudu: Duplicate PDU, CmdSN %d (0x%x), dropping it</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42258</td>
<td>QLIS_InstantiateSession: Can't add Initiator to the database</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42259</td>
<td>QLIS_InstantiateSession: Maximum number (%d) of allowed hosts already logged in</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42404</td>
<td>QLIS_InstantiateSession: Maximum number (%d) of allowed hosts already logged in</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42648</td>
<td>QLIS_HandleTeb: Driver Fatal Error</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42649</td>
<td>QLIS_HandleTeb: Unload Driver</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>42654</td>
<td>QLIS_HandleTeb: iSNS Connection Failed</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>43265</td>
<td>QLUT_AllocateTpbExtension: TPB allocation failed</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>43267</td>
<td>QLUT_AllocateTpbExtension: Alloc of DSD failed for buffer len %d</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>43268</td>
<td>QLUT_AllocateTpbExtension: Data buffer allocation failed (length %d)</td>
<td>App</td>
<td>Error</td>
</tr>
<tr>
<td>53254</td>
<td>System Booting Up.</td>
<td>App</td>
<td>Info</td>
</tr>
<tr>
<td>Log Message</td>
<td>Module</td>
<td>Severity</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>--------</td>
<td>----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>QLIS_LoginPduContinue: [0x%x] SES_STATE_LOGGED_IN</td>
<td>App</td>
<td>Info</td>
<td>iSCSI session full feature login.</td>
</tr>
<tr>
<td>QLIS_LoginPduContinue: [0x%x] SES_STATE_LOGGED_IN DISCOVERY</td>
<td>App</td>
<td>Info</td>
<td>iSCSI session discovery login.</td>
</tr>
<tr>
<td>QLIS_LoginPduContinue: Initiator: %s</td>
<td>App</td>
<td>Info</td>
<td>iSCSI login of Initiator: %s.</td>
</tr>
<tr>
<td>QLIS_LoginPduContinue: Target: %s</td>
<td>App</td>
<td>Info</td>
<td>iSCSI login of Target: %s.</td>
</tr>
<tr>
<td>QLFC_Login: Origin 0x%x, VP Index 0x%x, Id 0x%x</td>
<td>App</td>
<td>Info</td>
<td>FC login occurred, origin xx (1 = adapter, 2 = target, 3 = initiator), VP (virtual port) xx, ID (loop ID) xx.</td>
</tr>
<tr>
<td>QLFC_Login: Port ID %.2x%.2x%.2x</td>
<td>App</td>
<td>Info</td>
<td>FC login occurred with port ID xx.xx.xx.</td>
</tr>
<tr>
<td>QLFC_Login: Node Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x</td>
<td>App</td>
<td>Info</td>
<td>FC login occurred with WWNN xx.xx.xx.xx.xx.xx.xx.xx.</td>
</tr>
<tr>
<td>QLFC_Login: Port Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x</td>
<td>App</td>
<td>Info</td>
<td>FC login occurred with WWPN xx.xx.xx.xx.xx.xx.xx.xx.</td>
</tr>
<tr>
<td>QLFC_Logout: Origin 0x%x, VP Index 0x%x, Id 0x%x</td>
<td>App</td>
<td>Info</td>
<td>QLFC_Logout: Origin 0x%x, VP Index 0x%x, Id 0x%x</td>
</tr>
<tr>
<td>QLFC_Logout: Port ID %.2x%.2x%.2x</td>
<td>App</td>
<td>Info</td>
<td>FC Logout: Port ID %.2x%.2x%.2x.</td>
</tr>
<tr>
<td>QLFC_Logout: Node Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x</td>
<td>App</td>
<td>Info</td>
<td>FC Logout: Node Name xx xx xx xx xx xx xx xx.</td>
</tr>
<tr>
<td>QLFC_Logout: Port Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x</td>
<td>App</td>
<td>Info</td>
<td>FC Logout: Port Name xx xx xx xx xx xx xx xx.</td>
</tr>
<tr>
<td>QLFC_Logout: Port Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x</td>
<td>App</td>
<td>Info</td>
<td>FC login event notification, VP (virtual port) xx.</td>
</tr>
<tr>
<td>QLIS_OpenConnectionNotification: Target connection opened (Port %d, DDB %d)</td>
<td>App</td>
<td>Info</td>
<td>iSCSI target connection opened for port %d, data description block (DDB) %d.</td>
</tr>
<tr>
<td>QLIS_OpenConnectionNotification: Target connection opened (Port %d, DDB %d)</td>
<td>App</td>
<td>Info</td>
<td>Event notification; iSCSI open connection request.</td>
</tr>
<tr>
<td>QLIS_HandleTeb: UTM_EC_CLOSE_CONNECTION or UTM_EC_CONNECTION_CLOSED</td>
<td>App</td>
<td>Info</td>
<td>Event notification; iSCSI close connection request or connection closed.</td>
</tr>
<tr>
<td>QLIS_HandleTeb: UTM_EC_CLOSE_CONNECTION or UTM_EC_CONNECTION_CLOSED</td>
<td>App</td>
<td>Info</td>
<td>Event notification; iSCSI connection closed.</td>
</tr>
<tr>
<td>QLIS_HandleTeb: iSNS Server Open Connection succeeded</td>
<td>App</td>
<td>Info</td>
<td>Event notification; connection opened with iSNS server.</td>
</tr>
<tr>
<td>QLIS_HandleTeb: UTM_EC_ISNS_SCN</td>
<td>App</td>
<td>Info</td>
<td>Event notification; iSNS registered state change notification (RSCN) received.</td>
</tr>
<tr>
<td>QLIS_HandleTeb: UTM_EC_ISNS_CLIENT_DISCOVERED</td>
<td>App</td>
<td>Info</td>
<td>Event notification; iSNS client discovered.</td>
</tr>
<tr>
<td>#%d: qlutm_init: Diagnostic failed, invalid SRAM</td>
<td>App</td>
<td>Fatal</td>
<td>iSCSI processor SRAM test failed.</td>
</tr>
<tr>
<td>Line</td>
<td>Message Description</td>
<td>Module</td>
<td>Severity</td>
</tr>
<tr>
<td>------</td>
<td>---------------------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>69653</td>
<td>qlutm_init: Diagnostic failed, fail reboot</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>69654</td>
<td>qlutm_init: Diagnostic failed, invalid NVRAM</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>69655</td>
<td>qlutm_init: Diagnostic failed, invalid DRAM</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>69656</td>
<td>qlutm_init: Failed to return diagnostic result to Bridge</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>69941</td>
<td>QLUtmProcessResponseQueue: Invalid handle $x EntryType $x</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>69951</td>
<td>QLSetNvram: QLRebootTimer failed AF $x RS $x Time $d</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>69964</td>
<td>QLDisable: QLRebootTimer failed AF $x RS $x Time $d</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>69966</td>
<td>QLEnable: QLRebootTimer failed AF $x RS $x Time $d</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70224</td>
<td>QLProcSrblessiSNSResponse: Invalid handle $x</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70400</td>
<td>QLInitializeDevice: QLStartAdapter failed</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70417</td>
<td>QLIsrDecodeMailbox: System Error 8002 MB[1-7] $0x $0x $0x $0x $0x</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70432</td>
<td>QLDoInterruptServiceRoutine: Port Fatal interrupt. PortFatalErrorStatus $0x CSR $0x AS $x AF $x</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70448</td>
<td>QLStartAdapter: QLRebootTimer failed AF $x RS $x Time $d</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70489</td>
<td>QLIsrDecodeMailbox: System Error 8002 MB[1-7] $0x $0x $0x $0x $0x $0x $0x</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70501</td>
<td>QLProcessResponseQueue: Invalid entry type in response queue $x</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70502</td>
<td>QLProcessResponseQueue: Invalid handle $x EntryType $x</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70524</td>
<td>QLProcessAen: Invalid event $x</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
<tr>
<td>70544</td>
<td>QLRebootTimer: Reboot failed!</td>
<td>iSCSI</td>
<td>Fatal</td>
</tr>
</tbody>
</table>
Table 35 iSCSI or iSCSI/FCoE module log messages (continued)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>70563</td>
<td>iSCSI Fatal iSCSI driver missed iSCSI processor heartbeat. iSCSI processor rebooted.</td>
</tr>
<tr>
<td>70564</td>
<td>iSCSI Fatal iSCSI processor failed to complete operation before timeout.</td>
</tr>
<tr>
<td>70609</td>
<td>iSCSI Fatal iSCSI processor system error restart.</td>
</tr>
<tr>
<td>70610</td>
<td>iSCSI Fatal iSCSI processor reboot failed.</td>
</tr>
<tr>
<td>70784</td>
<td>iSCSI Fatal iSCSI processor NVRAM invalid (checksum error).</td>
</tr>
<tr>
<td>70835</td>
<td>iSCSI Fatal iSCSI controller Set Flash command failed.</td>
</tr>
<tr>
<td>70836</td>
<td>iSCSI Fatal iSCSI controller failed to load firmware.</td>
</tr>
<tr>
<td>70837</td>
<td>iSCSI Fatal iSCSI controller firmware load operation timed out.</td>
</tr>
<tr>
<td>70938</td>
<td>iSCSI Fatal iSCSI controller failed to initialize.</td>
</tr>
<tr>
<td>72351</td>
<td>iSCSI Fatal iSCSI controller reported that an SNS response had an invalid handle.</td>
</tr>
<tr>
<td>73990</td>
<td>iSCSI Error iSCSI processor failed firmware initialization.</td>
</tr>
<tr>
<td>74056</td>
<td>iSCSI Error iSCSI processor failed the internal loopback test.</td>
</tr>
<tr>
<td>74057</td>
<td>iSCSI Error iSCSI processor failed the external loopback test.</td>
</tr>
<tr>
<td>74068</td>
<td>iSCSI Error iSCSI processor reported an invalid Accept Target I/O (ATIO) Continuation type x.</td>
</tr>
<tr>
<td>74069</td>
<td>iSCSI Error iSCSI processor reported an Immediate data address (xxxxxxxx:xxxxxx) in an unsupported PDU Type.</td>
</tr>
<tr>
<td>74241</td>
<td>iSCSI Error iSCSI processor could not connect with the iSCSI name server (iSNS).</td>
</tr>
<tr>
<td>74577</td>
<td>iSCSI Error iSCSI processor reported that the iSCSI port NVRAM contains invalid data (checksum error).</td>
</tr>
<tr>
<td>74580</td>
<td>iSCSI Error iSCSI processor reported a duplicate IP address was detected (address xxxxx xxxx xxxx xxxx xxxx).</td>
</tr>
<tr>
<td>74587</td>
<td>iSCSI Error iSCSI processor reported a link down condition.</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>74656</td>
<td>#%d: QLReadyTimer: Adapter missed heartbeat for $d seconds. Time left $d</td>
</tr>
<tr>
<td>74659</td>
<td>#%d: QLReadyTimer: Adapter missed heartbeat for 0x%x seconds</td>
</tr>
<tr>
<td>74660</td>
<td>#%d: QLReadyTimer: Abort pTpB=$p failed, DrvCount 0x%x</td>
</tr>
<tr>
<td>74661</td>
<td>#%d: QLTimer: Abort pTpB=$p, Type %x, Timeout 0x%x DrvCount 0x%x, DdbIndex 0x%x</td>
</tr>
<tr>
<td>74663</td>
<td>#%d: QLReadyTimer: MBOX_CMD 0x%04x 0x%04x 0x%04x 0x%04x 0x%04x 0x%04x 0x%04x timed out</td>
</tr>
<tr>
<td>74665</td>
<td>#%d: QLReadyTimer: QLiSNSReenable failed.</td>
</tr>
<tr>
<td>74705</td>
<td>#%d: QLProcessSystemError: Restart RISC</td>
</tr>
<tr>
<td>74746</td>
<td>#%d: QLInitializeFW: MBOX_CMD_INITIALIZE_FIRMWARE failed 0x%04x 0x%04x 0x%04x 0x%04x 0x%04x 0x%04x 0x%04x</td>
</tr>
<tr>
<td>74784</td>
<td>#%d: QLUpdateInitiatorData: No more room in Initiator Database.</td>
</tr>
<tr>
<td>74800</td>
<td>#%d: QLSetTargetData: No more room in Target Database.</td>
</tr>
<tr>
<td>75008</td>
<td>#%d: ql_process_error: OB_TCP_IOCB_RSP_W returned DdbInx 0x%x pTpB $p</td>
</tr>
<tr>
<td>86347</td>
<td>#%d: QLDisable: Restart RISC</td>
</tr>
<tr>
<td>86349</td>
<td>#%d: QLEnable: Restart RISC to update EEPROM</td>
</tr>
<tr>
<td>86874</td>
<td>#%d: QLiSrsDecodeMailbox: Link up</td>
</tr>
<tr>
<td>87346</td>
<td>#%d: QLGetFwStateCallback: link 100Mb FDX</td>
</tr>
<tr>
<td>87348</td>
<td>#%d: QLGetFwStateCallback: link 1000Mb FDX</td>
</tr>
<tr>
<td>87350</td>
<td>#%d: QLGetFwStateCallback: Invalid link speed 0x%x</td>
</tr>
<tr>
<td>102419</td>
<td>#%d: qlutm_init: Diagnostic failed, port 1 invalid SRAM</td>
</tr>
<tr>
<td>102420</td>
<td>#%d: qlutm_init: Diagnostic failed, port 1 POST failed</td>
</tr>
<tr>
<td>102421</td>
<td>#%d: qlutm_init: Diagnostic failed, port 2 invalid SRAM</td>
</tr>
<tr>
<td>Log Message Number</td>
<td>Message Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>102422</td>
<td>#%d: qlutm_init: Diagnostic failed, port 2 POST failed</td>
</tr>
<tr>
<td>102423</td>
<td>#%d: qlutm_init: Failed to return diagnostic result to Bridge</td>
</tr>
<tr>
<td>102656</td>
<td>#%d: QLInitializeAdapter: Reset ISP failed</td>
</tr>
<tr>
<td>102657</td>
<td>#%d: QLInitializeAdapter: Load RISC code failed</td>
</tr>
<tr>
<td>102658</td>
<td>#%d: QLInitializeAdapter: Load ISP2322 receive sequencer code failed</td>
</tr>
<tr>
<td>102659</td>
<td>#%d: QLInitializeAdapter: Load ISP2322 transmit sequencer code failed</td>
</tr>
<tr>
<td>102662</td>
<td>#%d: QLInitializeAdapter: Verify Checksum command failed (%x)</td>
</tr>
<tr>
<td>102680</td>
<td>#%d: QLInitializeFW: FAILED</td>
</tr>
<tr>
<td>102688</td>
<td>#%d: QLInterruptServiceRoutine: Risc pause %x with parity error hccr %x, Disable adapter</td>
</tr>
<tr>
<td>102689</td>
<td>#%d: QLInterruptServiceRoutine: Invalid interrupt status: %x</td>
</tr>
<tr>
<td>102716</td>
<td>#%d: QLIsrEventHandler: System error event (%x), MB1=%x, MB2=%x, MB3=%x, MB4=%x, MB5=%x, MB6=%x, MB7=%x</td>
</tr>
<tr>
<td>102746</td>
<td>#%d: QLProcessResponseQueue: Invalid handle %x, type %x</td>
</tr>
<tr>
<td>102752</td>
<td>#%d: QLTimer: Ext Ram parity error exceed limit cnt 0x%x, limit 0x%x, Disabled adapter</td>
</tr>
<tr>
<td>102755</td>
<td>#%d: QLTimer: Heartbeat failed</td>
</tr>
<tr>
<td>102800</td>
<td>#%d: QLRestartRisc: restart RISC</td>
</tr>
<tr>
<td>106583</td>
<td>#%d: QLUtmReceiveIo: Path invalid/FW No resource count %x</td>
</tr>
<tr>
<td>106589</td>
<td>#%d: QLioctlEnable: Adapter disabled</td>
</tr>
<tr>
<td>106590</td>
<td>#%d: QLioctlEnable: Initialize FW error</td>
</tr>
<tr>
<td>Number</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>106592</td>
<td>FC processor failed the external loopback test.</td>
</tr>
<tr>
<td>106593</td>
<td>FC processor failed to re-initialize in response to an IOCTL disable request.</td>
</tr>
<tr>
<td>106803</td>
<td>FC processor reported a link down condition.</td>
</tr>
<tr>
<td>106813</td>
<td>FC processor reported an unexpected asynchronous event. The mailbox registers provide status, event code, and data related to the event.</td>
</tr>
<tr>
<td>106847</td>
<td>FC controller reported an invalid Entry Status %x, type %x.</td>
</tr>
<tr>
<td>106851</td>
<td>FC controller failed to provide a heartbeat.</td>
</tr>
<tr>
<td>106912</td>
<td>FC processor was unable to obtain the number of loop IDs required. This failure occurs only when the FC processor is running multi-ID firmware.</td>
</tr>
<tr>
<td>106928</td>
<td>Driver was unable to re-establish connection to the target within the timeout and retry counts, and is therefore marking it offline.</td>
</tr>
<tr>
<td>106948</td>
<td>FC controller is unable to log into the FC fabric name server.</td>
</tr>
<tr>
<td>107029</td>
<td>Driver’s host (initiator) database is full.</td>
</tr>
<tr>
<td>107030</td>
<td>Driver’s target database is full.</td>
</tr>
<tr>
<td>107041</td>
<td>Driver’s host (initiator) database is full. Maximum host database is 64.</td>
</tr>
<tr>
<td>107056</td>
<td>Drivers host (initiator) database is full.</td>
</tr>
<tr>
<td>107078</td>
<td>Driver was unable to re-establish connection to the target within the timeout and retry counts, and is therefore marking it offline.</td>
</tr>
<tr>
<td>107984</td>
<td>FC controller failed a Flash write (address x data x).</td>
</tr>
<tr>
<td>108032</td>
<td>FC controller failed the Get VP Database command (for virtual port %d).</td>
</tr>
<tr>
<td>108033</td>
<td>FC controller failed the Get VP Database command (for virtual port %d) with status x.</td>
</tr>
<tr>
<td>ID</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>108049</td>
<td>FC controller reported failure status for an Execute IOCB (input/output control block) command.</td>
</tr>
<tr>
<td>108050</td>
<td>FC controller reported a fatal error while processing an Execute IOCB command.</td>
</tr>
<tr>
<td>108064</td>
<td>FC controller reported failure status for a Get Firmware State failed 0-3</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>118882</td>
<td>Request to reset the FC processor (adapter) received from IOCTL interface.</td>
</tr>
<tr>
<td>119088</td>
<td>FC loop initialization process (LIP) occurred. The LIP type is reported, as is the contents of the FC processor’s mailbox 1 register.</td>
</tr>
<tr>
<td>119089</td>
<td>FC loop initialization process (LIP) occurred. The LIP type is reported, as is the contents of the FC processor’s mailbox 1 register.</td>
</tr>
<tr>
<td>119090</td>
<td>FC loop initialization process (LIP) occurred. The LIP type is reported, as is the RunTimeMode (0 = loop, 1 = point-to-point).</td>
</tr>
<tr>
<td>119092</td>
<td>FC loop initialization process (LIP) occurred. The LIP type is reported, as is the RunTimeMode (0 = loop, 1 = point-to-point).</td>
</tr>
<tr>
<td>119093</td>
<td>FC loop initialization process (LIP) occurred. The LIP type is reported, as is the RunTimeMode (0 = loop, 1 = point-to-point).</td>
</tr>
<tr>
<td>119097</td>
<td>FC loop initialization process (LIP) occurred. The LIP type is reported, as is the RunTimeMode (0 = loop, 1 = point-to-point).</td>
</tr>
<tr>
<td>139265</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139266</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139267</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139268</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139269</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139270</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139271</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139272</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139273</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139280</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
<tr>
<td>139281</td>
<td>RPC (remote procedure call) server initialization entry point.</td>
</tr>
</tbody>
</table>

Table 35 iSCSI or iSCSI/FCoE module log messages (continued)
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Type</th>
<th>Severity</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>139282</td>
<td>Failed memory allocation for Get Statistics API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:GetStats Mem Allocation error</td>
</tr>
<tr>
<td>139283</td>
<td>Failed memory allocation for Get Initiator List API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:InitListMem Allocation error</td>
</tr>
<tr>
<td>139284</td>
<td>Failed memory allocation for Get Target List API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:TargetList Mem Allocation error</td>
</tr>
<tr>
<td>139285</td>
<td>Failed memory allocation for Get LUN List API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:LunList MemAllocation error</td>
</tr>
<tr>
<td>139286</td>
<td>Failed memory allocation for Get Presented Targets List API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:PresTarget Mem Allocation error</td>
</tr>
<tr>
<td>139287</td>
<td>Failed memory allocation for Get LUN Mask API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:LunMask Mem Allocation error</td>
</tr>
<tr>
<td>139288</td>
<td>Failed memory allocation for Initiator API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:Init Mem Allocation error</td>
</tr>
<tr>
<td>139289</td>
<td>Failed memory allocation for Target Device API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:TgtDevice Mem Allocation error</td>
</tr>
<tr>
<td>139296</td>
<td>Failed memory allocation for FC Target API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:FcTgt Mem Allocation error</td>
</tr>
<tr>
<td>139297</td>
<td>Failed memory allocation for System Status API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:BridgeStatus Mem Allocation error</td>
</tr>
<tr>
<td>139298</td>
<td>Failed memory allocation for Diagnostic API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:Diag Mem Allocation error</td>
</tr>
<tr>
<td>139299</td>
<td>Failed memory allocation for Diagnostic Log API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:DiagLog Mem Allocation error</td>
</tr>
<tr>
<td>139300</td>
<td>Failed memory allocation for FRU Image API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:FruImage Mem Allocation error</td>
</tr>
<tr>
<td>139301</td>
<td>Failed memory allocation for OEM Manufacturing API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:OemMfg Mem Allocation error</td>
</tr>
<tr>
<td>139302</td>
<td>Failed memory allocation for Status API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:Status Mem Allocation error</td>
</tr>
<tr>
<td>139303</td>
<td>Failed memory allocation for TCP/IP Statistics API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:TcpIpStats Mem Allocation error</td>
</tr>
<tr>
<td>139304</td>
<td>Failed memory allocation for NTP Status API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:NtpStats Mem Allocation error</td>
</tr>
<tr>
<td>139305</td>
<td>Failed memory allocation for LUN List API.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_Initialize:LunList MemAlloc error</td>
</tr>
<tr>
<td>139315</td>
<td>RPC free resources entry point.</td>
<td>User</td>
<td>Error</td>
<td>QBRPC_FreeResources:Entered</td>
</tr>
<tr>
<td>139553</td>
<td>Detected duplicate IP address for management port.</td>
<td>User</td>
<td>Error</td>
<td>checkDuplicateIp: Detected Error %08x %08x%04x</td>
</tr>
<tr>
<td>151842</td>
<td>A firmware upgrade was performed, the new version is: d.d.d.d.</td>
<td>User</td>
<td>Info</td>
<td>FW Upgrade performed: new version is: %d.%d.%d.%d</td>
</tr>
<tr>
<td>151843</td>
<td>User issued a REBOOT or SHUTDOWN command.</td>
<td>User</td>
<td>Info</td>
<td>REBOOT/SHUTDOWN Command from user. Code=%d</td>
</tr>
<tr>
<td>151889</td>
<td>FC port configuration has changed.</td>
<td>User</td>
<td>Info</td>
<td>#%d: qapisetfcinterfaceparams_1_svc: FC port configuration changed</td>
</tr>
</tbody>
</table>
### Table 35 iSCSI or iSCSI/FCoE module log messages (continued)

<table>
<thead>
<tr>
<th>Message ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>151890</td>
<td>%d: qapisetiscsiinterfaceparams_1_svc: iSCSI port configuration changed</td>
</tr>
<tr>
<td>151891</td>
<td>%d: qapisetisns_1_svc: iSNS configuration changed</td>
</tr>
<tr>
<td>151892</td>
<td>qapisetntpparams_1_svc: NTP configuration changed</td>
</tr>
<tr>
<td>151893</td>
<td>%d: qapisetvlanparams_1_svc: VLAN configuration changed</td>
</tr>
<tr>
<td>151894</td>
<td>qapisetlunmask_1_svc: Lunmask added for LUN %d</td>
</tr>
<tr>
<td>151895</td>
<td>qapisetlunmask_1_svc: Lunmask removed for LUN %d</td>
</tr>
<tr>
<td>151896</td>
<td>qapisetmgmintfcparams_1_svc: Management port configuration changed</td>
</tr>
<tr>
<td>151897</td>
<td>qapisetbridgebasicinfo_1_svc: Bridge configuration changed</td>
</tr>
<tr>
<td>151908</td>
<td>GE%d: Port status changed by user to ENABLED.</td>
</tr>
<tr>
<td>151909</td>
<td>GE%d: Port status changed by user to DISABLED.</td>
</tr>
<tr>
<td>151910</td>
<td>FC%d: Port status changed by user to ENABLED.</td>
</tr>
<tr>
<td>151911</td>
<td>FC%d: Port status changed by user to DISABLED.</td>
</tr>
<tr>
<td>151912</td>
<td>qapimaptargetdevice_1_svc: Target WWPN: %2x%2x%2x%2x%2x%2x%2x%2x mapped to iSCSI portal %d.</td>
</tr>
<tr>
<td>151913</td>
<td>qapimaptargetdevice_1_svc: Target WWPN: %2x%2x%2x%2x%2x%2x%2x%2x unmapped from iSCSI portal %d.</td>
</tr>
<tr>
<td>152082</td>
<td>qapiaddmodifyinitiator_1_svc: Initiator Configuration Changed</td>
</tr>
<tr>
<td>152083</td>
<td>qapiremoveinitiator_1_svc: Initiator Removed</td>
</tr>
<tr>
<td>152129</td>
<td>sysTempMon: Left PCM Installed</td>
</tr>
<tr>
<td>152130</td>
<td>sysTempMon: Left PCM Un-installed</td>
</tr>
<tr>
<td>152131</td>
<td>sysTempMon: Right PCM Installed</td>
</tr>
<tr>
<td>152132</td>
<td>sysTempMon: Right PCM Un-installed</td>
</tr>
</tbody>
</table>

iSCSI port configuration has changed.

iSNS configuration has changed.

NTP configuration has changed.

VLAN configuration has changed.

LUN mask was added for LUN %d.

LUN mask was removed for LUN %d.

Management port configuration has changed.

Module configuration has changed.

Target at WWPN: xx.xx.xx.xx.xx.xx.xx.xx has been mapped to iSCSI portal %d.

Target at WWPN: xx.xx.xx.xx.xx.xx.xx.xx has been unmapped from iSCSI portal %d.

Initiators configuration has changed.

Initiator has been removed.

Left power and cooling module (PCM) is or has been installed.

Left PCM is or has been uninstalled.

Right PCM is or has been installed.

Right PCM is or has been uninstalled.
Table 35 iSCSI or iSCSI/FCoE module log messages (continued)

<table>
<thead>
<tr>
<th>Message ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>152133</td>
<td>sysTempMon: Power for Left PCM Plugged-in</td>
</tr>
<tr>
<td>152134</td>
<td>sysTempMon: Power for Left PCM Un-plugged</td>
</tr>
<tr>
<td>152135</td>
<td>sysTempMon: Power for Right PCM Plugged-in</td>
</tr>
<tr>
<td>152136</td>
<td>sysTempMon: Power for Right PCM Un-plugged</td>
</tr>
<tr>
<td>152137</td>
<td>sysTempMon: Slot 1 (R1) PCM Fan%d faulty</td>
</tr>
<tr>
<td>152138</td>
<td>sysTempMon: Slot 2 (R2) PCM Fan%d faulty</td>
</tr>
<tr>
<td>152139</td>
<td>sysTempMon: Slot 1 (R1) PCM Fan%d healthy</td>
</tr>
<tr>
<td>152140</td>
<td>sysTempMon: Slot 2 (R2) PCM Fan%d healthy</td>
</tr>
<tr>
<td>152141</td>
<td>sysTempMon: Over Temperature Front: %dC Rear: %dC CPU1: %dC CPU2: %dC</td>
</tr>
<tr>
<td>152142</td>
<td>sysTempMon: Setting the fan speed to high</td>
</tr>
<tr>
<td>152143</td>
<td>sysTempMon: Setting the fan speed to normal</td>
</tr>
<tr>
<td>152144</td>
<td>sysTempMon: Temperature back to safe value. Front: %dC Rear: %dC CPU1: %dC CPU2: %dC</td>
</tr>
<tr>
<td>152145</td>
<td>sysTempMon: Critical Temperature, Shutting Down Front: %dC Rear: %dC CPU1: %dC CPU2: %dC</td>
</tr>
<tr>
<td>200721</td>
<td>QL3022:ql3xxx_probe: Adapter eth#%d, Invalid NVRAM parameters</td>
</tr>
<tr>
<td>233473</td>
<td>&quot;memory monitor: Detected Uncorrectable Ecc %08lx system is rebooting in 5 secs\n&quot;</td>
</tr>
<tr>
<td>233474</td>
<td>&quot;Failed to register interrupt handler!\n&quot;</td>
</tr>
<tr>
<td>233475</td>
<td>&quot;%s class_simple_create failed\n&quot;</td>
</tr>
<tr>
<td>237572</td>
<td>&quot;Failed to kill sys killer %d\n&quot;</td>
</tr>
<tr>
<td>237573</td>
<td>Temperature over high threshold %d</td>
</tr>
<tr>
<td>249862</td>
<td>Temperature is back to normal range %d</td>
</tr>
</tbody>
</table>
This glossary defines terms used in this guide or related to this product and is not a comprehensive glossary of computer terms.

Symbols and numbers

**3U**
A unit of measurement representing three “U” spaces. “U” spacing is used to designate panel or enclosure heights. Three “U” spaces is equivalent to 5.25 inches (133 mm).
See also **rack-mounting unit**.

**µm**
A symbol for micrometer; one millionth of a meter. For example, 50 µm is equivalent to 0.000050 m.

A

**active member of a virtual disk family**
A simulated disk drive created by the controllers as storage for one or more hosts. An active member of a virtual disk family is accessible by one or more hosts for normal storage. An active virtual disk member and its snapshot, if one exists, constitute a virtual disk family. An active member of a virtual disk family is the only necessary member of a virtual disk family.
See also **virtual disk**, **virtual disk copy**, **virtual disk family**.

**adapter**
See **controller**.

**AL_PA**
Arbitrated loop physical address. A 1-byte value the arbitrated loop topology uses to identify the loop ports. This value becomes the last byte of the address identifier for each public port on the loop.

**allocation policy**
Storage system rules that govern how virtual disks are created. Allocate Completely and Allocate on Demand are the two rules used in creating virtual disks.
- Allocate Completely—The space a virtual disk requires on the physical disks is reserved, even if the virtual disk is not currently using the space.
- Allocate on Demand—The space a virtual disk requires on the physical disks is not reserved until needed.

**ALUA**
Asymmetric logical unit access. Operating systems that support asymmetric logical unit access work with the EVA’s active/active functionality to enable any virtual disk to be accessed through either of the array’s two controllers.

**ambient temperature**
The air temperature in the area where a system is installed. Also called intake temperature or room temperature.

**ANSI**
American National Standards Institute. A non-governmental organization that develops standards (such as SCSI I/O interface standards and Fibre Channel interface standards) used voluntarily by many manufacturers within the United States.

**arbitrated loop**
A Fibre Channel topology that links multiple ports (up to 126) together on a single shared simplex media. Transmissions can only occur between a single pair of nodes at any given time. Arbitration is the scheme that determines which node has control of the loop at any given moment.

**arbitrated loop physical address**
See **AL_PA**.

**arbitrated loop topology**
See **arbitrated loop**.

**array**
A synonym of storage array, storage system, and virtual array. A group of disks in one or more disk enclosures combined with controller software that presents disk storage capacity as one or more virtual disks.

**array controller**
See **controller**.

**array controller failover**
The process that takes place when one controller assumes the workload of a failed companion controller.

**array-based management**
A management structure in which HP P6000 Command View is installed on the management module within the EVA controller enclosure.
asynchronous  Events scheduled as the result of a signal requesting the event or that which is without any specified time relation.

B

backplane  An electronic printed circuit board that distributes data, control, power, and other signals among components within an enclosure.

bad block  A data block that contains a physical defect.

bad block replacement  A replacement routine that substitutes defect-free disk blocks for those found to have defects. This process takes place in the controller and is transparent to the host.

bail lock  The part of the power supply AC receptacle that engages the AC power cord connector to ensure that the cord cannot be accidentally disconnected.

battery  A rechargeable unit mounted within a controller enclosure that supplies backup power to the cache module in case of primary power shortage.

baud  The maximum rate of signal state changes per second on a communication circuit. If each signal state change corresponds to a code bit, then the baud rate and the bit rate are the same. It is also possible for signal state changes to correspond to more than one code bit so the baud rate may be lower than the code bit rate.

bay  The physical location of a component, such as a drive, I/O module, or power supply in a disk enclosure. Each bay is numbered to define its location.

bidirectional  An array that contains both source and destination virtual disks. A bidirectional configuration allows multidirectional I/O flow among several arrays.

block  Also called a sector. The smallest collection of consecutive bytes addressable on a disk drive. In integrated storage elements, a block contains 512 bytes of data, error codes, flags, and the block address header.

blower  See fan.

C

cabinet  An alternate term used for a rack.

cable assembly  A fiber optic cable that has connectors installed on one or both ends. General use of these cable assemblies includes the interconnection of multimode fiber optic cable assemblies with either LC or SC type connectors.

• When there is a connector on only one end of the cable, the cable assembly is referred to as a pigtail.

• When there is a connector on each end of the cable, the cable assembly is referred to as a jumper.

CAC  Corrective action code. An HP P6000 Command View graphical user interface (GUI) display component that defines the action required to correct a problem. See also read caching, mirrored caching, write caching.

cache  High-speed memory that sets aside data as an intermediate data buffer between a host and the storage media. The purpose of cache is to improve performance.

cache battery  See battery.

carrier  A drive-enclosure-compatible assembly containing a disk drive or other storage devices.

client  An intelligent device that requests the services from other intelligent devices. In the context of HP P6000 Command View, a client is a computer used to access the software remotely using a supported browser.

close  A full copy of a volume usable by an application.

communication LUN  See console LUN.

condition report  A three-element code generated by the EMU in the form where e.t. is the element type (a hexadecimal number), en. is the element number (a decimal number), and ec is the condition code (a decimal number).
console LUN  A SCSI-3 virtual object that makes a controller pair accessible by the host before any virtual disks are created. Also called a communication LUN.

console LUN ID  The ID that can be assigned when a host operating system requires a unique ID. The console LUN ID is assigned by the user, usually when the storage system is initialized.

container  Virtual disk space that is preallocated for later use as a snapclone, snapshot, or mirrorclone.

controller  A hardware/software device that manages communications host systems and other devices. Controllers typically differ by the type of interface to the host and provide functions beyond those the devices support.

controller enclosure  A unit that holds one or more controllers, power supplies, fans, transceivers, and connectors.

controller event  A significant occurrence involving any storage system hardware or software component reported by the controller to HP P6000 Command View.

controller pair  Two connected controller modules that control a disk array.

corrective action code  See CAC.

CRITICAL Condition  A drive enclosure EMU condition that occurs when one or more drive enclosure elements have failed or are operating outside of their specifications. The failure of the element makes continued normal operation of at least some elements in the enclosure impossible. Some enclosure elements may be able to continue normal operations. Only an UNRECOVERABLE condition has precedence. This condition has precedence over NONCRITICAL errors and an INFORMATION condition.

CRU  Customer replaceable unit. A storage system element that a user can replace without using special tools or techniques, or special training.

customer replaceable unit  See CRU.

D

data entry mode  The state in which controller information can be displayed or controller configuration data can be entered. On the Enterprise Storage System, the controller mode is active when the LCD on the HSV Controller OCP is Flashing.

data replication group failover  An operation that reverses data replication direction so that the destination becomes the source and the source becomes the destination. Failovers can be planned or unplanned and can occur between DR groups or managed sets (which are sets of DR groups).

default disk group  The disk group created when the system is initialized. The disk group must contain a minimum of eight disks. The maximum is the number of installed disks.

Detailed Fault View  An HSV Controller OCP display that permits a user to view detailed information about a controller fault.

device channel  A channel used to connect storage devices to a host I/O bus adapter or intelligent controller.

device ports  The controller pair device ports connected to the storage system’s physical disk drive array through the Fibre Channel drive enclosure. Also called a device-side port.

device-side ports  See device ports.

DIMM  Dual Inline Memory Module. A small circuit board holding memory chips.

dirty data  The write-back cached data that has not been written to storage media even though the host operation processing the data has completed.

disk drive  A carrier-mounted storage device supporting random access to fixed size blocks of data.

disk drive blank  A carrier that replaces a disk drive to control airflow within a drive enclosure whenever there is less than a full complement of storage devices.

disk drive enclosure  A unit that holds storage system devices such as disk drives, power supplies, fans, I/O modules, and transceivers.

disk failure protection  A method by which a controller pair reserves drive capacity to take over the functionality of a failed or failing physical disk. For each disk group, the controllers reserve space in the physical disk pool equivalent to the selected number of physical disk drives.
disk group

A named group of disks selected from all the available disks in a disk array. One or more virtual disks can be created from a disk group. Also refers to the physical disk locations associated with a parity group.

disk migration state

A physical disk drive operating state. A physical disk drive can be in a stable or migration state:

- **Stable**—The state in which the physical disk drive has no failure nor is a failure predicted.
- **Migration**—The state in which the disk drive is failing, or failure is predicted to be imminent.

Data is then moved off the disk onto other disk drives in the same disk group.

disk replacement delay

The time that elapses during a drive failure and when the controller starts searching for spare disk space. Drive replacement seldom starts immediately in case the “failure” was a glitch or temporary condition.

drive enclosure event

A significant operational occurrence involving a hardware or software component in the drive enclosure. The drive enclosure EMU reports these events to the controller for processing.

dual power supply configuration

See redundant power configuration.

dual-loop

A configuration where each drive is connected to a pair of controllers through two loops. These two Fibre Channel loops constitute a loop pair.

dynamic capacity expansion

A storage system feature that provides the ability to increase the size of an existing virtual disk. Before using this feature, you must ensure that your operating system supports capacity expansion of a virtual disk (or LUN).

E

EIA

Electronic Industries Alliance. A standards organization specializing in the electrical and functional characteristics of interface equipment.

EIP

Event Information Packet. The event information packet is an HSV element hexadecimal character display that defines how an event was detected. Also called the EIP type.

electromagnetic interference

See EMI.

electrostatic discharge

See ESD.

element

In a disk enclosure, a device such as a power supply, disk, fan/blower, or I/O module. The object can be controlled, interrogated, or described by the enclosure services process.

EMI

Electromagnetic Interference. The impairment of a signal by an electromagnetic disturbance.

EMU

Environmental Monitoring Unit. An element which monitors the status of an enclosure, including the power, air temperature, and blower status. The EMU detects problems and displays and reports these conditions to a user and the controller. In some cases, the EMU implements corrective action.

enclosure

A unit used to hold various storage system devices such as disk drives, controllers, power supplies, I/O modules, or fans/blowers.

enclosure address bus

An Enterprise storage system bus that interconnects and identifies controller enclosures and disk drive enclosures by their physical location. Enclosures within a reporting group can exchange environmental data. This bus uses enclosure ID expansion cables to assign enclosure numbers to each enclosure. Communications over this bus do not involve the Fibre Channel drive enclosure bus and are, therefore, classified as out-of-band communications.

enclosure number (En)

One of the vertical rack-mounting positions where the enclosure is located. The positions are numbered sequentially in decimal numbers starting from the bottom of the cabinet. Each disk enclosure has its own enclosure number. A controller pair shares an enclosure number. If the system has an expansion rack, the enclosures in the expansion rack are numbered from 15 to 24, starting at the bottom.

enclosure services

Those services that establish the mechanical environment, electrical environment, and external indicators and controls for the proper operation and maintenance of devices with an enclosure as described in the SES SCSI-3 Enclosure Services Command Set (SES), Rev 8b, American National Standard for Information Services.
<table>
<thead>
<tr>
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<th>Definition</th>
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<tr>
<td>Enclosure Services Interface</td>
<td>See ESI.</td>
</tr>
<tr>
<td>Enclosure Services Processor</td>
<td>See ESP.</td>
</tr>
<tr>
<td>Enterprise Virtual Array</td>
<td>The Enterprise Virtual Array is a product that consists of one or more storage systems. Each storage system consists of a pair of HSV controllers and the disk drives they manage. A storage system within the Enterprise Virtual Array can be formally referred to as an Enterprise storage system, or generically referred to as the storage system.</td>
</tr>
<tr>
<td>environmental monitoring unit</td>
<td>See EMU.</td>
</tr>
<tr>
<td>error code</td>
<td>The portion of an EMU condition report that defines a problem.</td>
</tr>
<tr>
<td>ESD</td>
<td>Electrostatic Discharge. The emission of a potentially harmful static electric voltage as a result of improper grounding.</td>
</tr>
<tr>
<td>ESI</td>
<td>Enclosure Services Interface. The SCSI-3 engineering services interface implementation developed for HP products. A bus that connects the EMU to the disk drives.</td>
</tr>
<tr>
<td>ESP</td>
<td>Enclosure Services Processor. An EMU that implements an enclosure’s services process.</td>
</tr>
<tr>
<td>event</td>
<td>Any significant change in the state of the Enterprise storage system hardware or software component reported by the controller to HP P6000 Command View.</td>
</tr>
<tr>
<td>Event Information Packet</td>
<td>See EIP.</td>
</tr>
<tr>
<td>Event Number</td>
<td>See Evt No.</td>
</tr>
<tr>
<td>Evt No.</td>
<td>Event Number. A sequential number assigned to each Software Code Identification (SWCID) event. It is a decimal number in the range 0-255.</td>
</tr>
<tr>
<td>exabyte</td>
<td>A unit of storage capacity that is the equivalent of (2^{60}) bytes or 1,152,921,504,606,846,976 bytes. One exabyte is equivalent to 1,024 petabytes.</td>
</tr>
<tr>
<td>HP P6000 Command View GUI</td>
<td>The graphical user interface (GUI) through which a user can control and monitor a storage system. HP P6000 Command View can be installed on more than one storage management server in a fabric. Each installation is a management agent. The client for the agent is a standard browser.</td>
</tr>
<tr>
<td>fabric</td>
<td>A network of Fibre Channel switches or hubs and other devices.</td>
</tr>
<tr>
<td>fabric port</td>
<td>A port which is capable of supporting an attached arbitrated loop. This port on a loop will have the AL_PA hexadecimal address 00 (loop ID 7E), giving the fabric the highest priority access to the loop. A loop port is the gateway to the fabric for the node ports on a loop.</td>
</tr>
<tr>
<td>failover</td>
<td>See array controller failover or data replication group failover.</td>
</tr>
<tr>
<td>failsafe</td>
<td>A safe state that devices automatically enter after a malfunction. Failsafe DR groups stop accepting host input and stop logging write history if a group member becomes unavailable.</td>
</tr>
<tr>
<td>fan</td>
<td>The variable speed airflow device that cools an enclosure or component by forcing ambient air into an enclosure or component and forcing heated air out the other side.</td>
</tr>
<tr>
<td>FATA</td>
<td>Fibre Attached Technology Adapted disk drive.</td>
</tr>
<tr>
<td>Fault Management Code</td>
<td>See FMC.</td>
</tr>
<tr>
<td>FC HBA</td>
<td>Fibre Channel Host Bus Adapter. See also FCA.</td>
</tr>
<tr>
<td>FCA</td>
<td>Fibre Channel Adapter. An adapter used to connect the host server to the fabric. Also called a Host Bus Adapter (HBA) or a Fibre Channel Host Bus Adapter (FC HBA).</td>
</tr>
<tr>
<td>FCC</td>
<td>Federal Communications Commission. The federal agency responsible for establishing standards and approving electronic devices within the United States.</td>
</tr>
<tr>
<td>FCoE</td>
<td>Fibre Channel over Ethernet.</td>
</tr>
<tr>
<td>FCP</td>
<td>Fibre Channel Protocol.</td>
</tr>
</tbody>
</table>
fiber | The optical media used to implement Fibre Channel.

fiber optic cable | A transmission medium designed to transmit digital signals in the form of pulses of light. Fiber optic cable is noted for its properties of electrical isolation and resistance to electrostatic contamination.

fiber optics | The technology where light is transmitted through glass or plastic (optical) threads (fibers) for data communication or signaling purposes.

fibre | The international spelling that refers to the Fibre Channel standards for optical media.

Fibre Channel | A data transfer architecture designed for mass storage devices and other peripheral devices that require high bandwidth.

Fibre Channel adapter | See FCA.

Fibre Channel drive enclosure | An enclosure that provides twelve-port central interconnect for Fibre Channel Arbitrated Loops following the ANSI Fibre Channel disk enclosure standard.

Fibre Channel Loop | Fibre Channel Arbitrated Loop. The American National Standards Institute’s (ANSI) document that specifies arbitrated loop topology operation.

field replaceable unit | See FRU.

flush | The act of writing dirty data from cache to a storage media.


form factor | A storage industry dimensional standard for 3.5inch (89 mm) and 5.25inch (133 mm) high storage devices. Device heights are specified as low-profile (1 inch or 25.4 mm), half-height (1.6inch or 41 mm), and full-height (5.25inch or 133 mm).

FPGA | Field Programmable Gate Array. A programmable device with an internal array of logic blocks surrounded by a ring of programmable I/O blocks connected together through a programmable interconnect.

frequency | The number of cycles that occur in one second expressed in Hertz (Hz). Thus, 1 Hz is equivalent to one cycle per second.

FRU | Field Replaceable Unit. An assembly component that is designed to be replaced on site, without the system having to be returned to the manufacturer for repair.

G

general purpose server | A server that runs customer applications, such as file and print services.

Giga (G) | The notation to represent \(10^9\) or 1 billion (1,000,000,000).

gigabaud | An encoded bit transmission rate of one billion \(10^9\) bits per second.

gray-color | The convention of applying an alloy or gray color to a CRU tab, lever, or handle to identify the unit as warm-swappable.

H

HBA | Host Bus Adapter. See also FCA.

host | A computer that runs user applications and uses (or can potentially use) one or more virtual disks created and presented by the controller pair.

Host bus adapter | See FCA.

host computer | See host.

host link indicator | The HSV Controller display that indicates the status of the storage system Fibre Channel links.

host port | A connection point to one or more hosts through a Fibre Channel fabric. A host is a computer that runs user applications and that uses (or can potentially use) one or more of the virtual disks that are created and presented by the controller pair.
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<tr>
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<td>host-side ports</td>
<td>See host port.</td>
</tr>
<tr>
<td>hot-pluggable</td>
<td>The ability to add and remove elements or devices to a system or appliance while the appliance is running and have the operating system automatically recognize the change.</td>
</tr>
<tr>
<td>hub</td>
<td>A communications infrastructure device to which nodes on a multi-point bus or loop are physically connected. It is used to improve the manageability of physical cables.</td>
</tr>
<tr>
<td>I/O module</td>
<td>Input/Output module. The enclosure element that is the Fibre Channel drive enclosure interface to the host or controller.</td>
</tr>
<tr>
<td>IDX</td>
<td>A 2-digit decimal number portion of the HSV controller termination code display that defines one of 48 locations in the Termination Code array that contains information about a specific event.</td>
</tr>
<tr>
<td>in-band communication</td>
<td>The communication that uses the same communications channel as the operational data.</td>
</tr>
<tr>
<td>INFORMATION condition</td>
<td>A drive enclosure EMU condition report that may require action. This condition is for information only and does not indicate the failure of an element. All condition reports have precedence over an INFORMATION condition.</td>
</tr>
<tr>
<td>initialization</td>
<td>A configuration step that binds the controllers together and establishes preliminary data structures on the array. Initialization also sets up the first disk group, called the default disk group, and makes the array ready for use.</td>
</tr>
<tr>
<td>intake temperature interface</td>
<td>See ambient temperature.</td>
</tr>
<tr>
<td>J</td>
<td>Just a Bunch of Disks.</td>
</tr>
<tr>
<td>K</td>
<td>Kilo. A scientific notation denoting a multiplier of one thousand (1,000).</td>
</tr>
<tr>
<td>KB</td>
<td>Kilobyte. A unit of measurement defining either storage or memory capacity.</td>
</tr>
<tr>
<td>1.</td>
<td>For storage, a KB is a capacity of 1,000 (10^3) bytes of data.</td>
</tr>
<tr>
<td>2.</td>
<td>For memory, a KB is a capacity of 1,024 (2^{10}) bytes of data.</td>
</tr>
<tr>
<td>L</td>
<td>Local area network. A group of computers and associated devices that share a common communications line and typically share the resources of a single processor or server within a small geographic area.</td>
</tr>
<tr>
<td>laser</td>
<td>A device that amplifies light waves and concentrates them in a narrow, very intense beam.</td>
</tr>
<tr>
<td>Last Fault View</td>
<td>An HSV Controller display defining the last reported fault condition.</td>
</tr>
<tr>
<td>Last Termination Error Array</td>
<td>See LTEA.</td>
</tr>
<tr>
<td>LED</td>
<td>Light Emitting Diode. A semiconductor diode used in an electronic display that emits light when a voltage is applied to it. A visual indicator.</td>
</tr>
<tr>
<td>License Key</td>
<td>A WWN-encoded sequence that is obtained from the license key fulfillment website.</td>
</tr>
<tr>
<td>light emitting diode link</td>
<td>See LED.</td>
</tr>
<tr>
<td>1.</td>
<td>A connection of ports on fibre channel devices.</td>
</tr>
<tr>
<td>2.</td>
<td>A full duplex connection to a fabric or a simplex connection of loop devices.</td>
</tr>
<tr>
<td>logon</td>
<td>A procedure whereby a user or network connection is identified as being an authorized network user or participant.</td>
</tr>
</tbody>
</table>
loop

See arbitrated loop.

loop ID

Seven-bit values numbered contiguous from 0 to 126 decimal that represent the 127 valid AL_PA values on a loop (not all 256 hexadecimal values are allowed as AL_PA values per Fibre Channel).

loop pair

A Fibre Channel attachment a controller and physical disk drives. Physical disk drives connect to controllers through paired Fibre Channel arbitrated loops. There are two loop pairs, designated loop pair 1 and loop pair 2. Each loop pair consists of two loops (called loop A and loop B) that operate independently during normal operation, but provide mutual backup in case one loop fails.

LTEA

Last termination event array. A two-digit HSV Controller number that identifies a specific event that terminated an operation. The valid numbers range from 00 to 47.

LUN

Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB.

M

management agent

The HP P6000 Command View software that controls and monitors the Enterprise storage system. The software can exist on more than one management server in a fabric. Each installation is a management agent.

management agent event

A significant occurrence to or within the management agent software, or an initialized storage cell controlled or monitored by the management agent.

management server

A server on which management software is installed, such as HP P6000 Command View and HP Replication Solutions Manager.

MB

Megabyte. A term defining either:

- A data transfer rate.
- A measure of either storage or memory capacity of 1,048,576 ($2^{20}$) bytes.

See also MB.

Mb

Megabit. A term defining a data transfer rate.

See also Mbps.

MBps

Megabytes per second. A measure of bandwidth or data transfers occurring at a rate of 1,000,000 ($10^6$) bytes per second.

Mbps

Megabits per second. A measure of bandwidth or data transfers occurring at a rate of 1,000,000 ($10^6$) bits per second.

mean time between failures

See MTBF.

Mega

A notation denoting a multiplier of 1 million (1,000,000).

metadata

The data in the first sectors of a disk drive that the system uses to identify virtual disk members.

micro meter

See µm.

mirrored caching

A process in which half of each controller’s write cache mirrors the companion controller’s write cache. The total memory available for cached write data is reduced by half, but the level of protection is greater.

mirroring

The act of creating an exact copy or image of data.

MTBF

Mean time between failures. The average time from start of use to first failure in a large population of identical systems, components, or devices.

multi-mode fiber

A fiber optic cable with a diameter large enough (50 microns or more) to allow multiple streams of light to travel different paths from the transmitter to the receiver. This transmission mode enables bidirectional transmissions.

N

near-online storage

On-site storage of data on media that takes slightly longer to access than online storage kept on high-speed disk drives.
| **Network Storage Controller** | See NSC. |
| **node port** | A device port that can operate on the arbitrated loop topology. |
| **non-OFC (Open Fibre Control)** | A laser transceiver whose lower-intensity output does not require special open Fibre Channel mechanisms for eye protection. The Enterprise storage system transceivers are non-OFC compatible. |
| **NONCRITICAL Condition** | A drive enclosure EMU condition report that occurs when one or more elements inside the enclosure have failed or are operating outside of their specifications. The failure does not affect continued normal operation of the enclosure. All devices in the enclosure continue to operate according to their specifications. The ability of the devices to operate correctly may be reduced if additional failures occur. UNRECOVERABLE and CRITICAL errors have precedence over this condition. This condition has precedence over INFORMATION condition. Early correction can prevent the loss of data. |
| **NSC** | Network Storage Controller. The HSV Controllers used by the Enterprise storage system. |
| **NVRAM** | Nonvolatile Random Access Memory. Memory whose contents are not lost when a system is turned Off or if there is a power failure. This is achieved through the use of UPS batteries or implementation technology such as flash memory. NVRAM is commonly used to store important configuration parameters. |
| **O** | |
| **occupancy alarm level** | A percentage of the total disk group capacity in blocks. When the number of blocks in the disk group that contain user data reaches this level, an event code is generated. The alarm level is specified by the user. |
| **OCP** | Operator Control Panel. The element that displays the controller’s status using indicators and an LCD. Information selection and data entry is controlled by the OCP push-button. |
| **online storage** | An allotment of storage space that is available for immediate use, such as a peripheral device that is turned on and connected to a server. |
| **operator control panel** | See OCP. |
| **P** | |
| **param** | The portion of the HSV controller termination code display that defines:  
  • The two-character parameter identifier that is a decimal number in the 0 through 31 range.  
  • The eight-character parameter code that is a hexadecimal number.  
  See also IDX, TC. |
| **password** | A security interlock where the purpose is to allow:  
  • A management agent to control only certain storage systems  
  • Only certain management agents to control a storage system |
| **PDM** | Power distribution module. A thermal circuit breaker-equipped power strip that distributes power from a PDU to Enterprise Storage System elements. |
| **PDU** | Power distribution unit. The rack device that distributes conditioned AC or DC power within a rack. |
| **petabyte** | A unit of storage capacity that is the equivalent of $2^{50}$, 1,125,899,906,842,624 bytes or 1,024 terabytes. |
| **physical disk** | A disk drive mounted in a drive enclosure that communicates with a controller pair through the device-side Fibre Channel loops. A physical disk is hardware with embedded software, as opposed to a virtual disk, which is constructed by the controllers. Only the controllers can communicate directly with the physical disks.  
  The physical disks, in aggregate, are called the array and constitute the storage pool from which the controllers create virtual disks. |
| **physical disk array** | See array. |
port
A physical connection that allows data to pass between a host and a disk array.

port-colored
Pertaining to the application of the color of port or red wine to a CRU tab, lever, or handle to identify the unit as hot-pluggable.

port_name
A 64-bit unique identifier assigned to each Fibre Channel port. The port_name is communicated during the login and port discovery processes.

power distribution module
See PDM.

power distribution unit
See PDU.

power supply
An element that develops DC voltages for operating the storage system elements from either an AC or DC source.

preferred address
An AL_PA which a node port attempts to acquire during loop initialization.

preferred path
A preference for which controller of the controller pair manages the virtual disk. This preference is set by the user when creating the virtual disk. A host can change the preferred path of a virtual disk at any time. The primary purpose of preferring a path is load balancing.

protocol
The conventions or rules for the format and timing of messages sent and received.

pushbutton
A button that is engaged or disengaged when it is pressed.

Q
quiesce
The act of rendering bus activity inactive or dormant. For example, “quiesce the SCSI bus operations during a device warm-swap.”

R
rack
A floorstanding structure primarily designed for, and capable of, holding and supporting storage system equipment. All racks provide for the mounting of panels per Electronic Industries Alliance (EIA) Standard RS310C.

rack-mounting unit
A measurement for rack heights based upon a repeating hole pattern. It is expressed as “U” spacing or panel heights. Repeating hole patterns are spaced every 44.45 mm (1.75 inches) and based on EIA’s Standard RS310C. For example, a 3U unit is 133.35 mm (5.25 inches) high, and a 4U unit is 177.79 mm (7.0 inches) high.

read ahead caching
A cache management method used to decrease the subsystem response time to a read request by allowing the controller to satisfy the request from the cache memory rather than from the disk drives.

read caching
A cache method used to decrease subsystem response times to a read request by allowing the controller to satisfy the request from the cache memory rather than from the disk drives. Reading data from cache memory is faster than reading data from a disk. The read cache is specified as either On or Off for each virtual disk. The default state is on.

reconstruction
The process of regenerating the contents of a failed member data. The reconstruction process writes the data to a spare set disk and incorporates the spare set disk into the mirrorset, striped mirrorset or RAID set from which the failed member came.

redundancy
1. Element Redundancy—The degree to which logical or physical elements are protected by having another element that can take over in case of failure. For example, each loop of a device-side loop pair normally works independently but can take over for the other in case of failure.

2. Data Redundancy—The level to which user data is protected. Redundancy is directly proportional to cost in terms of storage usage; the greater the level of data protection, the more storage space is required.
redundant power configuration  A capability of the Enterprise storage system racks and enclosures to allow continuous system operation by preventing single points of power failure.

- For a rack, two AC power sources and two power conditioning units distribute primary and redundant AC power to enclosure power supplies.
- For a controller or drive enclosure, two power supplies ensure that the DC power is available even when there is a failure of one supply, one AC source, or one power conditioning unit. Implementing the redundant power configuration provides protection against the loss or corruption of data.

reporting group  An Enterprise Storage System controller pair and the associated disk drive enclosures. The Enterprise Storage System controller assigns a unique decimal reporting group number to each EMU on its loops. Each EMU collects disk drive environmental information from its own sub-enclosure and broadcasts the data over the enclosure address bus to all members of the reporting group. Information from enclosures in other reporting groups is ignored.

RoHS  Reduction of Hazardous Substances.

room temperature  See ambient temperature.

RPO  Recovery point objective. The maximum age of the data you want the ability to restore in the event of a disaster. For example, if your RPO is six hours, you want to be able to restore systems back to the state they were in as of no longer than six hours ago. To achieve this objective, you need to make backups or other data copies at least every six hours.

S

SCSI  1. Small Computer System Interface. An American National Standards Institute (ANSI) interface which defines the physical and electrical parameters of a parallel I/O bus used to connect computers and a maximum of 16 bus elements.

2. The communication protocol used a controller pair and the hosts. Specifically, the protocol is Fibre Channel drive enclosure or SCSI on Fibre Channel. SCSI is the higher command-level protocol and Fibre Channel is the low-level transmission protocol. The controllers have full support for SCSI-2; additionally, they support some elements of SCSI-3.

SCSI-3  The ANSI standard that defines the operation and function of Fibre Channel systems.

SCSI-3 Enclosure Services  See SES.

selective presentation  The process whereby a controller presents a virtual disk only to the host computer which is authorized access.

serial transmission  A method of transmission where each bit of information is sent sequentially on a single channel, not simultaneously on all channels as occurs in parallel transmission.

SES  SCSI-3 Enclosures Services. Those services that establish the mechanical environment, electrical environment, and external indicators and controls for the proper operation and maintenance of devices within an enclosure.

SFP  Small form-factor pluggable transceiver.

solid state disk (SSD)  A high-performance storage device that contains no moving parts. SSD components include either DRAM or EEPROM memory boards, a memory bus board, a CPU, and a battery card.

SSN  Storage System Name. An HP P6000 Command View-assigned, unique 20-character name that identifies a specific storage system.

storage carrier  See carrier.

storage pool  The aggregated blocks of available storage in the total physical disk array.

storage system  See array.

Storage System Name  See SSN.

switch  An electronic component that switches network traffic from one connection to another.
TB  
Terabyte. A term defining either:
- A data transfer rate.
- A measure of either storage or memory capacity of \(1,099,511,627,776\) (\(2^{40}\)) bytes.

See also TBps.

TBps  
Terabytes per second. A data transfer rate of \(1,000,000,000,000\) (\(10^{12}\)) bytes per second.

TC  
Termination Code. An Enterprise Storage System controller 8-character hexadecimal display that defines a problem causing controller operations to halt.

Termination Code  
See TC.

termination event  
The occurrences that cause a storage system to cease operation.

terminator  
Interconnected elements that form the ends of the transmission lines in the enclosure address bus.

topology  
An interconnection scheme that allows multiple Fibre Channel ports to communicate. Point-to-point and arbitrated loop are examples of Fibre Channel topologies.

transceiver  
The device that converts electrical signals to optical signals where the fiber cables connect to the Fibre Channel elements such as hubs, controllers, or adapters.

U  
UID  
Unit identification.

uninitialized system  
A state in which the storage system is not ready for use.

UNRECOVERABLE condition  
A drive enclosure EMU condition report that occurs when one or more elements inside the enclosure have failed and have disabled the enclosure. The enclosure may be incapable of recovering or bypassing the failure and will require repairs to correct the condition. This is the highest level condition and has precedence over all other errors and requires immediate corrective action.

unwritten cached data  
Also known as unflushed data.

See also dirty data.

UPS  
Uninterruptible Power Supply. A battery-operated power supply guaranteed to provide power to an electrical device in the event of an unexpected interruption to the primary power supply.

Uninterruptible power supplies are usually rated by the amount of voltage supplied and the length of time the voltage is supplied.

UUID  
Unique Universal Identifier. A unique 128-bit identifier for each component of an array. UUIDs are internal system values that users cannot modify.

V  
virtual disk  
Variable disk capacity that is defined and managed by the array controller and presented to hosts as a disk. Can be called Vdisk in the user interface.

virtual disk copy  
A clone or exact replica of another virtual disk at a particular point in time. Only an active virtual disk can be copied. A copy immediately becomes the active disk of its own virtual disk family.

See also active member of a virtual disk family.

virtual disk family  
A virtual disk and its snapshot, if a snapshot exists, constitute a family. The original virtual disk is called the active disk. When you first create a virtual disk family, the only member is the active disk.

See also active member of a virtual disk family, virtual disk copy.

Vraid  
The level to which user data is protected. Redundancy is directly proportional to cost in terms of storage usage; the greater the level of data protection, the more storage space is required.

Vraid0  
Optimized for I/O speed and efficient use of physical disk space, but provides no data redundancy.

Vraid1  
Optimized for data redundancy and I/O speed, but uses the most physical disk space.

Vraid5  
Provides a balance of data redundancy, I/O speed, and efficient use of physical disk space.
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<th>Definition</th>
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<td>Vraid6</td>
<td>Offers the features of Vraid5 while providing more protection for an additional drive failure, but uses additional physical disk space.</td>
</tr>
<tr>
<td>World Wide Name</td>
<td>See WWN.</td>
</tr>
<tr>
<td>write back caching</td>
<td>A controller process that notifies the host that the write operation is complete when the data is written to the cache. This occurs before transferring the data to the disk. Write back caching improves response time since the write operation completes as soon as the data reaches the cache. As soon as possible after caching the data, the controller then writes the data to the disk drives.</td>
</tr>
<tr>
<td>write caching</td>
<td>A process when the host sends a write request to the controller, and the controller places the data in the controller cache module. As soon as possible, the controller transfers the data to the physical disk drives.</td>
</tr>
<tr>
<td>WWN</td>
<td>World Wide Name. A unique identifier assigned to a Fibre Channel device.</td>
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