Abstract
This guide provides information about installing, configuring, restoring, and managing the HP IP Distance Gateway (mpx110). It is intended for system administrators responsible for installing, managing, and servicing the mpx110 and the SAN to which it is attached.
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1 Overview

This chapter provides a description of the mpx110 and an overview of FCIP.

mpx110 product description

The HP IP Distance Gateway (referred to as the mpx110) provides FC SAN extension over an IP network. Used in conjunction with the P10000/3PAR, P6000/EVA, and P9000/XP storage system families, HP Continuous Access P6000/EVA, P9000/XP, and P10000/3PAR Remote Copy software, the mpx110 provides long-distance remote replication for disaster tolerance.

A base FCIP configuration consists of a minimum of two mpx110 gateways—one for the local site and one for the remote site. A single mpx110 gateway is HP part number AG680A—HP IP Distance Gateway. One mpx110 per site is required. See “FCIP overview” (page 9).

Optional equipment

HP part number AG681A—HP IP Distance Gateway Upgrade (single mpx110 gateway for redundancy, one per site required) is available for hardware redundancy.

The following configurations implement redundant pairs of gateways:

- FCIP fully redundant, high-availability configuration (page 10)
- Redundant pairs of gateways, one long-distance link (page 12)
- Redundant pairs of gateways, two long-distance links (page 13)
- Redundant pairs of gateways, fully redundant long-distance links (page 13)

**NOTE:** See Configuration rules and guidelines (page 11) for additional required and optional equipment for your configuration.
FCIP overview

FCIP enables connectivity between geographically dispersed FC devices over an IP network. To deploy FCIP, two mpx110 gateways are required. Each gateway is configured for FCIP and connected to a fabric. The gateways are connected to each other through an IP network (LAN/WAN). For more information, see Figure 1 (page 9).

Local FC devices need no additional hardware or software to access remote FC devices using the mpx110 deployed for FCIP.

Figure 1 FCIP overview

Using FCIP to encapsulate FC packets

With FCIP, gateways transport FC frames over an IP network. From the perspective of the local and remote fabrics, the FC devices accessed through the gateways appear to be part of one unified fabric. This effect is possible because FC traffic is carried over the IP network in such a way that the FC fabric and all FC devices on the fabric are unaware of the presence of the IP network.

Once configured, FCIP instances on each gateway become active and establish their connectivity through the IP network. The FC devices in the local fabric access the FC devices in the remote fabric using FC frames. The FC frames are encapsulated in IP packets by the local gateway and then transmitted to the remote gateway. The remote gateway strips the IP packet data and passes only the FC frames to the remote FC devices.

The gateways deployed for FCIP are configured to use TCP, which uses standard TCP flow control and error recovery algorithms.
Redundant FCIP network structure example

In a high-availability FCIP configuration, such as between pairs of mpx110 gateways and two independent IP networks that provide full redundancy, a loss of connectivity that occurs through one of the IP networks does not result in a loss of connectivity between the fabrics. See FCIP fully redundant, high-availability configuration.

Figure 2 FCIP fully redundant, high-availability configuration
2 Configuration rules and guidelines

This chapter includes mpx110 supported configurations, rules and guidelines for the configurations, and IP performance information.

Supported configurations

The mpx110 supports the following configurations:

- One pair of gateways with single-path connectivity (page 11)
- One pair of gateways with redundant fabrics (page 12)
- One pair of gateways, two long-distance links (page 12)
- Redundant pairs of gateways, one long-distance link (page 12)
- Redundant pairs of gateways, two long-distance links (page 13)
- Redundant pairs of gateways, fully redundant long-distance links (page 13)
- Highly redundant pairs of gateways, two long distance links (page 13)
- Highly redundant pairs of gateways, fully redundant long-distance links (page 14)
- Basic configuration, MPX200 FCIP with remote IP Distance Gateway (mpx110) (page 14)
- mpx110 FCIP with B-series Integrated Routing (page 15)
- mpx110 IP Distance Gateway FCIP with C-series IVR (page 16)
- HP Continuous Access EVA 3-site configuration with four gateways (page 17)
- HP Continuous Access EVA 3-site configuration with six gateways (page 17)
- HP Continuous Access EVA 3-site configuration with eight gateways (page 19)

Figure 3 One pair of gateways with single-path connectivity
Figure 7 Redundant pairs of gateways, two long-distance links

Figure 8 Redundant pairs of gateways, fully redundant long-distance links

Figure 9 Highly redundant pairs of gateways, two long-distance links
Figure 10 Highly redundant pairs of gateways, fully redundant long-distance links

Figure 11 Basic configuration, MPX200 FCIP with remote IP Distance Gateway (mpx110)
Figure 12 shows a configuration using the mpx110 with FCIP and B-series switches with Integrated Routing. This provides fabric isolation between the local and remote fabrics, enabling device access without merging the fabrics. This can be implemented in all supported mpx110 FCIP configurations using B-series Fibre Channel switches with Integrated Routing or B-series routers configured for Fibre Channel routing.

**Figure 12 mpx110 FCIP with B-series Integrated Routing**
Figure 13 shows a configuration using the mpx110 with FCIP and C-series switches with IVR. This provides fabric isolation between the local and remote fabrics, allowing device access without merging the fabrics. This can be implemented in all supported mpx110 FCIP configurations using C-series Fibre Channel switches with IVR.

**Figure 13 mpx110 IP Distance Gateway FCIP with C-series IVR**
HP Continuous Access P6000/EVA 3-site configurations

This section describes the following HP Continuous Access P6000/EVA 3-site configurations:

- HP Continuous Access EVA 3-site configuration with four gateways (page 17)
- HP Continuous Access EVA 3-site configuration with six gateways (page 17)
- HP Continuous Access EVA 3-site configuration with eight gateways (page 19)
- (page 20)

The first three configurations provide a fan-in or fan-out relationship between the sites. The fourth configuration provides a peer-to-peer relationship between all sites.

Figure 14 (page 17) shows connectivity for three sites using four mpx110 gateways, which implements the minimum-level and lowest-cost connectivity for a 3-site configuration. Figure 15 (page 18) shows additional connectivity and redundancy using six mpx110 gateways. Figure 16 (page 19) shows the highest level of 3-site connectivity using eight mpx110 gateways.

Figure 17 (page 20) is similar to Figure 15 (page 18), with additional connectivity to allow for replication between Site 2 and Site 3.

The following configuration rules apply to Figure 14 (page 17) through Figure 16 (page 19) (fan-in/fan-out relationships):

- For Site 1, Site 2 or Site 3 can function as the remote site.
- For Site 2 or Site 3, Site 1 can function as the remote site.
- Replication between Site 2 and Site 3 is not supported.

The following configuration rules apply to Figure 17 (page 20) (peer-to-peer relationship):

- For Site 1, Site 2 or Site 3 can function as the remote site.
- For Site 2, Site 1 or Site 3 can function as the remote site.
- For Site 3, Site 1 or Site 2 can function as the remote site.

### 3-site configuration with four mpx110 gateways

The configuration shown in Figure 14 (page 17) provides long-distance link redundancy between all three sites.

#### Figure 14 HP Continuous Access P6000/EVA 3-site configuration with four mpx110 gateways

![Diagram](image)

### 3-site configuration with six mpx110 gateways

The configuration shown in Figure 15 (page 18) provides the same long-distance link redundancy as the configuration shown in Figure 14 (page 17), with the addition of redundant mpx110 gateways at sites 2 and 3.
Figure 15 HP Continuous Access P6000/EVA 3-site configuration with six mpx110 gateways
3-site configuration with eight mpx110 gateways

The configuration shown in Figure 16 (page 19) provides the highest 3-site redundancy, with a dedicated mpx110 pair for all long-distance links to all three sites.

Figure 16 HP Continuous Access P6000/EVA 3-site configuration with eight mpx110 gateways
3-site configuration with six gateways and full inter-site connectivity

Figure 17 (page 20) provides long-distance link redundancy and full connectivity between all three sites.

Figure 17 HP Continuous Access P6000/EVA 3-site configuration with six gateways, full peer-to-peer connectivity
Configuration rules and guidelines

The following sections define the configuration rules for using the mpx110 gateways for FCIP.

General configuration rules

The following general configuration rules apply:

- All mpx110 configurations require a minimum of two mpx110 gateways, or one mpx110 and one MPX200 Multifunction Router with an FCIP license, one local and one remote, connected through an IP network.
- The mpx110 gateway must connect to another mpx110 or an mp200 Multifunction Router with an FCIP license. HP does not support FCIP connectivity between other gateway models.
- The mpx110 gateway is supported for FCIP extension with HP P9000 and P6000 Continuous Access (see EVA storage system rules and guidelines (page 21) and XP storage system rules and guidelines (page 22)), and P10000/3PAR Remote Copy software.

**NOTE:** For current support, see SPOCK at [http://www.hp.com/storage/spock](http://www.hp.com/storage/spock). You must sign up for an HP Passport to enable access.

Operating system and multipath support

The mpx110 gateway is supported using FCIP with all operating systems and multipath software supported by HP. For more information, see the HP SAN Design Reference Guide, available at [http://www.hp.com/go/SDGManuals](http://www.hp.com/go/SDGManuals).

P6000/EVA storage system rules and guidelines

Observe the following P6000/EVA storage system rules and guidelines:

- P6350/P6300/P6550/P6500
- The mpx110 gateway configured for FCIP is supported for use with the following HP Continuous Access P6000/EVA storage systems:
  - EVA4400/4400 with embedded switch
  - EVA4000/4100/6000/6100/8000/8100
  - EVA6400/8400
- The mpx110 gateway is supported for use in all HP-supported P6000 Continuous Access configurations, including the standard two-fabric, five-fabric, and six-fabric configurations.
- HP P6000 Continuous Access supports RCS and non-RCS LUNs with FCIP extension.
- HP mpx110 gateway supports the minimum IP bandwidth/maximum DR groups.

Table 1 (page 22) defines the minimum IP bandwidth and maximum EVA DR groups for EVA XCS and VCS.
Table 1 Minimum IP bandwidth and maximum DR groups

<table>
<thead>
<tr>
<th>Gateway pair</th>
<th>Minimum IP bandwidth and maximum DR groups&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Single or shared IP link latency (0 to 100 ms one-way)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Distance</td>
<td>Dual fabric latency (0 to 100 ms one-way)</td>
<td></td>
</tr>
<tr>
<td>Gateway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(mpx110)</td>
<td>Minimum: At least 2 Mb/s for 1 DR group</td>
<td>Minimum: At least 4 Mb/s for 1 DR group</td>
</tr>
<tr>
<td></td>
<td>Recommended: At least 5 Mb/s for 1 to 5 DR groups</td>
<td>Recommended: At least 10 Mb/s for 1 to 5 DR groups</td>
</tr>
</tbody>
</table>

<sup>1</sup> 1 Gb/s IP bandwidth can have up to 128 DR groups with VCS 4.x, and up to 256 DR groups with XCS.

P6000/EVA storage system software

The mpx110 gateway is supported with current P6000/EVA storage software applications such as HP P6000 Continuous Access, Command View EVA, Business Copy, SSSU, and Replication Solutions Manager.

P9000/XP storage system rules and guidelines

Observe the following P9000/XP storage system rules and guidelines:

- Supported P9000/XP models are P9500/XP24000/20000 and XP12000/10000, with supported firmware levels. For more information, see SPOCK at [http://www.hp.com/storage/spock](http://www.hp.com/storage/spock).
- The mpx110 gateway configured for FCIP is supported for use with P9000/XP Continuous Access Sync, Async, and Journal.
- A P9000/XP storage system requires a minimum IP bandwidth of 16 Mb/s per path. The maximum latency is 100 ms round-trip.

P9000/XP storage system software

The mpx110 gateway is supported with current versions of P9000/XP storage software applications, such as XP Continuous Access, Command View XP, Continuous Access Journal XP, Business Copy XP, and XP Array Manager.

Fibre Channel switch and firmware support

The mpx110 is compatible with the following Fibre Channel switches:

- B-series 8 Gb/s, 4 Gb/s, and 2 Gb/s Fibre Channel switches
- C-series 8 Gb/s, 4 Gb/s, and 2 Gb/s Fibre Channel switches
- H-series 8 Gb/s Fibre Channel switches

**NOTE:** For current support, see SPOCK at [http://www.hp.com/storage/spock](http://www.hp.com/storage/spock). You must sign up for an HP Passport to enable access.

FC switch requirements

The following additional B-series, C-series, and H-series FC switch requirements must be observed:

- Local and remote mpx110 gateway pairs must be connected to the same Fibre Channel switch product line series.
- The maximum distance between an mpx110 and a Fibre Channel switch is 300 meters at 2 Gb/s.

**NOTE:** The mpx110 Fibre Channel ports operate at 2 Gb/s.
IP network requirements

HP requires that the following standards be met for the IP network:

- Supported network protocols are TCP/IP IPv4 and IPv6 Ethernet 1,000 Mb/s.
  See EVA storage system rules and guidelines (page 21) and XP storage system rules and guidelines (page 22) for minimum IP bandwidth requirements.

- For mpx110 IP data—Local and remote pairs are supported for up to 100 ms of IP network delay one-way, or 200 ms round-trip for HP Continuous Access P6000. HP requires dedicated IP bandwidth (see Table 2 (page 24)). For P9000 Continuous Access, the maximum distance and delay is based on the replication mode. See “P9000/XP and VA storage system rules” in the HP SAN Design Reference Guide.

- For mpx110 IP management—LAN and WAN are supported.
Table 2 Network requirements for the mpx110 with XCS and VCS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>Must be dedicated to the HP Continuous Access storage replication function. There is no support for dynamic pacing of the gateway.</td>
</tr>
<tr>
<td>Maximum number of DR groups</td>
<td>See Table 1 (page 22) for minimum supported bandwidth based on the average packet-loss ratio and one-way intersite latencies.</td>
</tr>
<tr>
<td>MTU of the IP network</td>
<td>1,500 bytes</td>
</tr>
<tr>
<td>Maximum latency</td>
<td>P6000/EVA: 100 ms one-way or 200 ms round-tripP9000/XP: 50 ms one-way or 100 ms round-trip</td>
</tr>
<tr>
<td>Average packet-loss ratio</td>
<td>Low-loss network: 0.0012% average over 24 hoursHigh-loss network: 0.2% average over 24 hours; must not exceed 0.5% for more than 5 minutes in a 2-hour window</td>
</tr>
<tr>
<td>Latency jitter</td>
<td>Must not exceed 10 ms over 24 hours</td>
</tr>
</tbody>
</table>

1 Pre-existing restriction
2 A high packet-loss ratio indicates the need to retransmit data across the intersite link. Each retransmission delays transmissions queued behind the current packet, thus increasing the time to complete pending transactions.
3 Latency jitter is the difference between the minimum and maximum values, and indicates how stable or predictable the network delay. The greater the jitter, the greater the variance in the delay, which lowers the performance predictability.
**IP performance tuning**

The mpx110 supports Fibre Channel service at transmission rates of 1 Gb/s or 2 Gb/s with a maximum frame size of 2,148 bytes. It supports Ethernet service at transmission rates of 1,000 or 100 Mb/s with an MTU size between 1,000 and 9,000 bytes (jumbo frames). Related performance characteristics include the following:

- Distance (page 25)
- Bandwidth per route (page 25)
- Latency (page 25)
- MTU/Jumbo frames (page 25)
- Compression (page 26)
- TCP Window size/scaling performance tuning (page 26)

**Distance**

Consider the physical distance between the mpx110 gateways. This is usually measured in RTT. The RTT can be anywhere from less than 1 millisecond to as great as 200 milliseconds.

**Bandwidth per route**

Bandwidth is a measure of the volume of data that can be transmitted at a given transmission rate. WAN data rates range from 1.5 Mb/s (T1) to greater than 600 Mb/s (OC-12). The proper mpx110 bandwidth setting is determined based on the bandwidth available for each FCIP route, irrespective of the total bandwidth and physical speed of the link.

To determine the proper mpx110 bandwidth setting, start with the total bandwidth of the WAN link. Adjust this number based on the guaranteed allocated FCIP bandwidth, then further adjust this number if the number of FCIP routes configured is greater than one. For example, if the WAN link is 45 Mb/s, and 15 Mb/s is allocated to network traffic, the remaining 30 Mb/s is available for FCIP. If in this example the mpx110 is configured for two routes, based on the 30 Mb/s total bandwidth available for FCIP, you would set the mpx110 bandwidth parameter to 15, the available bandwidth for each FCIP route.

HP P9000 and P6000 Continuous Access replication solutions require dedicated bandwidth for the intersite link. If other applications share the intersite link, some method of QoS must be used to ensure that the replication application has uncontested access to the allocated bandwidth.

**NOTE:** Setting the bandwidth per route parameter higher than the actual bandwidth available for each route results in a decrease in performance; the optimal setting matches the bandwidth per route setting to the actual bandwidth available to each FCIP route.

**Latency**

Latency is the amount of time a packet takes to traverse the network from source to destination.

**MTU/Jumbo frames**

For MTU size there are 3 settings, Normal (1500 bytes), Jumbo (9000 bytes) and Other, where you are then prompted for a value between 1000 and 9000.

- **Normal:** Typically MTU should be set to the default of 1500; rarely do WAN networks support MTU sizes greater than 1500.
- **Jumbo:** Jumbo frames can enhance the IP performance of the mpx110. Before enabling jumbo frames, ensure that all switches in the IP path are configured for jumbo frames.
NOTE: Jumbo frames are not supported for use with HP P9000 or P6000 Continuous Access.

- **Other:** Allows you to configure the MTU size to a value between 1000 and 9000 bytes. Encryption products on the WAN link often add some number of additional bytes to each packet, so it may be necessary to decrease the mpx110 MTU size setting to between 1450 and 1200. This accommodates the additional bytes, while maintaining a total MTU size of 1500 or less. Keeping the total MTU size to a maximum of 1500 ensures a single Fibre Channel frame (2112 bytes) will fit within two Ethernet packets, resulting in optimal performance.

Compression

The mpx110 integrates a software compression option. Enable compression for IP fabrics with an RTT greater than or equal to 50 ms, or guaranteed WAN bandwidth of less than or equal to 45 Mb/s. See **TCP window size recommendations** (page 28) for compression options for specific network rates and RTT.

TCP window size/scaling performance tuning

The mpx110 performance is maximized when properly configured. Knowing the RTT (distance) between mpx110 gateways and the WAN effective data rate (connection type) allows the gateways to be tuned for optimal performance. See (page 26).

Modifying the window size and scaling factor

The mpx110 window size can be set to a maximum of 32 KB. The scaling factor is used as a multiplier to increase the window size above 32 KB. Modify the window size and scaling factor in the mpx110 gateway pairs based on the WAN RTT and link speed. To determine the appropriate window size setting, use the pre-populated tables or a formula.

If the recommended TCP window size scale factor for a given RTT and WAN link speed is not shown in Table 4 (page 28) through Table 10 (page 31), use the following formula:

\[(\text{RTT} \text{ (ms)} \times \text{link rate} \text{ (Kb/s)} \times 1 \text{ byte/8 bits)} = \text{minimum window size (MWS)}\]

Then, convert the MWS to a recommended scale factor by dividing it by the default window size (32,768 bytes). Use Table 3 (page 27) to determine the scale factor.
### Table 3 TCP window size scale factors

<table>
<thead>
<tr>
<th>MWS scale result</th>
<th>Scale factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 2</td>
<td>0</td>
</tr>
<tr>
<td>2 to 4</td>
<td>1</td>
</tr>
<tr>
<td>4 to 8</td>
<td>2</td>
</tr>
<tr>
<td>8 to 16</td>
<td>3</td>
</tr>
<tr>
<td>16 to 32</td>
<td>4</td>
</tr>
<tr>
<td>32 to 64</td>
<td>5</td>
</tr>
<tr>
<td>64 to 128</td>
<td>6</td>
</tr>
<tr>
<td>128 or greater</td>
<td>7</td>
</tr>
</tbody>
</table>
TCP window size recommendations

Table 4 (page 28) through Table 10 (page 31) provide TCP window scaling factor and window size settings for specific WAN environments.

**NOTE:** The TCP window size recommendations listed in Table 4 (page 28) through Table 10 (page 31) are based on low-loss networks (0.0012% average packet-loss ratio over 24 hours). For higher-loss, longer-latency networks, you should reduce the recommended window size and scaling factor by one setting to compensate for the increased number of packet retransmissions.

### Table 4 T1 / DS-1: 1.554 Mb/s

<table>
<thead>
<tr>
<th>Round-trip time</th>
<th>Total window size (bytes)</th>
<th>Scaling factor</th>
<th>Compression recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>64 K</td>
<td>1</td>
<td>ON</td>
</tr>
<tr>
<td>100</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>50</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>25</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>20</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>15</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>10</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>5</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>2.5</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>1 or less</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
</tbody>
</table>
### Table 5 T3 / DS-3: 45 Mb/s

<table>
<thead>
<tr>
<th>Round-trip time</th>
<th>Total window size (bytes)</th>
<th>Scaling factor</th>
<th>Compression recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>2 MB</td>
<td>6</td>
<td>ON</td>
</tr>
<tr>
<td>100</td>
<td>1 MB</td>
<td>5</td>
<td>ON</td>
</tr>
<tr>
<td>50</td>
<td>256 K</td>
<td>3</td>
<td>ON</td>
</tr>
<tr>
<td>25</td>
<td>128 K</td>
<td>2</td>
<td>ON</td>
</tr>
<tr>
<td>20</td>
<td>128 K</td>
<td>2</td>
<td>ON</td>
</tr>
<tr>
<td>15</td>
<td>64 K</td>
<td>1</td>
<td>ON</td>
</tr>
<tr>
<td>10</td>
<td>64 K</td>
<td>1</td>
<td>ON</td>
</tr>
<tr>
<td>5</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>2.5</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
<tr>
<td>1 or less</td>
<td>32 K</td>
<td>0</td>
<td>ON</td>
</tr>
</tbody>
</table>

### Table 6 DS-5: 400 Mb/s

<table>
<thead>
<tr>
<th>Round-trip time</th>
<th>Total window size (bytes)</th>
<th>Scaling factor</th>
<th>Compression recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>100</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>50</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>25</td>
<td>2 MB</td>
<td>6</td>
<td>OFF</td>
</tr>
<tr>
<td>20</td>
<td>1 MB</td>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>15</td>
<td>1 MB</td>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>10</td>
<td>512 K</td>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>256 K</td>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>2.5</td>
<td>128 K</td>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>1 or less</td>
<td>64 K</td>
<td>1</td>
<td>OFF</td>
</tr>
</tbody>
</table>
Table 7 OC-1: 50 Mb/s

<table>
<thead>
<tr>
<th>Round-trip time</th>
<th>Total window size (bytes)</th>
<th>Scaling factor</th>
<th>Compression recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>2 MB</td>
<td>6</td>
<td>ON</td>
</tr>
<tr>
<td>100</td>
<td>1 MB</td>
<td>5</td>
<td>ON</td>
</tr>
<tr>
<td>50</td>
<td>512 K</td>
<td>4</td>
<td>ON</td>
</tr>
<tr>
<td>25</td>
<td>128 K</td>
<td>2</td>
<td>ON</td>
</tr>
<tr>
<td>20</td>
<td>128 K</td>
<td>2</td>
<td>ON</td>
</tr>
<tr>
<td>15</td>
<td>128 K</td>
<td>2</td>
<td>ON or OFF</td>
</tr>
<tr>
<td>10</td>
<td>64 K</td>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>32 K</td>
<td>0</td>
<td>OFF</td>
</tr>
<tr>
<td>2.5</td>
<td>32 K</td>
<td>0</td>
<td>OFF</td>
</tr>
<tr>
<td>1 or less</td>
<td>32 K</td>
<td>0</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Table 8 100-BASE T: 100 Mb/s

<table>
<thead>
<tr>
<th>Round-trip time</th>
<th>Total window size (bytes)</th>
<th>Scaling factor</th>
<th>Compression recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>100</td>
<td>2 MB</td>
<td>6</td>
<td>ON</td>
</tr>
<tr>
<td>50</td>
<td>1 MB</td>
<td>5</td>
<td>ON</td>
</tr>
<tr>
<td>25</td>
<td>512 K</td>
<td>4</td>
<td>ON</td>
</tr>
<tr>
<td>20</td>
<td>256 K</td>
<td>3</td>
<td>ON</td>
</tr>
<tr>
<td>15</td>
<td>256 K</td>
<td>3</td>
<td>ON or OFF</td>
</tr>
<tr>
<td>10</td>
<td>128 K</td>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>64 K</td>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>2.5</td>
<td>32 K</td>
<td>0</td>
<td>OFF</td>
</tr>
<tr>
<td>1 or less</td>
<td>32 K</td>
<td>0</td>
<td>OFF</td>
</tr>
</tbody>
</table>
### Table 9 OC-3: 150 Mb/s

<table>
<thead>
<tr>
<th>Round-trip time</th>
<th>Total window size (bytes)</th>
<th>Scaling factor</th>
<th>Compression recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>100</td>
<td>2 MB</td>
<td>6</td>
<td>ON</td>
</tr>
<tr>
<td>50</td>
<td>1 MB</td>
<td>5</td>
<td>ON</td>
</tr>
<tr>
<td>25</td>
<td>512 K</td>
<td>4</td>
<td>ON or OFF</td>
</tr>
<tr>
<td>20</td>
<td>512 K</td>
<td>4</td>
<td>ON or OFF</td>
</tr>
<tr>
<td>15</td>
<td>256 K</td>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>10</td>
<td>256 K</td>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>128 K</td>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>2.5</td>
<td>64 K</td>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>1 or less</td>
<td>32 K</td>
<td>0</td>
<td>OFF</td>
</tr>
</tbody>
</table>

### Table 10 OC-6: 311 Mb/s

<table>
<thead>
<tr>
<th>Round-trip time</th>
<th>Total window size (bytes)</th>
<th>Scaling factor</th>
<th>Compression recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>100</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>50</td>
<td>2 MB</td>
<td>6</td>
<td>ON</td>
</tr>
<tr>
<td>25</td>
<td>1 MB</td>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>20</td>
<td>1 MB</td>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>15</td>
<td>1 MB</td>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>10</td>
<td>512 K</td>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>256 K</td>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>2.5</td>
<td>128 K</td>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>1 or less</td>
<td>64 K</td>
<td>1</td>
<td>OFF</td>
</tr>
</tbody>
</table>
### Table 11 OC-12 and above: 621 Mb/s

<table>
<thead>
<tr>
<th>Round-trip time</th>
<th>Total window size (bytes)</th>
<th>Scaling factor</th>
<th>Compression recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>100</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>50</td>
<td>4 MB</td>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>25</td>
<td>2 MB</td>
<td>6</td>
<td>OFF</td>
</tr>
<tr>
<td>20</td>
<td>2 MB</td>
<td>6</td>
<td>OFF</td>
</tr>
<tr>
<td>15</td>
<td>2 MB</td>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>10</td>
<td>1 MB</td>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>512 K</td>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>2.5</td>
<td>256 K</td>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>1 or less</td>
<td>64 K</td>
<td>1</td>
<td>OFF</td>
</tr>
</tbody>
</table>
3 Installation and upgrades

This chapter contains the information needed to install, configure, and upgrade the mpx110.

Verifying mpx110 requirements

Obtain the following (one of each, unless otherwise noted) for the local and remote site:

- HP IP Distance Gateway (mpx110), Part Number: AG680A
- HP P9000 or P6000 Continuous Access software or P10000/3PAR Remote Copy software
  EVA4400/4400 with embedded switch, EVA4000/4100/6000/6100/8000/8100, EVA6400/8400, P6350/P6300/P6550/P6500, or
  P9500/XP24000/20000/12000/10000 storage system or P10000/3PAR V-Class, F-Class, T-Class storage systems
- FC fabrics consisting of HP B-series, C-series, or H-series switches
- Cat 5e network cable, two per site
- Optical SFPs and FC cables, two per site

Additional optional equipment (one of each, unless otherwise noted) for the local and remote site:

- HP IP Distance Gateway Upgrade (mpx110 for redundancy), Part Number: AG681A
- Optical SFPs and FC cables, two per site

NOTE: For the latest information about the minimum system requirements, see the HP IP Distance Gateway release notes, available at http://www.hp.com/support/manuals. Under Storage, select Storage Networking, and then under Routers/Gateways/Multiplexers, select HP IP Distance Gateway.
Pre-installation checklist

Before starting the configuration process, contact your System Administrator for the following mpx110 parameters:

- Symbolic Name of the mpx110
- IP address, subnet mask and gateway for the mpx110 management port (if not using DHCP)
- IP address, subnet mask and gateway for the GE1 port
- IP address of the remote mpx110 that connects to the GE1 port
- IP address, subnet mask and gateway for the GE2 port (if applicable)
- IP address of the remote mpx110 that connects to the GE2 port (if applicable)
- FCIP link parameters (specifically, Guaranteed Bandwidth, Round-Trip-Delay, Quality Of Service, and VLAN/Priority)

For more information, see (page 41).

- mpx110 serial console cable adapter
- HP mpx Manager software (optional)
- The default TCP port used by the mpx110 is 3225. To ensure that the FCIP link is formed correctly, make sure that any firewalls have port 3225 unblocked before connecting the mpx110s.

Rack mounting the mpx110

⚠️ WARNING! Mount the mpx100/100b in the rack so that the weight is evenly distributed. An unevenly loaded rack can become unstable possibly resulting in equipment damage or personal injury.

This product is supplied with a three-wire cable and plug for the user’s safety. Use this power cable in a properly grounded outlet to avoid electrical shock. An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the switch chassis. It is the responsibility of the customer to ensure the outlet is correctly wired and grounded to prevent electrical shock.

If the chassis is installed in a closed or multi-rack assembly, the operating temperature of the rack environment may be greater than the ambient temperature. Be sure to install the chassis in an environment that is compatible with the maximum ambient rated temperature.

You need a Phillips head screwdriver to rack mount the mpx110. You also need to make sure that the operating temperature inside the rack enclosure does not exceed the maximum rated ambient temperature (70°C), especially if the mpx110 is mounted in a closed or multi-unit rack assembly.

1. Assemble two slide brackets (right and left) on the back ends of the C-Shelf, using the four hole nut plates:

   **NOTE:** The rear of the C-Shelf is the end without the knurled thumbscrews.

   a. Mount the C-Shelf with the open side up.
   b. Fit the slide bracket along the 1U side at the back of the C-Shelf with its screw hole tab pointing outboard and its lip supporting the C-Shelf. Mount both right-hand and left-hand slide brackets.
   c. Attach the nut plate outside the slide bracket with the dimpled threaded holes pointing outboard.
d. Place two screws (10-32 Pan 0.625 XRCS) through the two holes at the back of the C-Shelf, through the slide plate slots and loosely into the front two threaded holes of the nut plate.
e. Repeat steps a through d with the opposite hand slide bracket.

2. Install the C-Shelf assembly into the rack:
a. Locate a clear 1U area space within the rack.

**NOTE:** The 1U space in a rack includes three rail mounting holes; however, the rack holes are not evenly spaced. For best installation the C-Shelf can be centered in a 1U space. To locate the center, find a hole that is 5/8” on center from the hole immediately above and below. The two holes above and below this center are only 1/2” on center from their adjacent holes.

b. At the front of the rack, in the center mounting holes, install two nuts (KEPs 10-32, 0.375AF CSZ EXT).
c. Carefully supporting the C-Shelf assembly, loosely thread the knurled thumbscrews through the rack into the two nuts just installed.
d. Go to the back of the rack and position a slide bracket next to the corresponding holes at the back of the rack. Slide the bracket to the rear until the threaded screw hole tabs are flush with the inside of the rack rail.
e. Insert two screws (10-32 Pan 0.325 XRCS screws) through the rack rail into the threaded screw hole tab and tighten loosely.
f. Repeat step e with the other side of the C-Shelf assembly.
g. Tighten all four screws (10-32 Pan 0.625 XRCS screws) at the rear of the C-Shelf assembly.
h. Tighten the front two knurled thumbscrews.
i. Tighten the two screws (10-32 Pan 0.625 XRCS screws) at each side of the back of the C-Shelf assembly.

3. Install the mpx110 into one of the two available positions in the C-Shelf:
a. As the mpx110 slides in there are two tabs at the front and rear that catch and ensure that the mpx110 is firmly seated to the C-Shelf assembly. Take care to ensure that the mpx110 is engaged in all four tabs. To ensure that all four of the tabs engage, you may need to hold both the mpx110 and the C-Shelf assembly as you slide it in the last inch.

**NOTE:** The front of the mpx110 is the end with the connections and faces the rear of the equipment rack. The mpx110 slides in from the front of the equipment rack.

b. Once the rear of the mpx110 is flush with the front of the C-Shelf assembly and all four clips are engaged, the bezel can be snapped on the front.

### Installing the SFPs

You will need an SFP transceiver for each of the FC ports that connect to an FC switch.

To install the SFPs:

1. Align the SFP transceiver so that the key is oriented correctly to the port. Transceivers are keyed so that they can only be inserted one way.
2. Insert the transceiver into the port.
3. Press gently until the transceiver snaps into place.

### Management

The GUI application and CLI execute on a management workstation that provides for the configuration, control, and maintenance of the mpx110. Supported platforms include Microsoft Windows, Solaris, and Linux. The GUI application is installed and executed on the workstation.
The mpx110 supports the following management interfaces:

- **mpx Manager GUI**—Executes on a management workstation
- **CLI**—Executes on the mpx110 and is accessed using Telnet or the serial port (see Command-line interface (page 80))
- **SNMP**—Provides mpx110 status, traps, and alerts (see Simple Network Management Protocol (page 132))

### Installing the management application

You can manage the mpx110 using the HP mpx Manager as a standalone application. The mpx Manager software is available in the HP IP Distance Gateway software kit. The Linux kit is provided in .tar format; the Windows kit is provided as a .zip file. The kits are available at [http://h18006.www1.hp.com/storage/networking/index.html](http://h18006.www1.hp.com/storage/networking/index.html).

Table 12 (page 36) lists the requirements for the management servers running the HP mpx Manager.

#### Table 12 mpx Manager server requirements

<table>
<thead>
<tr>
<th>Component</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
<td>Windows 2003, 2008 or XP</td>
</tr>
<tr>
<td></td>
<td>MAC OS X</td>
</tr>
<tr>
<td></td>
<td>Linux</td>
</tr>
<tr>
<td></td>
<td>• SUSE LINUX Enterprise Server 10 (x86)</td>
</tr>
<tr>
<td></td>
<td>• SUSE LINUX Enterprise Server 9 (x86)</td>
</tr>
<tr>
<td></td>
<td>• SUSE LINUX Enterprise Server 8 (x86)</td>
</tr>
<tr>
<td></td>
<td>• Red Hat Enterprise Linux 3 Update 5 (x86) minimum</td>
</tr>
<tr>
<td></td>
<td>• Red Hat Enterprise Linux 4 (x86)</td>
</tr>
<tr>
<td></td>
<td>• Red Hat Enterprise Linux 5 (x86)</td>
</tr>
<tr>
<td>Memory</td>
<td>256 MB or more</td>
</tr>
<tr>
<td>Disk space</td>
<td>150 MB per installation</td>
</tr>
<tr>
<td>Processor</td>
<td>500 MHz or faster</td>
</tr>
<tr>
<td>Hardware</td>
<td>CD-ROM drive, RJ-45 Ethernet port, RS-232 serial port (optional)</td>
</tr>
<tr>
<td>Internet browser</td>
<td>• Microsoft Internet Explorer 5.0 and later</td>
</tr>
<tr>
<td></td>
<td>• Netscape Navigator 4.72 and later</td>
</tr>
<tr>
<td></td>
<td>• Mozilla 1.02 and later</td>
</tr>
<tr>
<td></td>
<td>• Safari Java 2 Runtime Environment to support web applet</td>
</tr>
</tbody>
</table>
HP mpx Manager for Windows

You can install HP mpx Manager on a Windows server. To install the HP mpx Manager application from the HP IP Distance Gateway installation file:

1. Close all programs currently running, and then unzip the executable file to the system.
2. Double-click the executable to start the installation.

HP mpx Manager for Linux

This section describes how to install HP mpx Manager on a Linux server.

NOTE: In the following procedure, replace n.n.nn and n.n.nnbnnn with a file name (for example, 2.0.30 and 2.0.30b112).

2. Unpack the file to a temporary directory. For example:
   
   ```
   tar -zxvf hpmpx_n.n.nn_linux_install.tar
   ```
   
3. Enter the following to start the install:
   
   ```
   ./hpmpxn.n.nnbnn_linux_install.bin
   ```
   
   A chmod may be necessary prior to execution.
4. Follow the installation instructions on the screen and note the installation location. The default directory is /opt/Hewlett-Packard/mpxManager.

Setting mpx110 management port parameters

NOTE: If you are using Telnet to configure the mpx110 for the first time, your workstation IP address must be 10.0.0.x, where x is a number other than 1, and the subnet mask is 255.0.0.0.

To set the initial mpx110 configuration parameters:

1. Connect the mpx110 management port to a workstation to configure the initial mpx110 parameters. You can connect the mpx110 management port to an IP switch or hub, directly to the workstation with an Ethernet crossover cable to the management port, or to the RS-232 port with a serial cable.

   NOTE: If connecting to the mpx110 serial port, the terminal settings are 115200 baud, 8 bit, 1 stop bit, no parity, and no flow control.

2. Attach one end of the AC power cord to the mpx110 and the other end to the PDU.
3. Verify that the Heartbeat LED is flashing (once per second) and that the System Fault LED does not illuminate. Figure 18 (page 37) shows the location of the ports and LEDs on the mpx110.

Figure 18 mpx110 ports and LEDs
See Diagnostics and troubleshooting (page 48) for a description of the LED fault indications.

4. Telnet to the mpx110 using IP address 1.0.0.1, or use a terminal emulation program (serial cable) from your workstation (see Figure 19 (page 38)):
   a. Enter guest at the login prompt.
   b. Enter password at the password prompt.

   **NOTE:** HP recommends changing the mpx110 guest password after logging in.

**Figure 19 Setting IP addressing using Telnet**

5. Enter admin start at the mpx110 prompt.
6. Enter the default password, config.

   **NOTE:** HP recommends that you change the mpx110 Admin password after logging in.

7. Enter the command set mgmt to set initial parameters.
8. Follow the on-screen prompts to define the following parameters (or press Enter to accept default parameters):
   - Mode (HP highly recommends using static address, Option 0)
   - IPv4/IPv6 address (Because the FCIP ports require dedicated bandwidth, HP recommends that the IP address for the management port be in a different subnet than the FCIP ports.)
   - Subnet mask
   - Default gateway or router

The management port is now configured with the appropriate IP address and network parameters.

   **IMPORTANT:** At this point, the Telnet session terminates. To restart the Telnet session, use the IP address you just assigned to the management port.
Configuring Fibre Channel switch settings for the mpx110

This section provides HP Fibre Channel switch parameters. Modify the switch settings listed below based on the switch product line used. All settings apply to HP P9000 and P6000 Continuous Access unless noted otherwise.

B-series Fibre Channel switch parameters

Execute the commands in Table 13 (page 39) for all switches that will use the FCIP link.

Table 13 Settings for B-series switches

<table>
<thead>
<tr>
<th>Command</th>
<th>HP storage system</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-Switch# switchdisable</td>
<td></td>
</tr>
<tr>
<td>B-Switch# iodset</td>
<td>P6000/EVA</td>
</tr>
<tr>
<td>B-Switch# aptpolicy [1 or 3] (See NOTE below.)</td>
<td>P9000/XP</td>
</tr>
<tr>
<td>B-Switch# portcfgislmode [slot/port],[1]</td>
<td>P10000/3PAR</td>
</tr>
<tr>
<td>(Set for all mpx110 connected switch ports, regardless of the storage type)</td>
<td></td>
</tr>
<tr>
<td>B-Switch# portcfggport [slot/port],[1]</td>
<td></td>
</tr>
<tr>
<td>(Set for all mpx110 switch ports)</td>
<td></td>
</tr>
<tr>
<td>B-Switch# switchenable</td>
<td></td>
</tr>
</tbody>
</table>
C-series Fibre Channel switch parameters

Execute the commands in Table 14 (page 40) for each VSAN that will use the FCIP link. Enter configuration commands based on the storage system, one per line in the order listed below.

Table 14 Settings for C-series switches

<table>
<thead>
<tr>
<th>Command</th>
<th>HP storage system</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-Switch# config</td>
<td>P6000/EVA</td>
</tr>
<tr>
<td>C-Switch(config)# in-order-guarantee VSAN #(where # stands for all VSANs that use the FCIP link)</td>
<td></td>
</tr>
<tr>
<td>C-Switch(config)# vsan database</td>
<td></td>
</tr>
<tr>
<td>C-Switch(config)# vsan # loadbalancing [src-dst-id] or [src-dst-ox-id] (See NOTE below.) (where # stands for all VSANs that use the FCIP link)</td>
<td></td>
</tr>
<tr>
<td>C-Switch(config-vsan-db)# exit</td>
<td></td>
</tr>
<tr>
<td>C-Switch(config)# exit</td>
<td></td>
</tr>
<tr>
<td>C-Switch# copy run start</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: For P6000 Continuous Access:
- For B-series, specify 1 for port-based routing (all XCS versions) or 3 for exchange-based routing (XCS 09534000 or later).
- For C-series, specify src-dst-id for port-based routing (all XCS versions) or src-dst-ox-id for exchange-based routing (XCS 09534000 or later).
- For port-based routing, set the P6000 Continuous Access data replication protocol to HP FC Data Replication Protocol.
- For exchange-based routing, use HP SCSI FC Compliant Data Replication Protocol.

H-series Fibre Channel switch parameters

Use the default H-series switch settings. The H-series switches employ exchange-based routing; therefore P6000 Continuous Access support with H-series switches requires XCS 09534000 or later and HP SCSI FC Compliant Data Replication Protocol.

Configuring the mpx110 for connecting remote SANs

Verify the SAN configuration requirements:
- At least one FC port of each mpx110 should be connected to an FC SAN.
- Use FC WWPN-based zoning.
Configuring FCIP routes

Follow these steps to configure the mpx tuning parameters and FCIP routes using the CLI or the mpx Manager GUI.

**Configuring mpx IP tuning parameters using the CLI or GUI**

See IP performance tuning (page 25) for information on the required configuration settings. For each mpx110 FCIP route, configure the following tuning parameters:

- Bandwidth per route setting
- Software compression
- TCP window size/scaling

**NOTE:** The mpx110 integrates a software compression option. Enable compression for IP fabrics with an RTT greater than or equal to 50 ms, or guaranteed WAN bandwidth of less than or equal to 45 Mb/s. See IP performance tuning (page 25) for link speed and delay information.

**NOTE:** With the exception of the tuning parameters listed above, HP strongly recommends that you use the default mpx110 settings shown in Figure 20 (page 41).

**Configuring the FCIP routes using the CLI**

For each mpx110, configure the FCIP route information as shown in Figure 20 (page 41).

---

**Figure 20 Setting FCIP route using the CLI**

![Figure 20 Setting FCIP route using the CLI](image-url)
Configuring the FCIP routes using the mpx Manager GUI

1. Invoke the mpx Manager previously installed on the computer (Figure 21 (page 42)).

Figure 21 Connection to mpx Manager

2. Click the Connect icon in the top left corner of the screen.
3. Enter the mpx110 IP address, and then click the Connect button.
4. Select the Wizard menu to run the FCIP Route Add wizard (Figure 22 (page 42)). A warning message appears.

Figure 22 FCIP Route Add wizard

5. Click Yes to continue.
   The FC & GigE Port Selection screen appears.
6. Select the FC/GE ports to configure. As an option, you may enter the GE port speed and flow control parameters. Click Next to continue.
   The Local & Remote IP Address screen appears.
7. Enter the local GE port IP address, subnet mask, gateway and the IP address of the remote mpx110. Click **Next** to continue.
   The TCP/IP Options screen appears.

8. Select the appropriate options for your configuration and ensure that the same options are selected on the remote port as well. Click **Next** to continue.
   The FCIP Option screen appears.

9. Select the appropriate options for your configuration and ensure that the same options are selected on the remote port as well. Click **Finish** to continue.
   The Security Check screen appears.

10. Enter the Admin password (default password is **config**). Click **OK** to continue.
    A message appears, indicating that the process for adding FCIP routes is now complete.
Cabling the mpx110 Fibre Channel, GE, and management ports

To cable the mpx110:
1. Connect the management port cable to the Ethernet network that is accessible from the management server running the mpx Manager GUI.
2. Connect cables to Fabric A1, Fabric B1, Fabric A2 and Fabric B2, as shown in the examples in Supported configurations (page 11).

**NOTE:** Use a standard Cat 5e straight network cable to connect mpx110 GE ports to an IP switch port. Use a Cat 5e crossover network cable when directly connecting two mpx110s through their respective GE ports without an IP switch.

Verifying FCIP links and firmware version

To verify the FCIP links and firmware version:
1. To determine if a firmware upgrade is necessary, see the HP website: [http://www.hp.com/go/san](http://www.hp.com/go/san)
   If applicable, see Firmware upgrades (page 44).
2. Use the CLI or the GUI ping command to verify FCIP Link connectivity.
3. Verify if FC switches have established an ISL over FCIP link.

Firmware upgrades

Use the mpx Manager GUI or the CLI to install firmware upgrades.

⚠️ **CAUTION:** Installing new firmware is disruptive because the mpx110 must be rebooted to activate the new firmware. The reboot may result in incorrect data being transferred between devices connected to the mpx110. HP recommends suspending activity on the interfaces before activating the new firmware.

Using the mpx Manager GUI to upgrade firmware

To upgrade firmware:
1. Double-click the mpx110 in the topology display.
2. In the Firmware Upload window, click the Select button to browse and select the firmware file to be uploaded.
3. Click the Start button to begin the firmware load process. A message appears warning you that the mpx110 will be reset to activate the firmware.
4. Click the OK to continue firmware installation, or click the Cancel button to cancel the firmware installation.

Using the CLI to upgrade firmware

Using the CLI involves transferring the firmware image file from a workstation to the mpx110, and then issuing `image unpack` to install the new firmware image, as described in the following steps:
1. At the workstation prompt, use the `ftp` command to go to the location on the mpx110 where you want to transfer the firmware image. For example:
   ```
   C:\fwImage>ftp 172.17.137.190
   Connected to 172.17.137.190.220 (none)
   FTP server (GNU inetutils 1.4.2) ready.
   ```
2. Enter your user name and password. For example:
   User (172.17.137.190:(none)):
   Password: ftp331 Guest login ok, type your name as password.
   Password: ftp230 Guest login ok, access restrictions apply.

3. At the ftp prompt, enter bin to set the binary mode. For example:
   ftp> bin200 Type set to I.

4. Issue the put command to transfer the firmware image file from the workstation to the mpx110. For example:
   ftp> put mpx110-2_0_3_2.bin200 PORT command successful.
   150 Opening BINARY mode data connection for mpx110-2_0_3_2.bin.
   226 Transfer complete.
   ftp: 4822816 bytes sent in 0.41 Seconds 11878.86Kbytes/sec.

5. Enter quit.
   The firmware image has been transferred to the mpx110.

6. Log in to the mpx110 as an administrator:
   (none) login: guest
   Password: password

   The following appears:
   Command Line Interface (CLI)
   mpx110 #> admin start
   Password: config
   mpx110 (admin) #>

7. Enter the following command from the gateway:
   image unpack mpx110-2_0_3_2.bin

   The following prompt appears:
   Unpack Completed. Please reboot the system for FW to take effect.

8. Enter reboot.

9. Enter y to reboot the system.
Recovery process

Consider the following when developing a recovery process for the mpx110:

- Save all firmware image files (updates) in a safe place, because you may:
  - Revert to a previous firmware version
  - Need the firmware image when replacing an mpx110
  - Need the firmware image when adding an mpx110 to your site
- Save the mpx110’s configuration (as a new file) after every configuration change, because you may:
  - Revert to a previous configuration
  - Configure a replacement mpx110
- Save the mpx110’s mappings (as a new file) after every mapping change, because you may:
  - Revert to a previous mapping
  - Map a replacement mpx110
  - Duplicate the mapping on a second mpx110 (for redundancy)

Removal and replacement

This section provides procedures for removing and replacing an mpx110.

Removing an mpx110

To remove an existing mpx110:
1. Make sure all I/O operations to the gateway are quiescent.
2. Save the mpx110 configuration data using the FRU command (see Command-line interface (page 80) or Saving and restoring the mpx110 configuration (page 143)).
3. Power down the mpx110.
4. Label all the cables to ensure proper connections to the mpx110.
5. Remove all the FC and Ethernet cables.
6. Remove the mpx110 from the enclosure where it is mounted.

Replacing an mpx110

To install a replacement mpx110:
1. Mount the mpx110 in the enclosure.
2. Reconnect the FC and Ethernet cables to the ports where they were previously connected.
3. Plug the mpx110 power cord into a power outlet.
4. Using a management workstation, configure the management port IP address. See Set mpx110 management port parameters (page 37).
5. Using a management workstation, restore the saved configuration or reconfigure the mpx110 parameters. See (page 88) or Saving and restoring the mpx110 configuration (page 143).

The newly installed mpx110 is connected and ready for use.
Services

You can configure your mpx110 to suit the demands of your environment using a variety of mpx110 services. Familiarize yourself with the following mpx110 services and determine which ones you need:

- **Telnet**—Manages the mpx110 over a Telnet connection.
- **mpx Manager GUI**—Provides out-of-band management.
- **SNMP**—Monitors the mpx110 through third-party SNMP applications.
- **NTP**—Synchronizes the mpx110 and the workstation dates and times with an NTP server. NTP is disabled (not configured) by default.
- **FTP**—Transfers files rapidly between the workstation and mpx110 using FTP.

Security

Managing the mpx110 requires secure passwords. The GUI application uses a default password when connecting to an mpx110. Once connected, the GUI prompts the operator for a password whenever a change is attempted.

The CLI requires a user name and password to start. All set operations require an active Admin session. To enter an Admin session, the operator must enter a password.

The password can be changed by the operator.
Diagnostics and troubleshooting

Diagnostic information about the mpx110 is available through the chassis LEDs and the port LEDs (Figure 23 (page 48)). Diagnostic information is also available through the mpx Manager GUI, CLI event logs, and error displays. This section describes the following:

- Power-On Self-Test (POST) diagnostics (page 48)
- Heartbeat LED (page 48)
- Input Power LED (page 49)
- System Fault LED (page 49)
- Fibre Channel Port LEDs (page 49)

**Figure 23 Locating LEDs**

**POST diagnostics**

The mpx110 completes a series of tests as part of its POST procedure:

- Memory
- FLASH validation
- PCI device discovery
- Management Ethernet port

**Heartbeat LED (green)**

The Heartbeat LED indicates the status of the internal mpx110 processor and any POST error results. Following a normal power-up, the Heartbeat LED flashes about once per second to indicate that the mpx110 passed the POST and that the internal mpx110 processor is running. See Table 15 (page 49) for a description of all Heartbeat LED flash codes.
Table 15 Heartbeat LED flash patterns

<table>
<thead>
<tr>
<th>Heartbeat LED description</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>One flash—One second ON followed by one second OFF.</td>
<td>Normal operation</td>
</tr>
<tr>
<td>Three flashes—Three flash pattern (once per second) followed by a two second pause.</td>
<td>System Error</td>
</tr>
<tr>
<td>Four flashes—Four flash pattern (once per second) followed by a two second pause.</td>
<td>Management port IP address conflict</td>
</tr>
<tr>
<td>Five flashes—Five flash pattern (once per second) followed by a two second pause.</td>
<td>Air temperature inside the mpx110 has exceeded the over temperature fault.</td>
</tr>
</tbody>
</table>

Input Power LED (green)

The Input Power LED indicates the input voltage status at the mpx110 logic circuit board. During normal operation, this LED illuminates indicating that the mpx110 logic circuit board is receiving the DC voltage from the power supply.

System Fault LED (amber)

The System Fault LED illuminates to indicate that a fault exists in the mpx110 firmware or hardware. Fault conditions include POST errors and over-temperature conditions. Also check the Heartbeat LED to confirm whether the air temperature inside the mpx110 has exceeded the failure temperature (see page 49).

Fibre Channel Port LEDs

- The top LED (Activity) indicates activity (data) is passing through the port.
- The middle LED (Link) indicates the logged-in or initialization status of the connected devices. This LED is on for three seconds and then will flash once for 1-Gbps or twice for 2-Gbps speed.
- The bottom LED (Fault) indicates an alert (port fault) condition except at power on or reboot.
4 Using the HP mpx Manager utility

This chapter describes the HP mpx Manager, the software tool used to manage the mpx110.

Overview

The HP mpx Manager enables you to manage the mpx110 gateway, and to monitor, configure, and modify information from a workstation. The mpx Manager GUI consists of a menu bar, tool bar, system tree, information/data status windows, and tabs (see Figure 24 (page 50) and Table 16 (page 51)).

Figure 24 mpx Manager main window
## Table 16 GUI main window sections

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu bar</td>
<td>Provides access to system functions and wizards.</td>
</tr>
<tr>
<td>Tool bar</td>
<td>Provides quick access to the common application functions—Connect, View Logs, and Refresh.</td>
</tr>
<tr>
<td>Tabs</td>
<td>Determines what is displayed in the window.</td>
</tr>
<tr>
<td>Action menu</td>
<td>To open, right-click the mouse. This menu provides a short cut to actions for the item that was right-clicked in the GUI.</td>
</tr>
<tr>
<td>System tree</td>
<td>Located on the left side of the display, shows the connected systems and their components. Click an entry handle or double-click the entry to expand or collapse a system tree entry.</td>
</tr>
<tr>
<td>Information/data status window</td>
<td>Shows the corresponding information, configuration, or status for the selected tab.</td>
</tr>
</tbody>
</table>
**Menu bar**

Figure 25 (page 52) shows the menu bar options described in this section.

**Figure 25 Menu bar**

**File menu**

The File menu includes the following options, as shown in Figure 26 (page 52):

- **Save FRU**—Saves the gateway’s configuration and persistent data to a file
- **Restore FRU**—Restores the gateway’s configuration and persistent data from a file
- **Exit**—Exits the mpx Manager GUI

**Figure 26 File menu**

**View menu**

The View menu displays the View Logs option (Figure 27 (page 52)), which opens the system logs.

**Figure 27 View menu**
Settings menu

The Settings menu includes the Broadcast option, which opens the Broadcast Settings option, as shown in Figure 28 (page 53).

Figure 28 Settings menu

Wizards menu

The Wizards menu includes the following options, as shown in Figure 29 (page 53):

- FW Update Wizard—Launches the Firmware Update Wizard, which enables you to update the mpx110 gateway’s firmware image. The firmware image is selected from a menu that enables browsing.
- FCIP Route Add—Launches the FCIP Route Add wizard, which enables you to select the resources used for the route, the IP address of the remote FCIP peer, IP parameters, VLAN support, compression, and bandwidth limit.
- FCIP Route Remove—Launches the FCIP Route Remove wizard, which enables you to remove an existing FCIP Route, freeing the resources (FC and GE ports) used by the route.

NOTE: Figure 29 (page 53) shows wizard menus not supported by the gateway at the time of this document’s release. Only wizards applicable to the mpx110 are described.

Figure 29 Sample Wizards menu
Help menu

The Help menu (Figure 30 (page 54)) includes the following options:

- **Set Browser Location**—Specifies the browser that is launched when you view the online help for the mpx Manager GUI
- **Browse Contents**—Launches the online help
- **About**—Displays the application version information

**Figure 30 Help menu**

![Help menu](image)

Tool bar

The tool bar (Figure 31 (page 54)) consists of a row of graphical buttons that enable you to perform common functions such as connect to an mpx110 gateway, view log files, and refresh the current display. The tool bar can be relocated in the display by clicking and dragging the handle at the left edge of the tool bar.

- **Connect**—Adds an mpx110 gateway to the system tree view
- **Logs**—Opens a window to display the system log data
- **Refresh**—Updates the display with current information

**Figure 31 Tool bar**

![Tool bar](image)

Action menu

The Action menu (Figure 32 (page 55)), which is displayed by right-clicking the mouse, provides shortcuts to actions available elsewhere in the GUI.

**NOTE:** Figure 32 (page 55) shows features not supported at the time of this document’s release. Only Menu features applicable to the mpx110 are described.

The Action menu options are as follows:

- **Connect**—Adds an mpx110 gateway to the system tree view
- **Refresh**—Updates the display with current information
- **Disconnect**—Disconnects from an mpx110 gateway, removing it from the system tree
- **Reboot**—Reboots the mpx110 gateway
- **View Logs**—Opens the View Logs window
- **Ping**—Initiates a ping from the specified port (management, GE1, or GE2) to a specified IP address
- **Traceroute**—Initiates a traceroute from the specified port (management, GE1, or GE2) to a specified IP address
- **FCIP Route Add**—Launches the FCIP Route Add wizard, which enables you to select the resources used for the route, the IP address of the remote FCIP peer, IP parameters, VLAN support, compression, and bandwidth limit
- **FCIP Route Remove**—Launches the FCIP Route Remove wizard, which enables you to remove an existing FCIP route, freeing the resources (FC and GE ports) used by the route
- **FW Update Wizard**—Launches a wizard for updating the gateway’s firmware
- **Beacon ON**—Turns on the mpx110 beacon to quickly locate the gateway
- **Beacon OFF**—Turns off the mpx110 gateway beacon

**Figure 32 Action menu**
System tree window

Figure 33 (page 56) shows the System tree window. The System tree window is located in the left-most window pane and displays the connected mpx110 gateways and the FCIP routes for each gateway.

Figure 33 System tree window
For example, select **FCIP Routes** in the System tree to see component data in the tabbed pages to the right of the tree (Figure 34 (page 57)).

**Figure 34 FCIP Route Info**
mpx110 gateway

The top of the Information/Data/Status window displays the gateway system configuration and status. It contains the following tabs:

- Page 58
- Page 62
- SNMP Management tab (page 63)

Information tab

The Information tab consists of four subpages:

- **Basic Information**—Use to display basic product information.

  Click the \( \sum \) icon to access the following settings (Figure 36 (page 60)):
  - **Product Name**—HP model mpx110
  - **Symbolic Name**—A symbolic name you can create for the gateway
  - **Serial Number**—Serial number of the gateway
  - **Hardware Version**—The gateway hardware version number
  - **Software Version**—The gateway software version number
  - **Temperature**—The current temperature reading, in degrees Celsius (C)
  - **iSCSI Port Count**—The number of iSCSI ports (two)
  - **Fibre Channel Port Count**—The number of FC ports (two)
**Management Information** (Figure 36 (page 60))—Use to configure management settings.

Click the icon to access the following settings:

- **MAC Address**—The management port’s MAC address.
- **Link Status**—The management port link status (Link Up or Link Down).
- **IPv4 Management Info Check box**—Used to define the source of the management port IP address, subnet mask, and gateway.
  - **DHCP Radio Button**—Used to select whether you want to define the management port IP address or have it obtained automatically through DHCP.
  - **IP Address**—The management port’s IP address. When the Use the following IP address button is selected, you can configure the IP address. When the Obtain an IP address automatically (DHCP) button is set, the IP address displayed is the address obtained automatically through DHCP.
  - **Subnet Mask**—The management port’s subnet mask. When the Use the following IP address button is selected, you can configure the subnet mask. When the Obtain an IP address automatically (DHCP) button is selected, the subnet mask displayed is the mask obtained automatically through DHCP.
  - **Gateway**—The management port’s default gateway address. When the Use the following IP address button is selected, you can configure the IP address of the default gateway. When the Obtain an IP address automatically (DHCP) button is set, the default gateway IP address displayed is the address obtained automatically through DHCP.
- **IPv6 Management Info Check box**
  - **Auto radio button**—Select this option to allow the system to obtain the IPv6 management information automatically.
  - **IPv6 Address 1/2**—If the Auto button is not selected, select to configure the IP address.
– IPv6 Default Router—If the Auto button is not selected, select to configure the IP default router.
– IPv6 Local Link—If the Auto button is not selected, select to configure the IP local link address.
– Set IP Address—Save any IP address changes.

Figure 36 Management Information

Network Time Protocol (NTP) Server Information—Use to configure NTP settings.

Click the icon to access the following settings (Figure 37 (page 61)):

◦ System Time—The current date and time set on the gateway.
◦ NTP Server radio buttons—Disable or enable the use of NTP servers to set the gateway’s date and time.
◦ NTP Server 1—IP address of the first NTP server to be queried by the gateway when setting its time and date.
◦ NTP Server 2—IP address of the second NTP server to be queried by the gateway when setting its time and date. This server is used only if the first NTP server did not respond.
◦ NTP Server 3—IP address of the third NTP server to be queried.
◦ Set NTP Address—Saves changes made to the NTP server IP addresses.
Figure 37 NTP Server Information
Security tab

The Security tab (Figure 38 (page 62)) enables you to set the gateway’s password.

Click the ☑ icon to access the following settings:

- **Current Password**—The current password must be supplied before it can be changed.
- **New Password**—Enter the new gateway password.
- **Verify New Password**—Enter the same content as in the New Password field, to verify that it was typed correctly.
- **Apply**—Save the password changes.
- **Clear Fields**—Clear the Current Password, New Password, and Verify Password fields.

**Figure 38 Security tab**
SNMP Management tab

The SNMP Management tab (Figure 39 (page 64)) consists of two sections: SNMP Configuration and SNMP Trap Receivers. The Save button saves any SNMP management changes. For more information, see Simple Network Management Protocol (page 132).

SNMP Management tab options include:

- **SNMP Configuration**
  - **System OID**—The system object identifier.
  - **System Description**—Text that identifies the gateway.
  - **Read Community**—A password that authorizes an SNMP management server to read information from the router. This is a write-only field. The value on the gateway and the SNMP management server must be the same. The Read Community password can be up to 32 characters and cannot include a #, semicolon (;), and comma (,). The default is public.
  - **Trap Community**—A password that authorizes an SNMP management server to receive traps. This is a write-only field. The value on the gateway and the SNMP management server must be the same. The Trap Community password can be up to 32 characters and cannot include a number sign (#), semicolon (;), and comma (,). The default is public.
  - **System Location**—Specifies the name of the gateway location. The name can be up to 64 characters and cannot include a number sign (#), semicolon (;), and comma (,).
  - **System Contact**—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 (,).
  - **Authentication Traps**—Enables or disables the generation of authentication traps in response to authentication failures.

- **SNMP Trap Receivers**
  - **Enabled**—A check box to enable the trap receiver specified by the IP address, trap port, and trap version.
  - **IP Address**—Specifies the IP address to which the SNMP traps are sent. A maximum of eight trap addresses are supported.
  - **Trap Port**—Specifies the port number on which the trap is sent. The default is 162.
  - **Trap Version**—Specifies the SNMP version (1 or 2) with which to format traps.
FCIP routes

The FCIP routes tab Figure 40 (page 66) consists of two sections: FCIP Route Information and Statistics.

FCIP Route Info tab settings (page 64) provides a definition for each setting.

**NOTE:** Selecting the FCIP Routes branch on the System tree does not provide any information in the right window.

**FCIP Route Info tab settings**

- **FCIP Interface Status**—Provides a dialog box for enabling and disabling the FCIP route. When the route is disabled the FC and GE ports are placed in a down state, but all route configuration parameters are retained. When you change this setting, you must click **Save** (at the bottom of the tab) for the change to take effect.
- **FC Port**—Identifies the FC port used for this FCIP route. The FC port cannot be changed because it is selected when the route is created.
- **FC Link Status**—Provides the state of the FC port used in this FCIP route.
- **GigE Port**—Identifies the GigE port used for this FCIP route. The GigE port cannot be changed because it is selected when the route is created.
- **GigE Link Status**—Provides the state of the GigE port used in this FCIP route.

**NOTE:** Change to the following settings do not take effect until you click **Save** at the bottom of the page.

- **Local IP Address**—The IP address to be used by the GigE port. An uninitialized port has an IP address of all zeros.
- **Remote IP Address**—The IP address of the GigE port on the remote router.
- **Subnet Mask**—The subnet mask used by the GigE port.
- **Gateway IP Address**—The gateway IP address used by the GigE port.
- **Jumbo Frames**—Provides a dialog box for enabling and disabling Jumbo IP frames. When disabled, the MTU is 1,500 bytes; when enabled, the maximum MTU is 9,000 bytes. When other is selected, the MTU size can be set between 1,000 and 9,000 bytes.

- **TCP Window Size**—Contains a dialog box that provides three options for TCP window size: 8,192, 16,384, and 32,768 bytes. The default is 32,768.

- **Window Scaling**—Contains a dialog box that provides for enabling and disabling TCP window scaling. The default is Disabled. When enabled, the Window Scaling Factor is used.

- **Window Scaling Factor**—Contains a dialog box that provides six options for TCP window scaling: 0, 1, 2, 3, 4, 5, 6, and 7.

- **TCP Port Number**—Provides a dialog box that enables the user to define the destination TCP port number used by the FCIP route. This port number must be the same on both routers participating in the FCIP route (local and remote routers must be using same port number). The default port number used by FCIP is 3225.

- **GigE Port Speed**—Provides a dialog box that contains four options for the GigE port speed: Auto, 10, 100, and 1000: The port speed rate is Auto.

- **Port Speed Mode**—Provides a dialog box that contains three options for the link rate mode: Auto, half duplex, and full duplex. This dialog box is available only when the GigE port speed is set to something other than Auto.

- **GigE Port Flow Control**—Provides a dialog box for enabling and disabling GigE port flow control. The default is Enabled. This dialog box is available only when the GigE port speed is set to something other than Auto.

- **VLAN Enabled**—Provides a dialog box for enabling and disabling VLAN support. The default is disabled.

- **VLAN ID**—Provides a dialog box that enables the user to define the VLAN ID. This dialog box is available only when VLAN is enabled. The VLAN ID must be the same on both gateways participating in the FCIP route (local and remote gateways must be using same VLAN ID) and the Ethernet switches.

- **VLAN Priority**—Provides a dialog box that contains eight options for the VLAN priority: 0 through 7. This dialog box is available only when VLAN is Enabled.

- **FCIP SW Compression**—Provides a dialog box for enabling and disabling FCIP compression. The default is Disabled.

- **Bandwidth (Mbit/sec)**—Provides a dialog box that enables the user to define the maximum bandwidth (in Mb/s) used by the GigE port during transmits. The range of values supported is 1 to 1,000 Mb/s. This setting enables the user to limit the bandwidth used by each FCIP route so as not to consume all the available link bandwidth. For example, if the slowest link in the WAN being used is a DS-3 link, then the maximum available bandwidth is 45 Mb/s. To limit the FCIP route to 33% of the overall link bandwidth, set the bandwidth to 15 Mb/s (see Bandwidth per route (page 25)).

HP P9000 and P6000 Continuous Access replication solution requires dedicated bandwidth for the intersite link. If other applications share the intersite link, some method of QoS must be used to ensure that the replication application has uncontested access to the allocated bandwidth.
Figure 40 FCIP Route Info

Using the HP mpx Manager utility
Starting the mpx110 Manager GUI

To start the mpx110 Manager GUI:

1. Double-click the mpx110 icon on your desktop to open the mpx Manager GUI (Figure 41 (page 67)).

   Figure 41 Connecting to an mpx110

2. Enter the mpx110 IP address, and then click the **Connect** button in the dialog box. The mpx Manager main window appears.

   Figure 42 mpx Manager main window

3. See Using wizards (page 68) for the steps for setting additional mpx110 parameters.
Using wizards

The Wizards menu contains step-by-step programs that help you configure and manage the mpx110 gateway (Figure 43 (page 68)).

NOTE: Only wizards applicable to the mpx110 are described in this section.

The following programs are available from the Wizards menu:

- **FW Update Wizard**—Updates the mpx110 gateway firmware
- **FCIP Route Add**—Launches the FCIP Route Add wizard, which enables you to select the resources used for the route, the IP address of the remote FCIP peer, IP parameters, VLAN support, compression, and bandwidth limit
- **FCIP Route Remove**—Launches the FCIP Route Remove wizard, which enables you to remove an existing FCIP route, freeing the resources (FC and GE ports) used by the route

Figure 43 Wizards menu
Firmware Update Wizard

The Firmware Update Wizard provides step-by-step instructions for updating the mpx110 gateway firmware.

To update the firmware:

1. Select the **FW Update Wizard** option from the Wizards menu. The **mpx Selection** dialog box appears (Figure 44 (page 69)).

   **Figure 44 mpx Selection dialog box**

   ![Figure 44](image)

2. Select the check box next to the appropriate gateway, and then click **Next**.
3. Enter the path to the firmware file, or click **Browse** to locate the firmware file. The **Firmware Image File** box appears, displaying the firmware file.

4. Click **Next** to continue.

   **Figure 45 Firmware File Selection dialog box**

   ![Figure 45](image)

5. Click **Save Configuration to File** to open the Confirm Changes dialog box (Figure 46 (page 70)).
6. Read the information. If you want to save a copy of the firmware configuration:
   a. Click **Save Configuration to File**, browse to the desired directory, enter a file name, and then click **Save**.
   b. Click **Next**.

   The Security Check dialog box requests the Admin password.

7. Enter the appropriate password, and then click **OK** to start the firmware update.

   The Firmware Update Status dialog box appears, showing the progress of the update in the message section. When the firmware loads successfully, the Finish dialog box and Update success dialog box appear. The new firmware will not take effect until the system is rebooted.

**Figure 47 Finish dialog box (successful firmware update)**

8. To reboot the system, click **Yes**; otherwise, click **No**.

9. Click **Finish**.
FCIP Route Add Wizard

The FCIP Route Add Wizard provides step-by-step instructions for adding an FCIP route.

**IMPORTANT:** When the FCIP Route Add Wizard launches, a warning indicates that the operation about to be performed will change the operation of the selected GE and FC ports. If the selected ports are being used in FC or iSCSI mappings, the connectivity is lost. Connectivity is also disrupted on the GE port not selected for the FCIP route.

To add an FCIP route:

1. A warning appears when you launch the FCIP Route Add Wizard (Figure 49 (page 71)). Click **Yes** to proceed or **No** to cancel the wizard.

   The FC and GigE Port Selection dialog box requests the selection of a FC-GigE port pair (Figure 48 (page 71)).

2. Select the gateway port pair to be used for the FCIP route.

   ![Figure 48 FCIP Routes Add Wizard—FC and GigE Port Selection dialog box](image)

   ![Figure 49 FCIP Routes Add Wizard—Warning dialog box](image)
3. (Optional) Configure the following port route/parameters:
   - **FCIP Interfaces FC & GE**—Provides a dialog box for enabling and disabling the FCIP route. When the route is disabled the FC and GE ports are placed in a down state: all route configuration parameters are retained.
   - **GigE Port Programmed Port Speed**—Provides a dialog box that contains four options for the GigE port speed: Auto, 10, 100, and 1000. The default port speed is Auto.
   - **Port Speed Mode**—Provides a dialog box that contains three options for the port speed mode: Auto, Half duplex, and Full duplex. This dialog box is available only when the GigE port speed is set to something other than Auto.
   - **GigE Port Flow Control**—Provides a dialog box for enabling and disabling GigE port flow control. The default is enabled. This dialog box is available only when the GigE port speed is set to something other than Auto.

4. After selecting a port pair and setting GE port parameters, click **Next** to continue or **Cancel** to exit the wizard.

5. Enter the IP addresses (Figure 50 (page 72)).

**Figure 50 FCIP Routes Add Wizard—Local and Remote IP Address dialog box**

6. Click **Next** to continue. Otherwise, click **Cancel** to exit the wizard.

7. Select either the **IPv4 Address** or **IPv6 Address** radio button.
   - **IPv4 parameters include:**
     - **Local IP Address**—The IP address to be used by the GigE port. An uninitialized port has an IP address of all zeros.
     - **Subnet Mask**—The subnet mask used by the GigE port.
     - **Gateway IP Address**—The gateway IP address used by the GigE port.
     - **Remote IP Address**—The IP address of the GigE port on the remote gateway.
IPv6 parameters include:

- **Local IPv6 Address**—The IP address assigned to the GigE port. An uninitialized port has an IP address of “::”.
- **IPv6 Default Router**—The IP address assigned to the GigE port for the default IPv6 router. An uninitialized port has an IP address of “::”.
- **IPv6 Local Link**—The IP address assigned to the Local Link port. This address is automatically configured and is based on the GigE port MAC address. An uninitialized port has an IP address of “::”.
- **Remote IPv6 Address**—The IP address assigned to the GigE port on the remote gateway. An uninitialized port has an IP address of “::”.

8. Enter the TCP/IP parameters in the TCP/IP Options dialog box (Figure 51 (page 73)).

**Figure 51 FCIP Routes Add Wizard—TCP/IP Options dialog box**

![TCP/IP Options dialog box](image)

Use the TCP/IP Options dialog box to configure the following parameters:

- **Jumbo Frames**—Provides a dialog box for enabling and disabling Jumbo IP frames. When disabled, the MTU is 1,500 bytes; when enabled, the maximum MTU is 9,000 bytes. When other is selected, the MTU size can be configured between 1,000 and 9,000 bytes.
- **TCP Window Size**—Contains a dialog box that provides three options for TCP window size: 8,192, 16,384, and 32,768 bytes. The default is 32,768.
- **Window Scaling**—Contains a dialog box that provides for enabling and disabling TCP window scaling. The default is Disabled. When enabled, the Window Scaling Factor is used.
- **Window Scaling Factor**—Contains a dialog box that provides eight options for TCP window scaling: 0, 1, 2, 3, 4, 5, 6, and 7
- **VLAN Enabled**—Provides a dialog box for enabling and disabling VLAN support. The default is Disabled.
- **VLAN ID**—Provides a dialog box that enables the user to define the VLAN ID (available only when VLAN is enabled). The VLAN ID must be the same on both routers participating in the FCIP route (local and remote routers must also be using the same VLAN ID) and the Ethernet switches.

- **VLAN Priority**—Provides a dialog box that contains eight options for the VLAN priority, 0 through 7. This dialog box is available only when VLAN is enabled.

9. After setting the TCP/IP parameters, click **Next** to continue or **Cancel** to exit the wizard.

10. Enter FCIP parameters in the FCIP Options dialog box (Figure 52 (page 74)).

**Figure 52 FCIP Routes Add Wizard—FCIP Options dialog box**

The following parameters are configured:

- **FCIP SW Compression**—Provides a dialog box for enabling and disabling FCIP compression. The default is **Disabled**.

- **Bandwidth (Mb/Sec)**—Provides a dialog box that enables the user to define the maximum bandwidth (in Mb/s) used by the GigE port during transmits. The range of values supported is 1 to 1,000 Mb/s. This setting enables the user to limit the bandwidth used by each FCIP route so as to not consume all the available link bandwidth.

  For example, if the slowest link in the WAN being used is a DS-3 link, then the maximum available bandwidth is 45 Mb/s. To limit the FCIP route to 33% of the overall link bandwidth, set the bandwidth to 15 Mb/s.

  HP replication solutions require dedicated bandwidth for the intersite link. If other applications share the intersite link, some method of QoS must be used to ensure that the replication application has uncontested access to the allocated bandwidth.

11. After setting the FCIP parameters, click **Next** to continue or **Cancel** to exit the wizard.

12. Enter the administrator password in the Security Check dialog box (Figure 53 (page 75)), and then click **OK** to confirm the addition of the FCIP route.
The Add FCIP Route Completed message appears, signifying the completion of the route-add operation.

13. Click **OK** to exit the dialog box.

**FCIP Route Remove**

The FCIP Route Remove wizard provides step-by-step instructions for removing a FCIP route.

To remove an FCIP route:

1. When the FCIP Route Remove wizard is launched, a warning appears, cautioning that the operation to be performed will change the operation of the selected GE and FC ports. Connectivity on the GE port that is not part of the FCIP route being removed will be momentarily disrupted (Figure 55 (page 75)).
   
   If you want to proceed, click **Yes** and continue with step 2. Otherwise, click **No** to cancel the wizard.

2. Enter the FCIP route to be removed (Figure 56 (page 75)).

3. Enter the administrator password in the Security Check dialog box.
4. Click **OK** to confirm the removal of the FCIP route. The Remove FCIP Route Completed dialog box indicates the completion of the route remove operation (**Figure 57 (page 76)**).

5. Click **OK** to exit the dialog box.

**Figure 57 Remove FCIP Route Completed dialog**
5 Support and other resources

This chapter describes the various resources available for operating and managing the mpx110.

Related documentation

The following documents provide related information:

- HP Command View EVA User Guide
- HP Continuous Access EVA Implementation Guide
- HP Command View EVA online help
- HP SAN Design Reference Guide
- HP 4400 Enterprise Virtual Array User Guide
- HP 6400/8400 Enterprise Virtual Array User Guide
- HP 4x00/6x00/8x00 Enterprise Virtual Array User Guide
- HP Enterprise Virtual Array 3000/5000 User Guide
- HP Replication Solutions Manager Installation Guide
- HP XP Continuous Access Journal User Guide
- HP Continuous Access XP User Guide
- HP XP24000 Disk Array Owner’s Guide
- HP LUN Configuration and Security Manager XP User Guide for the XP12000/XP10000
- HP XP Disk/Cache Partition User Guide

Conventions

This section describes the conventions used in this document.

- Text conventions
- Alerts and symbols

Document conventions and symbols

<table>
<thead>
<tr>
<th>Table 17 Document conventions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Convention</strong></td>
</tr>
<tr>
<td>Blue text: Table 17 (page 77)</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  
• Text entered into a GUI element, such as a box  
• GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes |
| **Italic** text | Text emphasis |
Table 17 Document conventions (continued)

<table>
<thead>
<tr>
<th>Convention</th>
<th>Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monospace text</td>
<td>• File and directory names</td>
</tr>
<tr>
<td></td>
<td>• System output</td>
</tr>
<tr>
<td></td>
<td>• Code</td>
</tr>
<tr>
<td></td>
<td>• Commands, their arguments, and argument values</td>
</tr>
<tr>
<td>Monospace, italic text</td>
<td>• Code variables</td>
</tr>
<tr>
<td></td>
<td>• Command variables</td>
</tr>
<tr>
<td>Monospace, bold text</td>
<td>Emphasized monospace text</td>
</tr>
</tbody>
</table>

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

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

⚠️ IMPORTANT: Provides clarifying information or specific instructions.

NOTE: Provides additional information.

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support website: [http://www.hp.com/support/](http://www.hp.com/support/).

Collect the following information before calling:

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

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

Subscription service


Subscribing to this service provides you with email updates on the latest product enhancements, newest driver versions, and firmware documentation updates as well as instant access to numerous other product resources.

After subscribing, locate your products by selecting Business support and then Storage under Product Category.

Other HP websites

For additional information, see the following HP websites:

- [http://www.hp.com](http://www.hp.com)
- [http://www.hp.com/go/storage](http://www.hp.com/go/storage)
• http://www.docs.hp.com
• http://www.hp.com/go/sandesignguide
A Command-line interface

This appendix includes information on using the command-line interface to manage the mpx110.

Logging on to the mpx110

To log on to an mpx110 using Telnet, open a command-line window on the workstation, and then enter the telnet command, followed by the mpx110 IP address:

```
# telnet (ip-address)
```

A Telnet window opens, prompting you to log in. Enter an account name and password.

To log on to a switch through the serial port, configure the server port with the following settings:

- 115200 baud
- 8-bit character
- 1 stop bit
- No parity
- No flow control

User accounts

The mpx110 ships with the following user account already defined:

Account name: guest
Password: password

Both should be changed the first time you log in. See Password command (page 91) for more information about changing passwords.

Working with SAN mpx110 configurations

Successful management using the CLI depends on the effective use of mpx110 configurations. The key tasks are modifying configurations, backing up configurations, and restoring configurations.

Modifying a configuration

The two major areas that require configuring include the management port configuration and FCIP route.

Management port configuration uses the following commands:

- `set mgmt`
- `show mgmt`

FCIP route configuration uses the following commands:

- `fciproute add`
- `fciproute mod`
- `show fciproutes`

Saving and restoring mpx110 configurations

For the commands related to backing up and restoring a configuration, see Saving and restoring the mpx110 configuration (page 143).

Saving mpx110 configuration and persistence

Persistent data consists of LUN mappings, discovered FC targets, and discovered iSCSI initiators.

To save the configuration and persistent data:
1. Execute the fru save command (see page 88) to generate a file (HP_mpx110_FRU.bin) containing the saved data. This file is stored locally on the mpx110 in an FTP directory.
2. Transfer the saved data from the mpx110 to a workstation by executing an FTP utility on a workstation.
   The following text is an example of an FTP transfer to retrieve the saved mpx110 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_mpx110_FRU.bin
   200 PORT command successful.
   150 Opening BINARY mode data connection for 'HP_StorageWorks_mpx110_FRU.bin' (6168 bytes).
   226 Transfer complete.
   ftp: 6168 bytes received in 0.00Seconds 6168000.00Kbytes/sec.
   ftp> quit
   221 Goodbye.
Restoring mpx110 configuration and persistence

To restore the mpx110’s configuration and persistent data:
1. Transfer the saved data from a workstation to the mpx110 by executing an FTP utility on the workstation.
   The following text is an example of an FTP transfer that will place previously saved mpx110 configuration data on the mpx110:
   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> put HP_StorageWorks_mpx110_FRU.bin
   200 PORT command successful.
   150 Opening BINARY mode data connection for 'HP_StorageWorks_mpx110_FRU.bin'.
   226 Transfer complete.
   ftp: 6168 bytes sent in 0.00Seconds 6168000.00Kbytes/sec.
   ftp> quit
   221 Goodbye.

2. Execute the fru restore command (see (page 88)) to update the mpx110 with the saved configuration data.

**NOTE:** Always use the Full Configuration Restore with the mpx110.
Commands

The command syntax is as follows:

command

keyword

keyword [value]

keyword [value1] [value2]

The command is followed by one or more parameters. Consider the following rules and conventions:

- Commands and parameters are not case sensitive.
- Required keyword values appear in standard font: [value]. Optional values appear in italics: [value].
- Underlined portions of the keyword in the command format indicate the abbreviated form that can be used. For example, the Delete keyword can be abbreviated Del.

The command-line completion feature makes entering and repeating commands easier. Table 18 (page 83) lists the command-line completion keystrokes.

**Table 18 Command-line completion keystrokes**

<table>
<thead>
<tr>
<th>Keystroke</th>
<th>Effect</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 cursor to the beginning of the command-line.</td>
</tr>
<tr>
<td>Ctrl+E</td>
<td>Moves cursor to the end of the command-line.</td>
</tr>
</tbody>
</table>

The command set performs monitoring and configuration tasks. 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 (page 84).
Admin command

Opens and closes the Admin session, which provides commands that change mpx110 configurations. Only one Admin session can be open on the mpx110 at any time. An inactive Admin session times out after 15 minutes.

**Authority**

Admin session

**Syntax**

admin

**Parameters**

start or begin

Opens the Admin session.

dead or stop

Closes the Admin session. The logout, shutdown, and reset commands will end an Admin session.

cancel

Terminates an Admin session opened by another user. Use this parameter with care because it terminates the Admin session without warning the other users and without saving pending changes.

**Notes**

Closing a Telnet window during an Admin session does not release the session. In this case, you must either wait for the Admin session to time out, or use the admin cancel command.

**Example**

The following example shows how to start and end an Admin session:

mpx110 #> admin start
Password: ******
mpx110 (admin) #>
.
.
.
mpx110 #> admin end
mpx110 #>
Beacon command

Enables or disables flashing the Heartbeat and System Fault LEDs. The Heartbeat and System Fault LEDs are flashed synchronously (they are turned on and off together). No other LEDs are affected.

**Authority**
None

**Syntax**
beacon

**Parameters**
on
Turns on the mpx110 beacon

off
Turns off the mpx110 beacon

**Example**
mpx110 #> beacon on

Clear command

Allows you to remove all entries from the mpx110’s log file and/or reset the Fibre Channel and iSCSI statistic counters.

**Authority**
Admin session

**Syntax**
clear

**Parameters**
logs
Clears all entries from logfile

stats
Resets statistic counters

**Examples**
The following is an example of the clear command:

mpx110 #> clear logs

mpx110 #> clear stats

Date command

Displays or sets the date and time. To set the date and time, the information string must be provided in this format MMDDhhmmCCYY. The new date and time take effect immediately.

**Authority**
Admin session

**Syntax**
date

**Parameters**
[MMDDhhmmCCYY]

Specifies the date—This requires an Admin session. If you omit [MMDDhhmmCCYY], the current date appears, which does not require an Admin session.

**Notes**
NTP must be disabled to set the time with the date command.

See Set command (page 94) for information about NTP.

**Example**
The following is an example of the date command:

mpx110 (admin) #> date 010314282006
Tue Jan 3 14:28:00 2006

mpx110 (admin) #> date
Tue Jan 3 14:28:14 2006

FcipRoute command

The fciproute command configures a new FCIP route and modifies or deletes an existing FCIP route. Each FCIP route requires a dedicated FC and Gigabit Ethernet (GbE) port. Configuring an
FCIP route and specifying an FC and GE port pair take precedence over any previous configuration for the port pair (FC/GE).

**Authority**
Admin session

**Syntax**
fciproute

**Parameters**
add
Configures a new FCIP route
mod
Modifies an existing FCIP route
rm
Removes an existing FCIP route

**Examples**
The following is an example of the fciproute add command:

```
mpx239 (admin) #> fciproute 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 to do so.
WARNING: The following command might cause a loss of connections to both GE ports.
Configuring FCIP Route: 1
------------------
FCIP Interfaces FC & GE (0=Enable, 1=Disable) [Enabled]
FC Port (1=FC1, 2=FC2, ...): [FC1]
GE Port (1=GE1, 2=GE2, ...): [GE1]
IP Address (IPv4 or IPv6; 0=IPv6 Link Local): [0.0.0.0] 44.44.1.239
Subnet Mask [0.0.0.0] 255.255.0.0
Gateway IP Address [0.0.0.0]: 44.44.1.240
Remote IP Address [0.0.0.0]: 2000:33::32:239
 IPv6 Default Router [::] 86 Command-line interface
```

The following is an example of the fciproute modify command:

```
mpx239 (admin) #> fciproute mod
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 GE ports.
Route FC Port ID GE Port ID
------------------
1 FC1 GE1
2 FC2 GE2
Please select a FCIP route from the list above ('q' to quit): 2
Configuring FCIP Route: 2
------------------
FCIP Interfaces FC & GE (0=Enable, 1=Disable) [Enabled]
IP Address (IPv4 or IPv6; 0=IPv6 Link Local): [0.0.0.0:33:32:2:239]
IPv6 Default Router [::]
```
Remote IPv6 Address [2000:33::32:2:240]
MTU Size (0=Normal, 1=Jumbo, 2=Other) [Normal]
TCP Window Size (0=8KB, 1=16KB, 2=32KB) [32768]
Window Scaling (0=Enable, 1=Disable) [Enabled]
Window Scaling Factor (Min=0, Max=7) [7]
TCP Port No. (Min=1024, Max=65535) [3225]
GE Port Speed (0=Auto, 1=100Mb, 2=1Gb) [Auto]
Bandwidth, Mbit/sec (Min=1, Max=1000) [155]
VLAN (0=Enable, 1=Disable) [Disabled]
FCIP SW Compression (0=Enable, 1=Disable) [Disabled]
All attribute values for FCIP Route 2 will now be saved.

mpx239 (admin) #>

The following is an example of the fciproute remove command:

mpx110 (admin) #> fciproute rm

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 GE ports.

Route FC Port ID GE Port ID
- - - - - - - - - - - - - - -
1FC2 GE2
2FC1 GE1

Please select an FCIP route from the list above ('q' to quit):
1
FCIP Route 1 has been removed from the system.
FRU command

Saves and restores the mpx 110 configuration.

**Authority**
Admin session

**Syntax**
fru

**Parameters**
restore

fru restore requires that the user first ftp the .tar file containing the desired configuration to the mpx 110. When this command is issued it prompts the user for the restore level. The user has the option of fully restoring the mpx 110's configuration (all configuration parameters and LUN mappings) or restoring only the LUN mappings. The restored configuration do not take effect until the mpx 110 is rebooted.

**save**

fru save creates a .tar file containing the mpx 110's persistent data, configuration and LUN mappings, storing the file in the mpx 110's /var/ftp directory. The user must then FTP the .bin file from the mpx 110.

**Examples**
The following is an example of the fru restore command:

```
mpx110 (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 effect.
```

The following is an example of the fru save command:

```
mpx110 (admin) #> fru saveFRU save completed. Configuration File is HP_StorageWorks_mpx110_fru.bin. Please use FTP to extract the file out from the System.
```
Help command

Displays a list of the CLI commands and their syntax.

**Authority**
None

**Syntax**
help

**Example**
The following is an example of the help command:

```
mpx110 (admin) #> help
admin [ cancel | start | end ]
beacon [ on | off ]
date [ <MMDDhhmmCCYY> ]
discover [ <IP_ADDR> ]
clear [ logs | stats ]
fciproute [ add | mod | rm ]
discover
fru [ restore | save ]
history
image [ cleanup | unpack ]
image cleanup
image unpack [ <filename> ]
logout
passwd
ping
quit
reboot
reset factory
reset factory
save [ capture | logs | traces ]
set [ chap | fc | features | iscsi | isns | mgmt | ntp | properties | snmp | system ]
set chap
set fc [ <PORT_NAME> ]
set features
set mgmt
set ntp
set properties
set snmp [ trap_destinations ]
set system
show [ chap | fc | fciproute ]
features | initiators | iscsi
isns | localmaps | logs
memory | mgmt | ntp
perf | presented_initiators | presented_targets
properties | remotemaps | remotepeers
snmp | stats | system
targets
show chap
show fc [ <PORT_NUM> ]
show fciproute [ <LINK_ID> ]
show features
show initiators [ fc | iscsi ]
show logs
show memory
show mgmt
show ntp
show perf [ byte | init_rbyte | init_wbyte | tgt_rbyte | tgt_wbyte ]
show statsshow system
show properties
show snmp
show stats
show system
show targets [ fc | iscsi ]
show vlan [ <PORT_NUM> ]
shutdown
target [ add | rm ]
```
show chap
show fc [ <PORT_NUM> ]
show fciproutes [ <LINK_ID> ]
show features
show initiators [ fc | iscsi ]
show logs
show memory
show mgmt
show ntp
show perf [ byte | init_rbyte | init_wbyte | tgt_rbyte |
tgt_wbyte ] show stats show system

show properties
show snmp
show stats
show system
show targets [ fc | iscsi ]
show vlan [ <PORT_NUM> ]
shutdown

History command
Displays a numbered list of the previously entered commands.

Authority Admin session
Syntax history
Notes Closing a Telnet window during an Admin session does not release the session. In this case, you must either wait for the Admin session to time out or use admin cancel command.
Example The following is an example of the history command:

mpx110 (admin) #> history
mpx110 (admin) #> history
1: admin start
2: help
3: history
mpx110 (admin) #>
Image command

Provides for updating the mp110’s firmware image and the cleanup (removal) of image files in the mp110’s /var/ftp directory.

**Authority**
Admin session

**Syntax**
image

**Parameters**

- **cleanup**
  Removes any firmware image file in the mp110’s /var/ftp directory. These are files transferred by the user when updating the firmware image.

- **list**
  Displays a list of the firmware image files in the mp110’s /var/ftp directory.

- **unpack [<filename>]**
  Unpacks the firmware image file specified in the `<filename>` parameter and installs the firmware image on the mp110. The mp110 must be rebooted for the new firmware image to be activated. The firmware image file must first have been transferred to the mp110’s /var/ftp directory using FTP.

**Examples**
The following is an example of the `image cleanup` command:

```
mp110 (admin) #> image cleanup
```

The following is an example of the `image list` command:

```
mp110 (admin) #> image list
```

The following is an example of the `image unpack` command:

```
mp110 (admin) #> image unpack mpx110-2_0_3_2.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): n
```

Logout command

Exits the CLI and returns the operator to the login prompt.

**Authority**
Admin session

**Syntax**
logout

**Example**
The following is an example of the `logout` command:

```
mp110 (admin) #> logout
```

Password command

Changes the guest and administrator passwords.

**Authority**
Admin session required only to set the command

**Syntax**
password

**Example**
The following is an example of the `password` command:

```
mp110 (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 command

Verifies the connectivity of each Ethernet port: management, GE1 (iSCSI 1), and GE2 (iSCSI 2).

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>ping</td>
</tr>
</tbody>
</table>
| Example     | mpx239 (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] 44.44.1.240  |
| Iteration Count (0=Continuously) [0 ] 10 |
| Outbound Port (0=Mgmt, 1=GE1, 2=GE2, ...) [Mgmt ] 1 |
| Size Of Packet (Min=1, Max=62256 Bytes) [56 ] 62256 |

Pinging 44.44.1.240 with 62256 bytes of data:

Reply from 44.44.1.240: bytes=62264 time=109.0ms
Reply from 44.44.1.240: bytes=62264 time=108.5ms
Reply from 44.44.1.240: bytes=62264 time=108.5ms
Reply from 44.44.1.240: bytes=62264 time=108.5ms
Reply from 44.44.1.240: bytes=62264 time=108.5ms
Reply from 44.44.1.240: bytes=62264 time=108.5ms
Reply from 44.44.1.240: bytes=62264 time=108.4ms
Reply from 44.44.1.240: bytes=62264 time=108.5ms
Reply from 44.44.1.240: bytes=62264 time=108.5ms

Ping Statistics for 44.44.1.240:
Packets: Sent = 10, Received = 9, Lost = 1
Minimum = 108.4ms, Maximum = 109.0ms, Average = 108.5ms

mpx239 (admin) #>

Quit command

Exits the CLI and returns the operator to the login prompt.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>quit</td>
</tr>
<tr>
<td>Example</td>
<td>The following is an example of the quit command:</td>
</tr>
</tbody>
</table>

mpx110 (admin) #> quit
(none) login:

Reboot command

Restarts the mpx110 firmware.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Admin session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntax</td>
<td>reboot</td>
</tr>
<tr>
<td>Example</td>
<td>The following is an example of the reboot command:</td>
</tr>
</tbody>
</table>

mpx110 (admin) #> reboot
Are you sure you want to reboot the System (y/n): y
System will now be rebooted...
Reset factory command

Restores the mpx110 factory default values. All LUN mappings are deleted, as are all persistent data regarding targets, LUNS, and initiators. The factory default IP addresses are restored.

**Authority**
Admin session

**Syntax**
reset

**Parameter**
factory
Restores mpx110 to factory default configuration.

**Example**
The following is an example of the reset factory command:

```
mpx110 (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.
```
Save command

Saves logs and traces.

**Authority**
Admin session

**Syntax**
save

capture

**Parameters**

Creates a debug file that captures all debug dump data. After the command completes, you must FTP the debug capture file from the mpx110.

logs

Creates a .tar file containing the mpx110’s log data, storing the file in the mpx110’s /var/ftp directory. The operator must then FTP the logs .tar file from the mpx110.

traces

Creates a .tar file containing the mpx110’s dump data storing the .tar file in the mpx110’s /var/ftp directory. The operator must then FTP the trace’s .tar file from the mpx110. If the mpx110 does not have any dump data, the operator will be notified when executing this command. An event log entry is generated whenever a data dump is generated.

**Examples**
The following is an example of the save capture command:

mpx110 (admin) #> save capture
Debug capture completed. Package is System_Capture.tar.gz Please use FTP to extract the file out from the System.

The following is an example of the save logs command:

mpx110 (admin) #> save logs
Save Event Logs completed. Package is System_Evl.tar.gz Please use FTP to extract the file out from the System.

The following is an example of the save traces command:

mpx110 (admin) #> save traces
Save ASIC Traces completed. Package is System_Asic_Trace.tar.gz. Please use FTP to extract the file out from the System.mpx110 (admin) #> save traces
No ASIC trace files exist to save. Command aborted.

Set command

Configures general parameters, as well as parameters for the FC, iSCSI, and management ports.

**Authority**
Admin session

**Syntax**
set

cchap

**Parameters**

Sets CHAP secrets

mgmt

Sets management port parameters

ntp

Sets NTP parameters

properties

Sets CLI properties

snmp

Sets SNMP parameters

system

Sets system parameters

**Example**
The following is an example of the set command:

mpx110 #> set mgmt
Set FC command

Configures an FC port.

Authority
Admin session

Syntax
set fc [port_num]

Parameter
port_num
Sets the number of the FC port to be configured

Example
The following is an example of the set fc command:

mpx239 (admin) #> set fc 1
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) [Auto]
Frame Size (0=512B, 1=1024B, 2=2048B) [2048]
Execution Throttle (Min=16, Max=256) [64]

All attribute values for Port 1 that have been changed will now be saved.

mpx239 (admin) #>
Set MGMT command

Configures the mpx110 management port (10/100).

**Authority**  
Admin session

**Syntax**  
set mgmt

**Example**  
The following is an example of the set mgmt command:

```
mpx239 (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 [10.6.7.239]
IPv4 Subnet Mask [255.255.248.0]
IPv4 Gateway [10.6.4.200]
IPv6 Interface (0=Enable, 1=Disable) [Disabled] 0
IPv6 Mode (0=Manual, 1=AutoConfigure) [Manual]
IPv6 Address 1 [:: ] 2000:10::32:239:1
IPv6 Address 2 [:: ]
IPv6 Default Router [:: ]
All attribute values that have been changed will now be saved.
mpx239 (admin) #>
```

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All attribute values that have been changed will now be saved.
```
Set NTP command

Configures NTP parameters.

**Authority**
Admin session

**Syntax**
set ntp

**Example**
The following is an example of the `set ntp` command:

```
mpx110 (admin) #> set ntp
NTP (0=Enable, 1=Disable) [Enabled ]
TimeZone Offset from GMT (Min=-12hrs,Max=12hrs) [-8 ]
IP Address [0] [0.0.0.0 ] 207.126.97.57
IP Address [1] [0.0.0.0 ]
IP Address [2] [0.0.0.0 ]
All attribute values that have been changed will now be saved.
```

Set Properties command

Configures CLI properties.

**Authority**
Admin session

**Syntax**
set properties

**Examples**
The following is an example of the `set properties` command:

```
mpx110 (admin) #> 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]
CLI Prompt (Max=32 Characters) [mpx110 ] RTR1
All attribute values that have been changed will now be saved.
```
Set SNMP command

Configures general SNMP properties. It also provides for configuration of up to eight trap destinations.

**Authority**

Admin session

**Syntax**

```
set snmp
```

**Parameter**

```
trap_destinations
```

Sets the number of the trap destinations to be configured for SNMP

**Examples**

The following is an example of the `set snmp` command:

```
mpx110 (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 is an example of configuring an SNMP trap destination:

```
mpx239 (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 Trap Destination 1 :
```
```
Destination enabled (0=Enable, 1=Disable) [Disabled] 0
IP Address (IPv4 or IPv6) [0.0.0.0] 10.6.6.28
Destination Port [0]
Trap Version [0]
```
```
Configuring SNMP Trap Destination 2 :
```
```
Destination enabled (0=Enable, 1=Disable) [Disabled]
```
```
Configuring SNMP Trap Destination 3 :
```
```
Destination enabled (0=Enable, 1=Disable) [Disabled]
```
```
Configuring SNMP Trap Destination 4 :
```
```
Destination enabled (0=Enable, 1=Disable) [Disabled]
```
```
Configuring SNMP Trap Destination 5 :
```
```
Destination enabled (0=Enable, 1=Disable) [Disabled]
```
```
Configuring SNMP Trap Destination 6 :
```
```
Destination enabled (0=Enable, 1=Disable) [Disabled]
```
```
Configuring SNMP Trap Destination 7 :
```
```
Destination enabled (0=Enable, 1=Disable) [Disabled]
```
```
Configuring SNMP Trap Destination 8 :
```
```
Destination enabled (0=Enable, 1=Disable) [Disabled]
```
```
All attribute values that have been changed will now be saved
```
```
mpx239 (admin) #>
```

Set System command

Configures general mpx110 parameters.

**Authority**

Admin session

**Syntax**

```
set system
```

**Parameter**

```
port_num
```

Sets the number of the iSCSI port to be configured for iSNS

**Example**

The following is an example of the `set system` command:
mpxl10 (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) [ ] testing

Mode (0=Normal, 1=Transparent, 2=Encap_FC) [0 ]
System Log Level (Min = 0, Max = 3) [0 ]
All attribute values that have been changed will now be saved.
Show command
Displays operational information.

Authority
None

Syntax
show [keyword]

Parameters
fciproutes [link_id]
Shows FCIP routes in effect and their configuration parameters
logs
Shows contents of the mpx110 logs.
memory
Shows memory managed by the mpx110; includes total and available
mgmt
Shows the mpx110 management port configuration
ntp
Shows the NTP configuration
perf [ byte | init_rbyte | init_wbyte | tgt_rbyte | tgt_wbyte ]
Shows performance data.
properties
Shows the mpx110 CLI properties
snmp
Shows the mpx110 SNMP properties and trap configurations
stats
Shows the mpx110 statistics, both FC and iSCSI
system
Shows product information, including serial number, software version, hardware version, configuration, and temperature

Example
The following is an example of the show command:

mpx110 #> show mpx110  QRouter Information
--------------
Product Name  QRouter
Symbolic Name Rack3
QRouter Mode iSCSI Server Connectivity Mode
Serial Number 0539A01070
HW Version 2
SW Version 1.0.5.0
No. of FC Ports 2
No. of iSCSI Ports 2
Log Level 0
Log Length (KB) 32768
Temperature (C) 32

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ShowFcipRoutes command

Shows FCIP route configuration parameters.

**Authority**
None

**Syntax**
show fciproutes

**Parameter**
[link_id]
Sets the number of the FCIP route to be displayed (1 or 2)

**Example**
The following is an example of the show fciproutes command:

```bash
mpx239 (admin) #> show fciproutes
FCIP Route Information
------------------------ FCIP Route 1
FCIP Interfaces Status Enabled
FCIP Link Status Up
FC Port FC1
GE Port GE1
GE Link Status Up
Local IP Address 44.44.1.239
Remote IP Address 44.44.1.240
Subnet Mask 255.255.0.0
Gateway IP Address 0.0.0.0
MTU Size Normal
TCP Window Size 32768
Window Scaling Enabled
Window Scaling Factor 7
TCP Port No 3225
Current GE Port Speed 1Gb/FDX
Programmed GE Port Speed Auto
Bandwidth, Mbit/sec 155 VLAN Disabled FCIP SW Compression Disabled
FCIP Route 2
FCIP Interfaces Status Enabled
FCIP Link Status Up
FC Port FC2
GE Port GE2
GE Link Status Up
IPv6 Address 1 2000:33::32:2:239
IPv6 Link Local fe80::2c0:ddff:fe0d:b27b
IPv6 Remote Address 2000:33::32:2:240 MTU Size Normal
TCP Window Size 32768
Window Scaling Enabled
Window Scaling Factor 7
TCP Port No 3225
Current GE Port Speed 1Gb/FDX
Programmed GE Port Speed Auto
Bandwidth, Mbit/sec 155 VLAN Disabled FCIP SW Compression Disabled
```
Show Logs command

Shows the mpx110 event log.

**Authority**
None

**Syntax**

```
show logs
```

**Example**

The following is an example of the `show logs` command:

```
mpx110 #> show logs
01/01/1970 00:00:13 System 3 Thursday 01 January 12:13 AM
01/01/1970 00:00:21 QL4022 3 #0: QLIsrDecodeMailbox: Link up
01/01/1970 00:00:13 System 3 Thursday 01 January 12:13 AM
01/01/1970 00:00:22 QL4022 3 #0: QLIsrDecodeMailbox: Link up
```

Show Memory command

Shows the mpx110 memory usage. The FCIP memory usage is zero (0) if there are no FCIP routes configured.

**Authority**
None

**Syntax**

```
show memory
```

**Examples**

The following is an example of the `show memory` command:

```
mpx110 #> show memory
Memory Units Free/Total
--------- ----------
Physical 15MB/505MB
Buffer Pool 11520/12544
Process Blocks 8192/8192
Request Blocks 8192/8192
Event Blocks 1024/1024
Control Blocks 256/256
FCIP Buffer Pool 0/0 FCIP
Request Blocks 16384/16384
```

The following is an example of the `show memory` command with one FCIP route configured:

```
mpx110 #> show memory
Memory Units Free/Total
--------- ----------
Physical 28MB/251MB
Buffer Pool 2176/4224
Process Blocks 4096/4096
Request Blocks 4096/4096
Event Blocks 512/512
Control Blocks 128/128
FCIP Buffer Pool 13320/16384
FCIP Request Blocks 15368/16384
```
Show MGMT command
Shows the management port (10/100) configuration.

Authority
None

Syntax
show mgmt

Example
The following is an example of the show mgmt command:

mpx239 (admin) #> show mgmt
Management Port Information
-----------------------------
IPv4 Interface Enabled
IPv4 Mode Static
IPv4 IP Address 10.6.7.239
IPv4 Subnet Mask 255.255.248.0
IPv4 Gateway 10.6.4.200
IPv6 Interface Enabled
IPv6 Mode Manual
IPv6 Address 1 2000:10::32:239:1
IPv6 Address 2 ::
IPv6 Link Local fe80::2c0:ddff:fe0d:b279IPv6
Default Router ::
Link Status Up
MAC Address 00-c0-dd-0d-b2-79

Show NTP command
Shows the NTP configuration.

Authority
None

Syntax
show ntp

Example
The following is an example of the show ntp command:

mpx110 #> show ntp
NTP Information
Mode Disabled
Status Offline
TimeZone Offset (Hours) 0
**Show Performance command**

Displays performance data.

**Authority**  
None

**Syntax**  
show perf

**Parameters**

- **byte**  
  Shows data transfer rate of each port (FC and GE)

- **init_rbyte**  
  Shows initiator read transfer rate per port

- **init_wbyte**  
  Shows initiator write transfer rate per port

- **tgt_rbyte**  
  Shows target read transfer rate per port

- **tgt_wbyte**  
  Shows target write transfer rate per port

**Example**  
The following is an example of the show perf byte command:

```bash
mpx110 #> show performance byte
Displaying bytes/sec (total)... (Press any key to stop display)
GE1   GE2   FC1  FC2
47M   93M   94M   48M
47M   94M   96M   47M
46M   96M   96M   47M
45M   94M   97M   48M
47M   92M   93M   48M
45M   93M   94M   46M
```

**Show Properties command**

Shows the CLI properties.

**Authority**  
None

**Syntax**  
show properties

**Example**  
The following is an example of the show properties command:

```bash
mpx110 #> show properties
CLI Properties ----------------
Inactivity Timer Disabled
Prompt String  QRouter
```
Show SNMP command

Displays the mpx10’s SNMP properties and any traps that have been configured.

**Authority**
None

**Syntax**
show snmp

**Example**
The following is an example of the `show snmp` command:

```
QRouter #> show snmp
SNMP configuration ------------------------------
Read Community Public
Trap Community Private
System Location
System Contact
Authentication traps
System OID 1.3.6.1.4.1.3873.1.4
System Description HP mpx110
Trap Destination 1
IP Address 10.0.0.5
Trap Port 1024
Trap Version 2
```
Show Stats command

Displays mpx110 statistics for FC and iSCSI.

**Authority** None

**Syntax**

```
show stats
```

**Example**

The following is an example of the `show stats` command:

```
mpx110 #> show stats
FC Port Statistics
--------------------
FC Port
Interrupt Count
Target Command Count
Initiator Command Count

iSCSI Port Statistics
---------------------
iSCSI Port
Interrupt Count
Target Command Count
Initiator Command Count
MAC Xmit Frames
MAC Xmit Frame Length Errors
MAC Xmit Jabbers
MAC Xmit Carrier Sense Errors
MAC Xmit Carrier Error Frames
MAC Xmit CRC Errors
MAC Xmit Frame Length Errors Large
MAC Xmit Small Errors Small
MAC Xmit Multicast Frames
MAC Xmit Broadcast Frames

FC Port
Interrupt Count
Target Command Count
Initiator Command Count
```

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MAC Xmit Frames
MAC Xmit Byte Count

MAC Xmit Multicast Frames
MAC Xmit Broadcast Frames
MAC Xmit Pause Frames
MAC Xmit Control Frames
MAC Xmit Deferrals
MAC Xmit Late Collisions
MAC Xmit Aborted
MAC Xmit Single Collisions
MAC Xmit Multiple Collisions
MAC Xmit Collisions

MAC Xmit Dropped Frames
MAC Xmit Jumbo Frames
MAC Rcvd Frames
MAC Rcvd Byte Count
MAC Rcvd Unknown Control Frames
MAC Rcvd Pause Frames
MAC Rcvd Control Frames
MAC Rcvd Dribbles
MAC Rcvd Frame Length Errors
MAC Rcvd Jabbers

MAC Rcvd Carrier Sense Errors
MAC Rcvd Dropped Frames
MAC Rcvd CRC Errors
MAC Rcvd Encoding Errors
MAC Rcvd Length Errors Large
MAC Rcvd Small Errors Small
MAC Rcvd Multicast Frames
MAC Rcvd Broadcast Frames

iSCSI Shared Statistics-----------------------
PDUs Xmitted
Data Bytes Xmitted
PDUs Rcvd
Data Bytes Rcvd
I/O Completed
Unexpected I/O Rcvd
iSCSI Format Errors
Header Digest Errors
Data Digest Errors
Sequence Errors

PDU Xmit Count
PDU Xmit Count
PDU Xmit Count
IP Xmit Packets
IP Xmit Byte Count
IP Xmit Fragments
IP Rcvd Packets
IP Rcvd Byte Count
IP Rcvd Fragments
IP Datagram Reassembly Count

IP Error Packets
IP Fragment Rcvd Overlap
IP Fragment Rcvd Out of Order
IP Datagram Reassembly Timeouts
TCP Xmit Segment Count
TCP Xmit Byte Count
TCP Rcvd Segment Count
TCP Rcvd Byte Count
TCP Persist Timer Expirations
TCP Rxmit Timer Expired
TCP Rcvd Duplicate Acks
TCP Rcvd Pure Acks
TCP Xmit Delayed Acks
TCP Rcvd Pure Acks
TCP Rcvd Segment Errors
TCP Rcvd Segment Out of Order
TCP Rcvd Window Probes
TCP Rcvd Window Updates
TCP ECC Error Corrections
Show System command

Displays product information, including the serial number, software version, hardware version, configuration, and temperature.

**Authority**
None

**Syntax**
show system

**Example**
The following is an example of the show system command:

```bash
mpx239 (admin) #> show system
System Information
---------------------
Product Name HP mpx110
Symbolic Name mpx239
System Mode SAN Router/FCIP
Serial Number MXK813E00R
HW Version 6 (IPv6 Supported)
SW Version 2.4.3.0
No. of FC Ports 2
No. of iSCSI Ports 2
Temperature (C) 40
```
Show Targets command

Shows the targets discovered by the mpx110 for FC, iSCSI, or both.

**Authority**
None

**Syntax**
show targets

**Parameters**
- *fc*
  Specifies the display of FC targets
- *iscsi*
  Specifies the display of iSCSI targets

**Examples**
The following is an example of the `show targets fc` command:

```
mpx110 #> show targets fc
Target Information
-------------------
WWNN  50:00:1f:e1:50:01:11:50
WWPN  50:00:1f:e1:50:01:11:58
Port ID 01-0d-00
Portal No. 1
State Online
```

```
WWNN  50:00:1f:e1:50:06:9d:20
WWPN  50:00:1f:e1:50:06:9d:2c
Port ID 01-08-00
Portal No. 1
State Online
```

The following is an example of the `show targets iscsi` command:

```
mpx110 #> show targets iscsi  No Targets found
```
Show VLAN command

Displays the mpx110’s VLAN configuration.

**Authority**
None

**Syntax**
show vlan [<port_num>]

**Parameter**
port_num

Specifies the iSCSI port number whose VLAN configuration is to be displayed

**Example**
The following is an example of the show vlan command:

```
mpx110 #> show vlan
VLAN Information
------------------
Port    VLAN     ID     Priority
 1       Disabled   0       0
```

```
mpx110 #> show vlan 1
VLAN Information
------------------
Port    VLAN     ID     Priority
 1       Disabled   0       0
```

Shutdown command

Provides for an orderly shutdown of mpx110 firmware. This command does not power down the mpx110.

**Authority**
Admin session

**Syntax**
shutdown

**Example**
The following is an example of the shutdown command:

```
mpx110 (admin) #> shutdown
```

Target command

Removes targets from the mpx110 database. This command is typically used to remove targets that are no longer connected to the mpx110.

**NOTE:** The target add command is not currently supported.

**Authority**
Admin session

**Syntax**
target

**Parameter**
rm

Removes a target from the mpx110 target database

**Example**
The following is an example of the target rm command:

```
mpx110 (admin) #> target rm
Index (WWNN,WWPN/iSCSI Name)
-----------------------------
0 20:00:00:20:37:fd:8b:ab:00:00:00:00:fc:b6:1f:fa
Please select an 'OFFLINE' Target from the list above ('q' to quit): q Command aborted.
```
**Traceroute command**

Tracks the route that packets take across an IP network on their way to an IP host.

**Authority**

Admin session

**Syntax**

`traceroute`

**Example**

The following is an example of the `traceroute` command:

```
mpx239 (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. To terminate this process before reaching the end of the list, press q or Q and the ENTER key.
IP Address (IPv4 or IPv6) [0.0.0.0] 44.44.1.240
Outbound Port [0=Mgmt, 1=GE1, 2=GE2, ...] [Mgmt] 1
Tracing route to 44.44.1.240 over a maximum of 30 hops:
1 44.44.1.240 201.4ms 100.2ms 100.2ms
Traceroute completed in 1 hops.
```
**B Log data**

The mpx110 maintains a message log that can be displayed and retrieved by the operator, either through the CLI or the mpx110 Manager GUI. The message log is persistent in that it is maintained across mpx110 power cycles and reboots. The three log categories are described in this appendix.

### Informational log messages

The following sections describe the informational log messages by reporting module.

#### Application modules

Table 19 (page 113) lists informational log messages provided by application modules.

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>53254</td>
<td>System (router) Booting up</td>
<td>6</td>
<td>Router is booting up</td>
</tr>
<tr>
<td>53357</td>
<td>QLBA_ProcessTpb: De-compression failed. Disabling compression temporarily</td>
<td>109</td>
<td>Decompression failed and will be temporarily disabled</td>
</tr>
<tr>
<td>53358</td>
<td>QLBA_RemoveTargetNodeObject : TargetNode %s</td>
<td>110</td>
<td>User removed a target (iSR6140 or iSR6142) or a target presentation (iSR6142)</td>
</tr>
<tr>
<td>54274</td>
<td>QLFC_Login: Origin 0x%xx, VP Index 0x%xx, Id 0x%xx</td>
<td>1026</td>
<td>FC logout occurred, origin xx (1 = HBA, 2 = target, 3 = initiator) VP%xx, ID (loop ID) x</td>
</tr>
<tr>
<td>54275</td>
<td>QLFC_Login: Port ID %.2x%.2x%.2x</td>
<td>1027</td>
<td>FC login occurred with port ID xx.xx.xx</td>
</tr>
</tbody>
</table>
Table 19 Application modules—Informational log messages (continued)

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>54939</td>
<td>QLIS_HandleTeb: UTM_EC_CLOSE_CONNECTION or UTM_EC_CONNECTION_CLOSED</td>
<td>1691</td>
<td>Event notification: iSCSI close connection request or connection closed.</td>
</tr>
<tr>
<td>54940</td>
<td>QLIS_HandleTeb: UTM_EC_CONNECTION_OPENED</td>
<td>1692</td>
<td>Event notification: iSCSI connection opened</td>
</tr>
<tr>
<td>54941</td>
<td>QLIS_HandleTeb: iSNS Server Open Connection succeeded</td>
<td>1693</td>
<td>Event notification: connection opened with iSNS server</td>
</tr>
<tr>
<td>54943</td>
<td>QLIS_HandleTeb: UTM_EC_ISNS_SCN</td>
<td>1695</td>
<td>Event notification: iSNS SCN received</td>
</tr>
<tr>
<td>54945</td>
<td>QLIS_HandleTeb: UTM_EC_ISNS_CLIENT_DISCOVERED</td>
<td>1697</td>
<td>Event notification: iSNS client discovered</td>
</tr>
<tr>
<td>54947</td>
<td>QLIS_HandleTeb: UTM_EC_CLOSE_CONNECTION</td>
<td>1699</td>
<td>iSCSI close connection request received</td>
</tr>
<tr>
<td>54948</td>
<td>QLIS_HandleTeb: UTM_EC_CONNECTION_CLOSED</td>
<td>1700</td>
<td>iSCSI connection closed</td>
</tr>
<tr>
<td>54963</td>
<td>QLIS_SetDbEntryContinue:[%d:%d] Remote system connection established</td>
<td>1715</td>
<td>Remote system connection established using DDB d:d</td>
</tr>
<tr>
<td>54964</td>
<td>QLIS_ConnectionOpenedNotification: Initiator connection opened (Port %d, DDB %d)</td>
<td>1716</td>
<td>Router iSCSI port xx, operating as an iSCSI initiator, opened a connection with an iSCSI target.</td>
</tr>
<tr>
<td>54986</td>
<td>QLIS_HandleSessionTimer: Re-enabling compression</td>
<td>1738</td>
<td>Re-enabling compression</td>
</tr>
<tr>
<td>55299</td>
<td>QLSC_CollectBUVUIO: Freeing dead TRB: State 0x%02X, AbortReason %d, Flags 0x%02X</td>
<td>2051</td>
<td>TRB freed, State xx, Abort Reason d, Flags xx</td>
</tr>
</tbody>
</table>

**iSCSI driver**

Table 20 (page 114) lists log messages common to both iSCSI ports, 1 (GE1) and 2 (GE2). Log messages beginning with #0 apply to iSCSI port 1 (GE1), and log messages beginning with #1 apply to iSCSI port 2 (GE2).

Table 20 SCSI driver—Informational log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>86343</td>
<td>#%d: QLPortUp: Set link configuration 0x%xx</td>
<td>327</td>
<td>iSCSI port enabled, port up 331 Restart iSCSI processor (RISC)</td>
</tr>
<tr>
<td>86347</td>
<td>#%d: QLDisable: Restart RISC</td>
<td>331</td>
<td>Restart iSCSI processor (RISC)</td>
</tr>
<tr>
<td>86349</td>
<td>#%d: QLEnable: Restart RISC to update EEPROM</td>
<td>333</td>
<td>EEPROM updated, restart iSCSI processor (RISC)</td>
</tr>
<tr>
<td>86352</td>
<td>#%d: QLPortDown: Set link configuration 0x%xx</td>
<td>336</td>
<td>iSCSI port disabled, port down</td>
</tr>
<tr>
<td>86874</td>
<td>#%d: QLIsrDecodeMailbox: Link up</td>
<td>858</td>
<td>Link up reported by iSCSI processor for GE1 or GE 2</td>
</tr>
<tr>
<td>87305</td>
<td>#%d: ql4xxx_offload_init: Outbound offload initialization completed</td>
<td>1289</td>
<td>Not used. To be used on 6200 in outbound offload code.</td>
</tr>
<tr>
<td>87346</td>
<td>#%d: QLGetFwStateCallback: link 100Mb FDX</td>
<td>1330</td>
<td>iSCSI port link-up at 100Mb full-duplex</td>
</tr>
<tr>
<td>ID</td>
<td>Log message</td>
<td>No.</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------------</td>
<td>------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>87347</td>
<td><code>%d: QLGetFwStateCallback: link 100Mb HDX</code></td>
<td>1331</td>
<td>iSCSI port link-up at 100Mb half-duplex</td>
</tr>
<tr>
<td>87348</td>
<td><code>%d: QLGetFwStateCallback: link 1000Mb FDX</code></td>
<td>1332</td>
<td>iSCSI port link-up at 1000Mb full-duplex</td>
</tr>
<tr>
<td>87349</td>
<td><code>%d: QLGetFwStateCallback: link 1000Mb HDX</code></td>
<td>1333</td>
<td>iSCSI port link-up at 1000Mb half-duplex</td>
</tr>
<tr>
<td>87350</td>
<td><code>%d: QLGetFwStateCallback: Invalid link speed 0x%x</code></td>
<td>1334</td>
<td>iSCSI port link speed could not be determined. Link speed may be incorrectly programmed</td>
</tr>
</tbody>
</table>
Table 21 lists informational log messages common to both FC ports, 1 (FC1) and 2 (FC2). Log messages beginning with #0 apply to Fibre Channel port 1 (FC1), and log messages beginning with #1 apply to Fibre Channel port 2 (FC2).

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>118882</td>
<td>#%d: QLioctlDisable: Reset adapter</td>
<td>98</td>
<td>Request to reset the FC processor (adapter) received from IOCTL interface.</td>
</tr>
<tr>
<td>119088</td>
<td>#%d: QUsrEvtHandler: LIP occurred (%x): mailbox1 = %x</td>
<td>304</td>
<td>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>#%d: QUsrEvtHandler: LIP reset occurred (%x): mailbox1 = %x</td>
<td>305</td>
<td>Fibre Channel LIP reset occurred. The LIP reset type is reported, as is the contents of the FC processor’s mailbox 1 register.</td>
</tr>
<tr>
<td>119090</td>
<td>#%d: QUsrEvtHandler: Link up (%x) mailbox1 = %x</td>
<td>306</td>
<td>Fibre Channel link up occurred. Event status is reported, as is the contents of the FC processor’s mailbox 1 register.</td>
</tr>
<tr>
<td>119092</td>
<td>#%d: QUsrEvtHandler: Link mode up (%x): RunTimeMode=%x</td>
<td>308</td>
<td>Fibre Channel link up occurred. Event status is reported, as is the RunTimeMode (0 = loop, 1 = point-to-point).</td>
</tr>
<tr>
<td>119093</td>
<td>#%d: QUsrEvtHandler: RSCN update (%x) rscnInfo: %x</td>
<td>309</td>
<td>An RSCN was received. Event status is reported, as is the RSCN information.</td>
</tr>
<tr>
<td>119097</td>
<td>#%d: QUsrEvtHandler: Port update (%x) mb1-3 %x %x %x</td>
<td>313</td>
<td>Fibre Channel port update. Event status is reported, as is the contents of the FC processor’s mailbox 1, 2, and 3 registers.</td>
</tr>
<tr>
<td>119552</td>
<td>#%d: QLFciplsrEvtHandler: Link up (%x) mailbox1 = %x</td>
<td>768</td>
<td>FCIP-Fibre Channel link up occurred. Event status is reported, as is the contents of the FC processor’s mailbox 1 register.</td>
</tr>
<tr>
<td>119553</td>
<td>#%d: QLFciplsrEvtHandler: Link down (%x)</td>
<td>769</td>
<td>FCIP-Fibre Channel link down occurred.</td>
</tr>
<tr>
<td>119554</td>
<td>#%d: QLFciplsrEvtHandler: Link mode up (%x)</td>
<td>770</td>
<td>FCIP-Fibre Channel link up occurred. Event status is reported, as is the RunTimeMode (0 = loop, 1 = point-to-point).</td>
</tr>
</tbody>
</table>
Table 22 (page 117) lists log messages provided by user modules.

**Table 22 User modules—Log messages**

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>151842</td>
<td>FW Upgrade performed: new version is: %d.%d.%d.%d</td>
<td>290</td>
<td>Router firmware upgrade performed, new version number is d.d.d.d.</td>
</tr>
<tr>
<td>151843</td>
<td>REBOOT/SHUTDOWN Command from user. Code=%d</td>
<td>291</td>
<td>User performed a router reboot or shutdown.</td>
</tr>
<tr>
<td>151889</td>
<td>#%d: qapisetfcinterfaceparams_1_svc: FC port configuration changed</td>
<td>337</td>
<td>FC port configuration has been modified.</td>
</tr>
<tr>
<td>151890</td>
<td>#%d: qapisetiscsiinterfaceparams_1_svc: iSCSI port configuration changed</td>
<td>338</td>
<td>iSCSI port configuration has been modified.</td>
</tr>
<tr>
<td>151891</td>
<td>#%d: qapisetisns_1_svc:iSNS configuration changed</td>
<td>339</td>
<td>iSNS configuration has been modified.</td>
</tr>
<tr>
<td>151892</td>
<td>qapisetntpparams_1_svc: NTP configuration changed</td>
<td>340</td>
<td>NTP configuration has been modified.</td>
</tr>
<tr>
<td>151893</td>
<td>#%d: qapisetvlanparams_1_svc: VLAN configuration changed</td>
<td>341</td>
<td>VLAN configuration has been modified.</td>
</tr>
<tr>
<td>151894</td>
<td>qapisetlunmask_1_svc: Lunmask added for LUN %d</td>
<td>342</td>
<td>User presented a LUN to an initiator.</td>
</tr>
<tr>
<td>151895</td>
<td>qapisetlunmask_1_svc: Lunmask removed for LUN %d</td>
<td>343</td>
<td>User unpresented a LUN to an initiator.</td>
</tr>
<tr>
<td>151896</td>
<td>qapisetmgmintfcparams_1_svc:Management port configuration changed</td>
<td>344</td>
<td>Management Ethernet port configuration has been modified.</td>
</tr>
<tr>
<td>151897</td>
<td>qapisetbridgebasicinfo_1_svc:Bridge configuration changed</td>
<td>345</td>
<td>Router configuration has been modified.</td>
</tr>
<tr>
<td>151898</td>
<td>QBRPC_Initialize:GetFcSfp Mem Allocation error</td>
<td>346</td>
<td>Remotemap added for local FC device WWPN xx.xx.xx.xx.xx.xx.xx.xx</td>
</tr>
<tr>
<td>151899</td>
<td>qapimapremote_1_svc: Remotemap added to remote device %2.x:%2.x:%2.x:%2.x:%2.x:%2.x</td>
<td>347</td>
<td>Remotemap added for remote FC device WWPN xx.xx.xx.xx.xx.xx.xx.xx</td>
</tr>
<tr>
<td>151900</td>
<td>qapidnmapremote_1_svc: Remotemap removed for local device %2.x:%2.x:%2.x:%2.x:%2.x:%2.x</td>
<td>348</td>
<td>Remotemap removed for local FC device WWPN xx.xx.xx.xx.xx.xx.xx.xx</td>
</tr>
<tr>
<td>151901</td>
<td>qapidnmapremote_1_svc: Remotemap removed to remote device %2.x:%2.x:%2.x:%2.x:%2.x:%2.x</td>
<td>349</td>
<td>Remotemap removed for remote FC device WWPN xx.xx.xx.xx.xx.xx.xx.xx</td>
</tr>
<tr>
<td>151902</td>
<td>qapimaptargettoinitiator_1_svc: Localmap added for initiator %2.x:%2.x:%2.x:%2.x:%2.x:%2.x</td>
<td>350</td>
<td>Localmap added for FC initiator WWPN xx.xx.xx.xx.xx.xx.xx.xx.xx</td>
</tr>
<tr>
<td>151903</td>
<td>qapimaptargettoinitiator_1_svc: Localmap added to target device %2.x:%2.x:%2.x:%2.x:%2.x:%2.x</td>
<td>351</td>
<td>Localmap added to FC target device WWPN xx.xx.xx.xx.xx.xx.xx.xx.xx</td>
</tr>
<tr>
<td>151904</td>
<td>qapidnmaptargettoinitiator_1_svc: Localmap removed for initiator device %2.x:%2.x:%2.x:%2.x:%2.x:%2.x</td>
<td>352</td>
<td>Localmap removed for FC initiator WWPN</td>
</tr>
<tr>
<td>151905</td>
<td>qapidnmaptargettoinitiator_1_svc: Localmap removed to target device %2.x:%2.x:%2.x:%2.x:%2.x:%2.x</td>
<td>353</td>
<td>Localmap removed for FC target device WWPN</td>
</tr>
</tbody>
</table>
### Table 22 User modules—Log messages (continued)

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>151906</td>
<td>qapimaptargettoinitiator_1_svc: Localmap added for initiator %s</td>
<td>354</td>
<td>Localmap added for iSCSI initiator &quot;iqn.dddd-dd.ttt.ttt.......&quot;</td>
</tr>
<tr>
<td>151907</td>
<td>qapimapunmaptargettoinitiator_1_svc: Localmap removed for initiator %s</td>
<td>355</td>
<td>Localmap removed for iSCSI initiator &quot;iqn.dddd-dd.ttt.ttt.......&quot;</td>
</tr>
<tr>
<td>151908</td>
<td>GE%d: Port status changed by user to ENABLED.</td>
<td>356</td>
<td>User enabled GE port d</td>
</tr>
<tr>
<td>151909</td>
<td>GE%d: Port status changed by user to DISABLED.</td>
<td>357</td>
<td>User disabled GE port d</td>
</tr>
<tr>
<td>151910</td>
<td>FC%d: Port status changed by user to ENABLED.</td>
<td>358</td>
<td>User enabled FC port d</td>
</tr>
<tr>
<td>151911</td>
<td>FC%d: Port status changed by user to DISABLED.</td>
<td>359</td>
<td>User disabled FC port d</td>
</tr>
<tr>
<td>152069</td>
<td>qapisetfcipparams_1_svc: FCIPROUTE %d Added</td>
<td>517</td>
<td>User added FCIP route #d</td>
</tr>
<tr>
<td>152070</td>
<td>qapisetfcipparams_1_svc: FCIPROUTE %d Modified</td>
<td>518</td>
<td>User modified FCIP route #d</td>
</tr>
<tr>
<td>152071</td>
<td>qapisetfcipparams_1_svc: FCIPROUTE %d Removed</td>
<td>519</td>
<td>User removed FCIP route #d</td>
</tr>
<tr>
<td>152082</td>
<td>qapiaddmodifyinitiator_1_svc : Initiator Configuration Changed</td>
<td>530</td>
<td>Initiator configuration changed, such as CHAP settings or OS type</td>
</tr>
<tr>
<td>152083</td>
<td>qapiremoveinitiator_1_svc : Initiator Removed</td>
<td>531</td>
<td>User removed an initiator from the router. Typically this is done using CLI &quot;initiator rm&quot; command</td>
</tr>
</tbody>
</table>

### Table 23 FCIP—Informational log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>184524</td>
<td>qlFcip_Linkchange#%d: Gige Link Down</td>
<td>204</td>
<td>FCIP Route GigE link d (1 or 2) is down</td>
</tr>
<tr>
<td>184525</td>
<td>qlFcip_Linkchange#%d: Gige Link Up</td>
<td>205</td>
<td>FCIP Route GigE link d (1 or 2) is up</td>
</tr>
</tbody>
</table>
TOE driver

Table 24 (page 119) lists log messages provided by the TOE driver.

**Table 24 TOE driver—Informational log messages**

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>217350</td>
<td>QL3022:eth%x: Interface is down</td>
<td>262</td>
<td>The GigE interface d (0 or 1) used for an FCIP route is down</td>
</tr>
</tbody>
</table>

System

Table 25 (page 119) lists log messages provided by the system modules.

**Table 25 System—Informational log messages**

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>249862</td>
<td>“Temperature is back to normal range %d\n”</td>
<td>6</td>
<td>The router temperature has returned to the normal operating range and is d (°C).</td>
</tr>
</tbody>
</table>

Error log messages

The following sections describe the error log messages by reporting module:

- Application modules (page 119)
- iSCSI driver (page 124)
- Fibre Channel driver (page 125)
- Error log messages in user modules (page 127)
- Page 128

Application modules

Table 26 (page 119) lists error log messages provided by application modules.

**Table 26 Application modules—Error log messages**

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>40967</td>
<td>QLBA_NullDoorbell: driver unloaded, port disabled</td>
<td>7</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>36</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>44</td>
<td>Processing unsupported head-of-queue tag task management command</td>
</tr>
<tr>
<td>41058</td>
<td>QLBA_CreateTargetDeviceObject: Too many devices</td>
<td>98</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>100</td>
<td>Unable to create an object for the target node; exceeded the maximum number of target devices</td>
</tr>
<tr>
<td>41067</td>
<td>QLBA_CreateLunObject: LunObject memory unavailable</td>
<td>107</td>
<td>Memory unavailable for LUN object</td>
</tr>
<tr>
<td>ID</td>
<td>Log message</td>
<td>No.</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------</td>
<td>------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>41077</td>
<td>QLBA_CreateInitiatorObject: Too many initiators</td>
<td>117</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>136</td>
<td>Process control block status indicates that a PCI error occurred during a target operation</td>
</tr>
<tr>
<td>41106</td>
<td>QLBA_DisplayInitiatorOperationStatus: DMA Error, Status 0x%.2x</td>
<td>146</td>
<td>Process control block status indicates that a DMA error occurred during an initiator operation</td>
</tr>
<tr>
<td>41107</td>
<td>QLBA_DisplayInitiatorOperationStatus: Transport Error, Status 0x%.2x</td>
<td>147</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>151</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>274</td>
<td>iSCSI Login failed between receipt of PDU and request for the data segment.</td>
</tr>
<tr>
<td>41238</td>
<td>QLKV_ValidateLoginTransitCsgNsgVersion failed (status 0x%x)</td>
<td>278</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>297</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>305</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>307</td>
<td>iSCSI Login PDU received for a target with a target name unknown to the router.</td>
</tr>
<tr>
<td>41268</td>
<td>iSCSI Login PDU received without a target name for a normal session.</td>
<td>308</td>
<td>iSCSI Login PDU received without a target name for a normal session.</td>
</tr>
<tr>
<td>41270</td>
<td>iSCSI Login PDU received without an initiator name key/value not provided.</td>
<td>310</td>
<td>iSCSI Login PDU received without an initiator name key or value.</td>
</tr>
<tr>
<td>41272</td>
<td>QLIS_LoginPduContinue: CONN_STATE_IN_LOGIN, Unknown InitTaskTag</td>
<td>312</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 that 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>323</td>
<td>iSCSI Login PDU was received with a TSIH out of range. This would occur if the iSCSI initiator attempting the login failed to use the TSIH value provided in the</td>
</tr>
<tr>
<td>ID</td>
<td>Log message</td>
<td>No.</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>------------------------------------------------------------------------------</td>
<td>------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>41284</td>
<td>QLIS_LoginPduContinue: Session does not exist, invalid TSIH 0x%x</td>
<td>324</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.</td>
</tr>
<tr>
<td>41353</td>
<td>QLIS_LoginPduContinue CHAP Validation Failure</td>
<td>393</td>
<td>CHAP validation failed during login</td>
</tr>
<tr>
<td>41354</td>
<td>QLIS_LoginPduContinue Unexpected CHAP key detected</td>
<td>394</td>
<td>Unexpected CHAP key</td>
</tr>
<tr>
<td>41508</td>
<td>QLBI_SetPortInfo: QLUT_AllocatePortalObject failed (PortType 0x%x, PortId 0x%x)</td>
<td>548</td>
<td>Failure to allocate object for &quot;Set Port Info&quot; IOCTL processing. PortType: 0 = FC, 1 = iSCSI. PortId: 0 = FC1 or iSCSI1(GE1), 1 = FC2 or iSCSI2 (GE2).</td>
</tr>
<tr>
<td>41626</td>
<td>QLBI_GetLunInfo: INQUIRY failed, TPB status 0x%x</td>
<td>666</td>
<td>The Inquiry command issued by the mpx110 as part of its discovery process failed.</td>
</tr>
<tr>
<td>41629</td>
<td>QLBI_GetLunInfo: QLBI_PassthruCommand failed for INQUIRY (page code 0x83)</td>
<td>669</td>
<td>The Inquiry command issued by the mpx110 as part of its discovery process failed.</td>
</tr>
<tr>
<td>41635</td>
<td>QLBI_GetLunInfo: QLBI_PassthruCommand failed for READ CAPACITY</td>
<td>675</td>
<td>The Inquiry command issued by the mpx110 as part of its discovery process failed.</td>
</tr>
<tr>
<td>41636</td>
<td>QLBI_GetLunInfo: READ CAPACITY failed, TPB status 0x%x</td>
<td>676</td>
<td>The Inquiry command issued by the mpx110 as part of its discovery process failed.</td>
</tr>
<tr>
<td>41696</td>
<td>QLBI_PassthruCommandCompletion: Passthru command aborted</td>
<td>736</td>
<td>The Pass Through command issued by management application (such as a GUI) was aborted.</td>
</tr>
<tr>
<td>41700</td>
<td>QLBI_Passthru: Invalid CDB length %d bytes</td>
<td>740</td>
<td>The Pass Through command issued by management application (such as a GUI) failed due to invalid CDB length.</td>
</tr>
<tr>
<td>41701</td>
<td>QLBI_Passthru: Invalid data length %d bytes</td>
<td>741</td>
<td>The Pass Through command issued by management application (such as a GUI) failed due to invalid data length.</td>
</tr>
<tr>
<td>41717</td>
<td>QLBI_PassthruCommand: command interrupted or timed out</td>
<td>757</td>
<td>The Pass Through command issued by management application (such as a GUI) was interrupted or timed out.</td>
</tr>
<tr>
<td>41750</td>
<td>QLBI_ioctl: ERROR: Operation (0x%x) not supported in this mode</td>
<td>790</td>
<td>IOCTL operation is unsupported for the operation code identified in the log message.</td>
</tr>
<tr>
<td>41768</td>
<td>QLBI_GetLunList: REPORT LUNS command failed</td>
<td>808</td>
<td>The Inquiry command issued by the mpx110 as part of its discovery process failed.</td>
</tr>
<tr>
<td>41769</td>
<td>QLBI_GetLunList: REPORT LUNS command failed with CHECK CONDITION, SCSI STATUS 0x%02X</td>
<td>809</td>
<td>The Inquiry command issued by the mpx110 as part of its discovery process failed.</td>
</tr>
<tr>
<td>ID</td>
<td>Log message</td>
<td>No.</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>41771</td>
<td>QLBI_GetLunList: LUN allocation failed for LunId %d</td>
<td>811</td>
<td>Failed to allocate LUN object: out of resources.</td>
</tr>
<tr>
<td>41994</td>
<td>QLFC_Login: VpIndex (%d) out of range</td>
<td>1034</td>
<td>Failed to allocate LUN object: out of resources.</td>
</tr>
<tr>
<td>41995</td>
<td>QLFC_Login: VP Index 0x%x not configured</td>
<td>1035</td>
<td>Login attempted using Fibre Channel VP index that has not been configured. Operation attempted on an unconfigured VP.</td>
</tr>
<tr>
<td>42002</td>
<td>QLFC_login: Can’t open connection</td>
<td>1042</td>
<td>Attempting login but Fibre Channel connection cannot be opened.</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>1064</td>
<td>Attempting logout of device for which there is no active path (WWPN not found).</td>
</tr>
<tr>
<td>42027</td>
<td>QLFC_Logout: VP Index 0x%x not configured</td>
<td>1067</td>
<td>Logout attempted using Fibre Channel VP index which has not been configured. Operation attempted on an unconfigured VP.</td>
</tr>
<tr>
<td>42068</td>
<td>QLFC_HandleTeb: System Error</td>
<td>1108</td>
<td>Event notification: Fibre Channel processor encountered a system error (unrecoverable firmware error).</td>
</tr>
<tr>
<td>42069</td>
<td>QLFC_HandleTeb: Driver Fatal Error</td>
<td>1109</td>
<td>Event notification: Fibre Channel driver encountered a fatal error.</td>
</tr>
<tr>
<td>42072</td>
<td>QLFC_HandleTeb: FC Logout.</td>
<td>1112</td>
<td>Event notification: Fibre Channel port logged out.</td>
</tr>
<tr>
<td>42242</td>
<td>QUIS_AllocateSessionObject: Out of session resources.</td>
<td>1282</td>
<td>Failed to allocate object for iSCSI session: out of session resources.</td>
</tr>
<tr>
<td>42252</td>
<td>QUIS_EnqueueIscsiPdu: Duplicate PDU, CmdSN %d (0x%x), dropping it.</td>
<td>1292</td>
<td>Received an iSCSI PDU with a duplicate CmdSN. Command PDU will be dropped.</td>
</tr>
<tr>
<td>42258</td>
<td>QUIS_InstantiateSession: Can’t add Initiator to the database</td>
<td>1298</td>
<td>Unable to allocate iSCSI initiator object while initiating a session.</td>
</tr>
<tr>
<td>42259</td>
<td>#%d: QUIS_InstantiateSession: Maximum number (%d) of allowed hosts already logged in</td>
<td>1299</td>
<td>Exceeded the number of iSCSI hosts allowed to connect to mpix100</td>
</tr>
<tr>
<td>42404</td>
<td>QUIS_ProcessStartTrb: [%d] CmdSN %ld is out of range (%ld—%ld), Cdb[0] 0x%02X, DataXferLen 0x%x.</td>
<td>1444</td>
<td>Failed to execute iSCSI command PDU due to its CmdSN being out of range. Log message provides the incorrect CmdSN, the valid CmdSN range, the first byte of the CDB, and the length of the data.</td>
</tr>
<tr>
<td>42648</td>
<td>QUIS_HandleTeb: Driver Fatal Error</td>
<td>1688</td>
<td>Event notification: iSCSI driver encountered a fatal error.</td>
</tr>
<tr>
<td>42649</td>
<td>QUIS_HandleTeb: Unload Driver.</td>
<td>1689</td>
<td>Event notification: an IOCTL request was received to unload the iSCSI driver.</td>
</tr>
<tr>
<td>42654</td>
<td>QUIS_HandleTeb: iSNS Connection Failed</td>
<td>1694</td>
<td>Event notification: attempt to connect to the iSNS server failed.</td>
</tr>
<tr>
<td>43012</td>
<td>QLSC_CollectBuvuiO: Allocation of DSD failed</td>
<td>2052</td>
<td>iSNS connection failed</td>
</tr>
<tr>
<td>ID</td>
<td>Log message</td>
<td>No.</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------------------------------</td>
<td>------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>43013</td>
<td>QLSC_CollectBUVUIORecovery: Allocation of DSD failed</td>
<td>2053</td>
<td>Break up I/O DSD allocation failed</td>
</tr>
<tr>
<td>43265</td>
<td>QLUT_AllocateTpbExtension: TPB allocation failed</td>
<td>2305</td>
<td>Break up I/O recover DSD allocation failed</td>
</tr>
<tr>
<td>43267</td>
<td>QLUT_AllocateTpbExtension: Data buffer allocation failed (length %d)</td>
<td>2307</td>
<td>Data buffer allocation failed (length %d) during tpb extension allocation</td>
</tr>
<tr>
<td>43268</td>
<td>QLUT_AllocateTpbExtension: Alloc of DSD failed for buffer len %d</td>
<td>2308</td>
<td>Allocation of DSD failed during Tpb extension allocation. Buffer length %d</td>
</tr>
<tr>
<td>43269</td>
<td>QLFCIP_IncomingFrame: BUGCHECK: Trb (0x%p) ValidFlag (0x%x) Direction (0x%x)</td>
<td>2309</td>
<td>FCIP incoming frame: BUGCHECK: Trb (0x%p) ValidFlag (0x%x) Direction (0x%x)</td>
</tr>
<tr>
<td>43270</td>
<td>QLFCIP_IncomingFrame: GetFcipMapPortal failed</td>
<td>2310</td>
<td>FCIP incoming frame: GetFcipMapPortal failed</td>
</tr>
<tr>
<td>43271</td>
<td>QLFCIP_IncomingFrame: Got Status aborted pTrb-&gt;pBufDescList[0]:%p Trb Direction:0x%x</td>
<td>2311</td>
<td>FCIP incoming frame: Got Status aborted pTrb-&gt;pBufDescList[0]:%p Trb Direction:0x%x</td>
</tr>
<tr>
<td>43272</td>
<td>QLFCIP_SystemError: System error</td>
<td>2312</td>
<td>FCIP system error</td>
</tr>
<tr>
<td>43273</td>
<td>QLFCIP_SystemError: QLOP_IssuePortEnable failed</td>
<td>2313</td>
<td>FCIP system error: QLOP_IssuePortEnable failed</td>
</tr>
<tr>
<td>43280</td>
<td>QLFCIP_HandleTeb: Driver Fatal error</td>
<td>2320</td>
<td>FCIP handle Teb: Driver Fatal error</td>
</tr>
<tr>
<td>43281</td>
<td>QLFCIP_ConfigPortal: Find portal object failed for QLUT_TYPE_FC, PortId (%d)</td>
<td>2321</td>
<td>FCIP configure portal: Find portal object failed for QLUT_TYPE.FC, PortId (%d)</td>
</tr>
<tr>
<td>43282</td>
<td>QLFCIP_ConfigPortal: QLFCIP_ConfigPortal: Invalid PortId for FCIP link PortId(%d)</td>
<td>2322</td>
<td>FCIP configure portal: QLFCIP_ConfigPortal: Invalid PortId for FCIP link PortId(%d)</td>
</tr>
<tr>
<td>43283</td>
<td>QLUT_AllocateFcipTpbPool: Allocation failed (size 0x%x)</td>
<td>2323</td>
<td>FCIP allocate TRB pool: Allocation failed (size 0x%x)</td>
</tr>
<tr>
<td>43284</td>
<td>QLUT_GetFcipTrb: Null portal object in map table</td>
<td>2324</td>
<td>FCIP Trb: Null portal object in map table</td>
</tr>
<tr>
<td>43285</td>
<td>QLUT_GetFcipTrb: Unable to get the Free Trb</td>
<td>2325</td>
<td>FCIP get TRB: Null portal object in map table</td>
</tr>
<tr>
<td>43286</td>
<td>QLUT_GetFcipTrb: Duplicate allocation of FcipTrb (0x%p)</td>
<td>2326</td>
<td>FCIP get TRB: Duplicate allocation of FcipTrb (0x%p)</td>
</tr>
<tr>
<td>43287</td>
<td>QLUT_FreeFcipTrb: Null portal object in map table</td>
<td>2327</td>
<td>FCIP free TRB: Null portal object in map table</td>
</tr>
<tr>
<td>43288</td>
<td>QLUT_FreeFcipTrb: Duplicate Free of FcipTrb (0x%p)</td>
<td>2328</td>
<td>FCIP free TRB: Duplicate Free of FcipTrb (0x%p)</td>
</tr>
<tr>
<td>43289</td>
<td>QLUT_InitializeFcipBufDescPool: Memory allocation for FCIP_BUF_EXT_DESC failed (size 0x%x)</td>
<td>2329</td>
<td>FCIP initialize buffer descriptor pool: Memory allocation for FCIP_BUF_EXT_DESC failed (size 0x%x)</td>
</tr>
<tr>
<td>43296</td>
<td>QLUT_FreeFcipDataBuffers: Duplicate Freeing of DataBuf (0x%p)</td>
<td>2336</td>
<td>FCIP free data buffers: Duplicate Freeing of DataBuf (0x%p)</td>
</tr>
</tbody>
</table>
### Table 26 Application modules—Error log messages (continued)

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>43297</td>
<td>QLUT_AllocateFcipDataBuffers: Duplicate allocation of DataBuffer (0x%p)</td>
<td>2337</td>
<td>FCIP allocate data buffers: Duplicate allocation of DataBuffer (0x%p)</td>
</tr>
<tr>
<td>43298</td>
<td>QLUT_AllocateFcipDataBuffers: Got NULL PORTAL Object in map table MEM LEAK!!!!!!</td>
<td>2338</td>
<td>FCIP allocate data buffer: Got NULL PORTAL Object in map table MEM LEAK!!!!!!</td>
</tr>
<tr>
<td>43299</td>
<td>QLUT_DeallocateFcipDataBuffers: Null portal object in map table</td>
<td>2339</td>
<td>FCIP de-allocate data buffer: Null portal object in map table</td>
</tr>
<tr>
<td>43300</td>
<td>QLUT_CreateFcipDataBufferpool: Allocation of 32K buffers from LargeBufferPool failed</td>
<td>2340</td>
<td>FCIP create data buffer pool: Allocation of 32K buffers from LargeBufferPool failed</td>
</tr>
</tbody>
</table>

#### iSCSI driver

Table 27 (page 124) lists error log messages common to both iSCSI ports, 1 (GE1) and 2 (GE2). Log messages beginning with #0 apply to iSCSI port 1 (GE1), and log messages beginning with #1 apply to iSCSI port 2 (GE2).

### Table 27 iSCSI driver—Error log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>73990</td>
<td>#%d: QLUtmoilctlEnable: Initialize FW failed</td>
<td>262</td>
<td>The iSCSI processor failed firmware initialization.</td>
</tr>
<tr>
<td>74046</td>
<td>#%d: QLPortUp: MBOX_CMD_SET_PORT_CONFIG %04x failed %04x</td>
<td>318</td>
<td>The iSCSI processor command to enable a GE port failed.</td>
</tr>
<tr>
<td>74056</td>
<td>#%d: QLRunDiag: MBOX Diag test internal loopback failed %x %x</td>
<td>328</td>
<td>The iSCSI processor failed the internal loopback test.</td>
</tr>
<tr>
<td>74057</td>
<td>#%d: QLRunDiag: MBOX Diag test external loopback failed %x %x</td>
<td>329</td>
<td>The iSCSI processor failed the external loopback test.</td>
</tr>
<tr>
<td>74065</td>
<td>#%d: QLPortDown: MBOX_CMD_SET_PORT_CONFIG %04x failed %04x</td>
<td>337</td>
<td>The iSCSI processor command to disable a GE port failed.</td>
</tr>
<tr>
<td>74068</td>
<td>#%d: QLUtReceiveScsiCmd: Invalid ATO Continuation type %x</td>
<td>340</td>
<td>iSCSI FW did not send a valid Continuation IOCB</td>
</tr>
<tr>
<td>74069</td>
<td>#%d: QLUtProcessResponseQueue: Immediate data addr %08x:%08x in unsupported PduType</td>
<td>341</td>
<td>Driver received an unsupported pdu type with immediate data address</td>
</tr>
<tr>
<td>74241</td>
<td>#%d: QLiSNSEnableCallback: iSNS Server TCP Connect failed</td>
<td>513</td>
<td>The iSCSI processor could not connect with the iSNS.</td>
</tr>
<tr>
<td>74577</td>
<td>#%d: QLiIsrDecodeMailbox: NVRAM invalid</td>
<td>849</td>
<td>The iSCSI processor reported that the iSCSI port NVRAM contains invalid data (checksum error).</td>
</tr>
<tr>
<td>74580</td>
<td>#%d: QLiIsrDecodeMailbox: AEN %04x, Duplicate IP address detected, MB[1-5] %04x %04x %04x %04x %04x</td>
<td>852</td>
<td>Duplicate IP address is detected on iScsi port %d</td>
</tr>
<tr>
<td>74587</td>
<td>#%d: QLiIsrDecodeMailbox: Link down</td>
<td>859</td>
<td>The iSCSI processor reported a link down condition.</td>
</tr>
<tr>
<td>74620</td>
<td>#%d: QLProcessAen: Invalid event %x</td>
<td>892</td>
<td>Driver received an invalid event from iScsi FW</td>
</tr>
</tbody>
</table>
### Table 27 iSCSI driver—Error log messages (continued)

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>74656</td>
<td><code>#%d: QLReadyTimer: Adapter missed heartbeat for %d seconds. Time left %d</code></td>
<td>928</td>
<td>The driver failed to receive a heartbeat from the iSCSI processor for the specified number of seconds.</td>
</tr>
<tr>
<td>74659</td>
<td><code>#%d: QLReadyTimer: Adapter missed heartbeat for 0x%x seconds</code></td>
<td>931</td>
<td>Driver did not receive a heartbeat event from iScsi FW</td>
</tr>
<tr>
<td>74661</td>
<td><code>#%d: QlTimer: Abort pTpb=%p, Type %x, Timeout 0x%x DrvCount 0x%x, DdbIndex 0x%x</code></td>
<td>933</td>
<td>The driver timed out an iSCSI processor operation and is aborting the operation.</td>
</tr>
<tr>
<td>74663</td>
<td><code>#%d: QLReadyTimer: MBOX_CMD %04x %04x %04x %04x %04x %04x %04x %04x %04x timed out</code></td>
<td>935</td>
<td>The driver timed out while attempting to reconnect with the iSNS.</td>
</tr>
<tr>
<td>74665</td>
<td><code>#%d: QLReadyTimer: QlISNSReenable failed</code></td>
<td>937</td>
<td>The driver timed out while attempting to reconnect with the iSNS.</td>
</tr>
<tr>
<td>74705</td>
<td><code>#%d: QlProcessSystemError: Restart RISC</code></td>
<td>977</td>
<td>Driver detected an error that requires iSCSI FW to be restarted</td>
</tr>
<tr>
<td>74746</td>
<td><code>#%d: QLInitializeFW: MBOX_CMD_INITIALIZE_FIRMWARE failed %04x %04x %04x %04x %04x %04x %04x</code></td>
<td>1018</td>
<td>iScsi FW failed to initialize</td>
</tr>
<tr>
<td>74784</td>
<td><code>#%d: QLUpdateInitiatorData: No more room in Initiator Database</code></td>
<td>1056</td>
<td>The driver’s initiator database is full. The driver is capable of storing 1024 iSCSI initiators in its database. Use the CLI or GUI to remove unwanted/unused iSCSI initiators.</td>
</tr>
<tr>
<td>74800</td>
<td><code>#%d: QLSetTargetData: No more room in Target Database</code></td>
<td>1072</td>
<td>The driver’s target database is full. Use the CLI or GUI to remove unwanted/unused iSCSI targets.</td>
</tr>
</tbody>
</table>

### Fibre Channel driver

**Table 28 (page 125)** lists error log messages common to both Fibre Channel ports, 1 (FC1) and 2 (FC2). Log messages beginning with #0 apply to Fibre Channel port 1 (FC1), and log messages beginning with #1 apply to Fibre Channel port 2 (FC2).

### Table 28 FC driver—Error log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>106583</td>
<td><code>#%d: QLUtmReceiveIo: Path invalid/FW No resource count %x</code></td>
<td>87</td>
<td>The FC processor received a SCSI command for an unknown target path or has run out of resources to execute additional commands.</td>
</tr>
<tr>
<td>106589</td>
<td><code>#%d: QLIoctlEnable: Adapter disabled</code></td>
<td>93</td>
<td>The FC processor was disabled by an IOCTCL request to the driver.</td>
</tr>
<tr>
<td>106590</td>
<td><code>#%d: QLIoctlEnable: Initialize FW error</code></td>
<td>94</td>
<td>The FC processor firmware failed initialization. The request to initialize was received by the driver in an IOCTCL request.</td>
</tr>
<tr>
<td>106592</td>
<td><code>#%d: QLIoctlRunDiag: Diagnostic loopback command failed %x %x %x %x</code></td>
<td>96</td>
<td>The FC processor failed the external loopback test.</td>
</tr>
<tr>
<td>ID</td>
<td>Log message</td>
<td>No.</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>106593</td>
<td><code>#d: QLIoctlDisable: Re-initialize adapter failed</code></td>
<td>97</td>
<td>The FC processor failed to re-initialize in response to an IOCTL disable request.</td>
</tr>
<tr>
<td>106595</td>
<td><code>#d: QLUtmReceivevelo: Invalid VP Loop Id 0x%x</code></td>
<td>99</td>
<td>Invalid Virtual Port loop ID</td>
</tr>
<tr>
<td>106803</td>
<td><code>#d: QLIsrEventHandler: Link down (%x)</code></td>
<td>307</td>
<td>The FC processor reported a link down condition. Table B-10. Fibre Channel Driver—Error Log Messages (Continued) ID Log Messages No.</td>
</tr>
<tr>
<td>106813</td>
<td><code>#d: QLIsrEventHandler: Unexpected async event (%x), MB1=%x, MB2=%x, MB3=%x, MB4=%x, MB5=%x, MB6=%x, MB7=%x</code></td>
<td>317</td>
<td>The FC processor reported an unexpected asynchronous event. The mailbox registers provide status, event code, and data related to the event.</td>
</tr>
<tr>
<td>106846</td>
<td><code>#d: QLProcessResponseQueueFS: TRB is NULL: %d</code></td>
<td>350</td>
<td>FCIP Response queue entry TRB pointer is NULL</td>
</tr>
<tr>
<td>106851</td>
<td><code>#d: QLTimer: Heartbeat failed</code></td>
<td>355</td>
<td>FC firmware failed to respond to a keep alive command. FC firmware will be restarted.</td>
</tr>
<tr>
<td>106853</td>
<td><code>#d: QLTimer: Link error count (0x%x) exceeded, link down</code></td>
<td>357</td>
<td>The driver has determined that the FC link is unreliable and unusable due to the number of errors encountered. The link has been taken down.</td>
</tr>
<tr>
<td>106912</td>
<td><code>#d: QLReserveLoopId: out of loop Ids</code></td>
<td>416</td>
<td>The 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><code>#d: QLMarkDeviceOffline: Device Id: %x marked offline, cLinkDownTimeout = %x, cPortDownRetryCount=%x</code></td>
<td>432</td>
<td>The 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><code>#d: QLSnsGetAllNext: Name server login FAILED %x</code></td>
<td>452</td>
<td>The FC processor is unable to log into the FC fabric name server.</td>
</tr>
<tr>
<td>107029</td>
<td><code>#d: QLUpdateDeviceData: out of slots in host database</code></td>
<td>533</td>
<td>The driver’s host (initiator) database is full.</td>
</tr>
<tr>
<td>107041</td>
<td><code>#d: QLUpdateDeviceDatabase 0x%x: GET_ID failed %x</code></td>
<td>545</td>
<td>The driver’s target database is full.</td>
</tr>
<tr>
<td>107056</td>
<td><code>#d: QLUpdateDeviceDatabase 0x%x: out of slots in host database</code></td>
<td>560</td>
<td>The driver’s host (initiator) database is full. Maximum host database is 64.</td>
</tr>
<tr>
<td>107058</td>
<td><code>#d: QLUpdateDeviceDatabase 0x%x: MBOX_CMD_GET_VP_DATABASE failed %x</code></td>
<td>562</td>
<td>FC processor “Get VP Database entry command” failed</td>
</tr>
<tr>
<td>107078</td>
<td><code>#d: QLUpdatePort 0x%x: out of slots in host database</code></td>
<td>582</td>
<td>The drivers host (initiator) database is full.</td>
</tr>
<tr>
<td>107254</td>
<td><code>#d: QLUpdatePort 0x%x: out of slots in host database</code></td>
<td>758</td>
<td>No slots available in host database</td>
</tr>
</tbody>
</table>
### Table 28 FC driver—Error log messages (continued)

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>107267</td>
<td>QLFciplsrEventHandler: System error event (%x), MB1=%x, MB2=%x, MB3=%x, MB4=%x, MB5=%x, MB6=%x, MB7=%x</td>
<td>771</td>
<td>FCIP system error event</td>
</tr>
<tr>
<td>107746</td>
<td>QLExecuteMSIOCB: Execute Management Server IOCB fatal error</td>
<td>1250</td>
<td>iSCSI firmware failed to respond to a request of sending a SNS command to the name server</td>
</tr>
</tbody>
</table>

### Error log messages in user modules

Table 29 (page 127) lists error log messages provided by user modules.

### Table 29 User modules—Error log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>139265</td>
<td>QBRPC_Initialize: Entered</td>
<td>1</td>
<td>RPC server initialization entry point.</td>
</tr>
<tr>
<td>139266</td>
<td>QBRPC_Initialize:GetBridge Mem Allocation error</td>
<td>2</td>
<td>Get System API memory allocation failed.</td>
</tr>
<tr>
<td>139268</td>
<td>QBRPC_Initialize:GetMgmt Mem Allocation error</td>
<td>4</td>
<td>Get Management API memory allocation failed.</td>
</tr>
<tr>
<td>139269</td>
<td>QBRPC_Initialize:GetIscsi Mem Allocation error</td>
<td>5</td>
<td>Get iSCSI API memory allocation failed.</td>
</tr>
<tr>
<td>139271</td>
<td>QBRPC_Initialize:GetIsns Mem Allocation error</td>
<td>7</td>
<td>Get iNS API memory allocation failed.</td>
</tr>
<tr>
<td>139272</td>
<td>QBRPC_Initialize:GetFc intf Mem Allocation error</td>
<td>8</td>
<td>Get FC Interface API memory allocation failed.</td>
</tr>
<tr>
<td>139273</td>
<td>QBRPC_Initialize:GetFcAdv Mem Allocation error</td>
<td>9</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139280</td>
<td>QBRPC_Initialize:GetFcSfp Mem Allocation error</td>
<td>16</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139281</td>
<td>QBRPC_Initialize:GetLog Mem Allocation error</td>
<td>17</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139282</td>
<td>QBRPC_Initialize:GetStats Mem Allocation error</td>
<td>18</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139283</td>
<td>QBRPC_Initialize:InitListMem Allocation error</td>
<td>19</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139284</td>
<td>QBRPC_Initialize:TargetList Mem Allocation error</td>
<td>20</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139285</td>
<td>QBRPC_Initialize:LunList Mem Allocation error</td>
<td>21</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139286</td>
<td>QBRPC_Initialize:PresTarget Mem Allocation error</td>
<td>22</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139287</td>
<td>QBRPC_Initialize:LunMask Mem Allocation error</td>
<td>23</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
</tbody>
</table>
### Table 29 User modules—Error log messages (continued)

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>139288</td>
<td>QBRPC.Initialize:Init Mem Allocation error</td>
<td>24</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139296</td>
<td>QBRPC.Initialize:FcTgt Mem Allocation error</td>
<td>32</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139297</td>
<td>QBRPC.Initialize:BridgeStatus Mem Allocation error</td>
<td>33</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139298</td>
<td>QBRPC.Initialize:Diag Mem Allocation error</td>
<td>34</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139299</td>
<td>QBRPC.Initialize:DiagLog Mem Allocation error</td>
<td>35</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139300</td>
<td>QBRPC.Initialize:FruImage Mem Allocation error</td>
<td>36</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139301</td>
<td>QBRPC.Initialize:OemMfg Mem Allocation error</td>
<td>37</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139302</td>
<td>QBRPC.Initialize:Status Mem Allocation error</td>
<td>38</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139303</td>
<td>QBRPC.Initialize:TcplpStats Mem Allocation error</td>
<td>39</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139304</td>
<td>QBRPC.Initialize:NtpStats Mem Allocation error</td>
<td>40</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139305</td>
<td>QBRPC.Initialize:LunList Mem Alloc error</td>
<td>41</td>
<td>Get FC Advanced API memory allocation failed.</td>
</tr>
<tr>
<td>139315</td>
<td>QBRPC_FreeResources:Entered</td>
<td>51</td>
<td>RPC free resources entry point.</td>
</tr>
<tr>
<td>139553</td>
<td>checkDuplicatelp: Detected Error %08x %08x %04x</td>
<td>289</td>
<td>Detected duplicate IP address for management port.</td>
</tr>
</tbody>
</table>

### System

Table 30 (page 128) lists error log messages provided by system modules.

#### Table 30 System—Error log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>237572</td>
<td>Failed to kill sys killer %d\n</td>
<td>4</td>
<td>Failed to kill system task.</td>
</tr>
<tr>
<td>237573</td>
<td>&quot;Temperature over high threshold %d\n&quot;</td>
<td>5</td>
<td>Reporting router exceeds maximum operating temperature.</td>
</tr>
</tbody>
</table>

### Fatal log messages

The following sections describe fatal log messages by reporting module.

#### iSCSI driver

Table 31 (page 129) lists fatal log messages common to both iSCSI ports, 1 (GE1) and 2 (GE2). Log messages beginning with #0 apply to iSCSI port 1 (GE1), and log messages beginning with #1 apply to iSCSI port 2 (GE2).
### Table 31 iSCSI driver—Fatal log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>69652</td>
<td><code>#%d: qlutm_init: Diagnostic failed, invalid SRAM</code></td>
<td>20</td>
<td>iSCSI processor SRAM test failed.</td>
</tr>
<tr>
<td>69653</td>
<td><code>#%d: qlutm_init: Diagnostic failed, fail reboot</code></td>
<td>21</td>
<td>iSCSI processor failed diagnostic reboot.</td>
</tr>
<tr>
<td>69654</td>
<td><code>#%d: qlutm_init: Diagnostic failed, invalid NVRAM</code></td>
<td>22</td>
<td>iSCSI processor failed NVRAM diagnostic.</td>
</tr>
<tr>
<td>69655</td>
<td><code>#%d: qlutm_init: Diagnostic failed, invalid DRAM</code></td>
<td>23</td>
<td>iSCSI processor failed DRAM diagnostic.</td>
</tr>
<tr>
<td>69656</td>
<td><code>#%d: qlutm_init: Failed to return diagnostic result to Bridge</code></td>
<td>24</td>
<td>iSCSI processor failed to return diagnostic results.</td>
</tr>
<tr>
<td>69941</td>
<td><code>#%d: QLUtImProcessResponseQueue: Invalid handle %x EntryType %x</code></td>
<td>309</td>
<td>Response queue entry contains an invalid handle.</td>
</tr>
<tr>
<td>69951</td>
<td><code>#%d: QLSetNvram: QLRebootTimer failed AF %x RS %x Time %d</code></td>
<td>319</td>
<td>Set NVRAM reboot timer failed.</td>
</tr>
<tr>
<td>69964</td>
<td><code>#%d: QLDisable: QLRebootTimer failed AF %x RS %x Time %d</code></td>
<td>332</td>
<td>Port disable reboot timer failed.</td>
</tr>
<tr>
<td>69966</td>
<td><code>#%d: QLEnable: QLRebootTimer failed AF %x RS %x Time %d</code></td>
<td>334</td>
<td>Port enable reboot timer failed.</td>
</tr>
<tr>
<td>70224</td>
<td><code>#%d: QLProcSrblessiSNSResponse: Invalid handle %x</code></td>
<td>592</td>
<td>iSNS response contains an invalid handle.</td>
</tr>
<tr>
<td>70400</td>
<td><code>#%d: QLInitializeDevice: QLStartAdapter failed</code></td>
<td>768</td>
<td>Start iSCSI processor failed.</td>
</tr>
<tr>
<td>70417</td>
<td><code>#%d: QLInitializeAdapter: QLInitializeFW failed</code></td>
<td>785</td>
<td>iSCSI processor firmware initialization failed.</td>
</tr>
<tr>
<td>70432</td>
<td><code>#%d: QLDoInterruptionServiceRoutine: PortFatal interrupt. PortFatalErrorStatus %08x CSR %08x AS %x AF %x Time %d</code></td>
<td>800</td>
<td>iSCSI processor port fatal error.</td>
</tr>
<tr>
<td>70448</td>
<td><code>#%d: QLStartAdapter: QLRebootTimer failed AF %x RS %x Time %d</code></td>
<td>816</td>
<td>Start iSCSI processor reboot timer failed.</td>
</tr>
<tr>
<td>70489</td>
<td><code>#%d: QLr DecodeMailbox: System Error 8002 MB[1-7] %04x %04x %04x %04x %04x %04x</code></td>
<td>857</td>
<td>iSCSI processor fatal system error.</td>
</tr>
<tr>
<td>70499</td>
<td><code>#%d: QLProcessResponseQueue: Invalid handle for ET_PASSTHROUGH_STATUS</code></td>
<td>867</td>
<td>Response queue invalid handle for ET pass-through.</td>
</tr>
<tr>
<td>70501</td>
<td><code>#%d: QLProcessResponseQueue: Invalid entry type in response queue %x</code></td>
<td>869</td>
<td>Response queue invalid entry type.</td>
</tr>
<tr>
<td>70502</td>
<td><code>#%d: QLProcessResponseQueue: Invalid handle %x EntryType %x</code></td>
<td>870</td>
<td>Response queue invalid handle for specified entry type.</td>
</tr>
<tr>
<td>70524</td>
<td><code>#%d: QLProcessAen: Invalid event %x</code></td>
<td>892</td>
<td>Asynchronous event for unknown event type.</td>
</tr>
<tr>
<td>70544</td>
<td><code>#%d: QLResetTimer: Reboot failed!</code></td>
<td>912</td>
<td>Reboot timer failed.</td>
</tr>
<tr>
<td>70563</td>
<td><code>#%d: QLResetTimer: Adapter missed heartbeat for 0x%x seconds. Rebooting</code></td>
<td>931</td>
<td>iSCSI driver missed iSCSI processor heartbeat. iSCSI processor rebooted.</td>
</tr>
<tr>
<td>70564</td>
<td><code>#%d: QLResetTimer: Abort pTpb=%p failed, DrvCount 0x%x</code></td>
<td>932</td>
<td>iSCSI processor failed to complete operation before timeout.</td>
</tr>
<tr>
<td>70609</td>
<td><code>#%d: QLProcessSystemError: Restart RISC</code></td>
<td>977</td>
<td>iSCSI processor system error restart.</td>
</tr>
</tbody>
</table>
### Table 31 iSCSI driver—Fatal log messages (continued)

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>70784</td>
<td><code>#%d: QLConfigChip: invalid NVRAM</code></td>
<td>1152</td>
<td>iSCSI processor NVRAM invalid (checksum error).</td>
</tr>
<tr>
<td>70835</td>
<td><code>#%d: QLStartFw: MBOX_CMD_SET_FLASH failed %x</code></td>
<td>1203</td>
<td>iSCSI FLASH (NVRAM) command failed</td>
</tr>
<tr>
<td>70836</td>
<td><code>#%d: QLStartFw: Invalid Fw loader state 0x%</code></td>
<td>1204</td>
<td>iSCSI firmware loader invalid state</td>
</tr>
<tr>
<td>70837</td>
<td><code>#%d: QLStartFw: Load Fw loader timeout</code></td>
<td>1205</td>
<td>iSCSI failed to load firmware in time allotted</td>
</tr>
</tbody>
</table>

### Fibre Channel driver

Table 32 (page 130) lists fatal log messages common to both Fibre Channel ports, 1 (FC1) and 2 (FC2). Log messages beginning with #0 apply to Fibre Channel port 1 (FC1), and log messages beginning with #1 apply to Fibre Channel port 2 (FC2).

### Table 32 FC driver—Fatal log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>102419</td>
<td><code>#%d: qlutm_init: Diagnostic failed, port 1 invalid SRAM</code></td>
<td>19</td>
<td>FC1 processor SRAM test failed.</td>
</tr>
<tr>
<td>102420</td>
<td><code>#%d: qlutm_init: Diagnostic failed, port 1 POST failed</code></td>
<td>20</td>
<td>FC1 processor POST failed.</td>
</tr>
<tr>
<td>102421</td>
<td><code>#%d: qlutm_init: Diagnostic failed, port 2 invalid SRAM</code></td>
<td>21</td>
<td>FC2 processor SRAM test failed.</td>
</tr>
<tr>
<td>102422</td>
<td><code>#%d: qlutm_init: Diagnostic failed, port 2 POST failed</code></td>
<td>22</td>
<td>FC2 processor POST failed.</td>
</tr>
<tr>
<td>102423</td>
<td><code>#%d: qlutm_init: Failed to return diagnostic result to Bridge</code></td>
<td>23</td>
<td>FC processor failed to return diagnostic results.</td>
</tr>
<tr>
<td>102656</td>
<td><code>#%d: QLInitializeAdapter: Reset ISP failed</code></td>
<td>256</td>
<td>FC processor failed reset.</td>
</tr>
<tr>
<td>102657</td>
<td><code>#%d: QLInitializeAdapter: Load RISC code failed</code></td>
<td>257</td>
<td>FC processor firmware load failed.</td>
</tr>
<tr>
<td>102658</td>
<td><code>#%d: QLInitializeAdapter: Load ISP2322 receive sequencer code failed</code></td>
<td>258</td>
<td>FC processor receive sequencer code load failed.</td>
</tr>
<tr>
<td>102659</td>
<td><code>#%d: QLInitializeAdapter: Load ISP2322 transmit sequencer code failed</code></td>
<td>259</td>
<td>FC processor transmit sequencer code load failed.</td>
</tr>
<tr>
<td>102662</td>
<td><code>#%d: QLInitializeAdapter: Verify Checksum command failed (%x)</code></td>
<td>262</td>
<td>FC processor firmware checksum failed.</td>
</tr>
<tr>
<td>102680</td>
<td><code>#%d: QLInitializeFw: FAILED</code></td>
<td>280</td>
<td>FC processor firmware initialization failed.</td>
</tr>
<tr>
<td>102688</td>
<td><code>#%d: QLInterruptServiceRoutine: Risc pause %x with parity error hccr %, Disable adapter</code></td>
<td>288</td>
<td>FC processor paused due to internal parity error.</td>
</tr>
<tr>
<td>102689</td>
<td><code>#%d: QLInterruptServiceRoutine: Invalid interrupt status: %x</code></td>
<td>289</td>
<td>FC processor returned an invalid interrupt status.</td>
</tr>
<tr>
<td>10691</td>
<td><code>#%d: QLFcipInterruptServiceRoutine: Risc pause %x with parity error hccr %, Disable adapter</code></td>
<td>291</td>
<td>FC processor invalid interrupt status.</td>
</tr>
<tr>
<td>10692</td>
<td><code>#%d: QLFcipInterruptServiceRoutine: Invalid interrupt status: %x</code></td>
<td>292</td>
<td>FC processor paused due to RAM parity error</td>
</tr>
</tbody>
</table>
### Table 32 FC driver—Fatal log messages (continued)

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>102716</td>
<td>#%d: QLlsrEventHandler: System error event (%x), MB1=%x, MB2=%x, MB3=%x, MB4=%x, MB5=%x, MB6=%x, MB7=%x</td>
<td>316</td>
<td>FC processor system error.</td>
</tr>
<tr>
<td>102746</td>
<td>#%d: QLProcessResponseQueue: Invalid handle %x, type %x</td>
<td>346</td>
<td>Response queue entry contains an invalid handle.</td>
</tr>
<tr>
<td>102747</td>
<td>#%d: QLProcessResponseQueueFS: Invalid buffer type: %x</td>
<td>347</td>
<td>FCIP:Response queue entry contains an invalid buffer type</td>
</tr>
<tr>
<td>102748</td>
<td>#%d: QLProcessResponseQueueFS: Invalid EntryType (0x%x)</td>
<td>348</td>
<td>FCIP:Response queue entry contains an invalid entry type</td>
</tr>
<tr>
<td>102749</td>
<td>#%d: QLProcessResponseQueueFS: Invalid handle 0x%x, type 0x%x</td>
<td>349</td>
<td>FCIP:Response queue entry contains an invalid handle</td>
</tr>
<tr>
<td>102752</td>
<td>#%d: QLTimer: Ext Ram parity error exceed limit cnt 0x%x, limit 0x%x, Disabled adapter</td>
<td>352</td>
<td>FC processor external SRAM parity error count exceeded limit; FC port disabled.</td>
</tr>
<tr>
<td>102755</td>
<td>#%d: QLTimer: Heartbeat failed</td>
<td>355</td>
<td>FC processor heartbeat failed.</td>
</tr>
<tr>
<td>102800</td>
<td>#%d: QLRestartRisc: restart RISC</td>
<td>400</td>
<td>FC processor being restarted.</td>
</tr>
</tbody>
</table>

#### TOE driver

Table 33 (page 131) lists fatal log messages provided by the TOE driver.

### Table 33 TOE driver—Fatal log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200721</td>
<td>QL3022:ql3xxx_probe: Adapter eth#%d, Invalid NVRAM parameters</td>
<td>17</td>
<td>Encountered invalid parameters in TOE NVRAM.</td>
</tr>
<tr>
<td>200725</td>
<td>QL3022:eth%x: Resetting chip, PortFatalErrStatus register = 0x%x</td>
<td>21</td>
<td>TOE chip reset due to detection of fatal error.</td>
</tr>
</tbody>
</table>

#### System

Table 34 (page 131) lists fatal log messages provided by system modules.

### Table 34 System—Fatal log messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Log message</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>233473</td>
<td>Memory monitor: Detected Uncorrectable Ecc %08lx system is rebooting in 5 secs\n</td>
<td>1</td>
<td>Uncorrectable memory error detected at address provided in log message.</td>
</tr>
<tr>
<td>233474</td>
<td>Failed to register interrupt handler!\n</td>
<td>2</td>
<td>Attempt to register the interrupt handler failed.</td>
</tr>
<tr>
<td>233475</td>
<td>%s class_simple_create failed!\n</td>
<td>3</td>
<td>Failed class_simple_create system call from memory monitor initialization routine.</td>
</tr>
</tbody>
</table>
C Simple Network Management Protocol

SNMP provides monitoring and trap functions for managing the mpx110 through third-party applications that support SNMP. The mpx110 firmware supports SNMP versions 1 and 2 and an HP MIB (see Management Information Base (MIB) (page 132)). Traps can be formatted using SNMP versions 1 or 2 (see Notifications (page 140)).

**SNMP properties**

The SNMP properties can be set using either the CLI or the GUI. Table 35 (page 132) describes the SNMP properties.

**Table 35 SNMP properties**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read Community</td>
<td>Password that authorizes an SNMP management server to read information from the mpx110. This is a write-only field. The value on the mpx110 and the SNMP management server must be the same. Can be up to 32 characters excluding #, semicolon (;), and comma (,). The default is public.</td>
</tr>
<tr>
<td>Trap Community</td>
<td>Trap community password that authorizes an SNMP management server to receive traps. This is a write-only field. The value on the mpx110 and the SNMP management server must be the same. The trap community password can be up to 32 characters excluding #, semicolon (;), and comma (,). The default is public.</td>
</tr>
<tr>
<td>System Location</td>
<td>Specifies the name of the mpx110 location. The name can be up to 64 characters excluding #, 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 #, 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**

SNMP trap configuration supports the setting of up to eight trap destinations. Choose from trap 1 to trap 8 to configure each trap. Table 36 (page 132) describes the parameters for configuring an SNMP trap.

**Table 36 SNMP 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 Address¹</td>
<td>Specifies the IP address to which the SNMP traps are sent. A maximum of 8 trap addresses are supported. The default address for traps is 0.0.0.0.</td>
</tr>
<tr>
<td>Trap Port¹</td>
<td>The port number on which the trap is sent. The default is 162.</td>
</tr>
<tr>
<td>Trap Version</td>
<td>Specifies the SNMP version (1 or 2) with which to format traps.</td>
</tr>
</tbody>
</table>

¹ 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, 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**

The following sections describe the MIB.
System information

The system information objects of the MIB provide the system serial number, version numbers (hardware, software, and agent), and number of ports (FC/GE).

qsrSerialNumber

Syntax: SnmpAdminString
Access: read-only
Description: The system serial number

qsrHwVersion

Syntax: SnmpAdminString
Access: read-only
Description: The system hardware version number

qsrSwVersion

Syntax: SnmpAdminString
Access: read-only
Description: The system software (firmware) version number

qsrNoOfFcPorts

Syntax: Unsigned32
Access: read-only
Description: The number of Fibre Channel ports on the system

qsrNoOfGbEPorts

Syntax: Unsigned32
Access: read-only
Description: The number of GbE ports on the system

qsrAgentVersion

Syntax: SnmpAdminString
Access: read-only
Description: The version number of the agent software on the system

Network port table

The network port table is a list of network ports that are operational on the mpx110. Note that a single GbE port can function as an iSCSI port and a TOE simultaneously; therefore, there may be up to two entries for a given GbE port.

qsrNwPorttable

Syntax: QsrNwPortEntry
Access: not-accessible
Description: The entries in this table include the management port and the iSCSI and TOE ports on the mpx110.
qsrNwPortEntry

Syntax: QsrNwPortEntry
Access: not-accessible
Description: Each entry (row) contains information about a specific network port.

QsrNwPortEntry

A network port entry consists of the following sequence of objects:

- qsrNwPortRole
- qsrNwPortIndex
- qsrNwPortAddressMode
- qsrIPAddressType
- qsrIPAddress
- qsrNetMask
- qsrGateway
- qsrMacAddress
- qsrNwLinkStatus
- qsrNwLinkRate

qsrNwPortRole

Syntax: QsrPortRole
Access: not-accessible
Description: The operational role of this port, such as a management port, an iSCSI port, or a TOE; a positive integer indexing each network port in a given role.

qsrNwPortIndex

Syntax: Unsigned32
Access: not-accessible
Description: A positive integer indexing each network port in a given role

qsrNwPortAddressMode

Syntax: INTEGER 1 - Static 2 - DHCP 3 - Bootp 4 - RARP
Access: read-only
Description: The method the port uses to obtain its IP address

qsrIPAddressType

Syntax: InetAddressType
Access: read-only
Description: The type of IP address, such as IPv4 or IPv6
qsrIPAddress

Syntax: InetAddress
Access: read-only
Description: The IP address of the port

qsrNetMask

Syntax: InetAddress
Access: read-only
Description: The subnet mask of the port

qsrGateway

Syntax: InetAddress
Access: read-only
Description: The gateway for this port

qsrMacAddress

Syntax: IMacAddress
Access: read-only
Description: The MAC address for this port

qstNwLinkStatus

Syntax: QsrLinkStatus
Access: read-only
Description: The operational link for this port

qsrNwLinkRate

Syntax: QsrLinkRate
Access: read-only
Description: The operational speed for this port

Fibre Channel port table

The Fibre Channel port table is a list of the FC ports on the mpx110.

qsrFcPortTable

Syntax: QsrFcPortEntry
Access: not-accessible
Description: A list of the FC ports on the mpx110. There are as many entries in this table as there are FC ports on the mpx110.
<table>
<thead>
<tr>
<th><strong>Syntax</strong></th>
<th>QsrFcPortEntry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access</strong></td>
<td>not-accessible</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Each entry (row) contains information about a specific FC port.</td>
</tr>
</tbody>
</table>
QsrFcPortEntry

A Fibre Channel 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

Syntax: QsrPortRole
Access: not-accessible
Description: The operational role of this port (that is, in FCP mode or in frame shuttle mode)

qsrFcPortIndex

Syntax: Unsigned32
Access: not-accessible
Description: A positive integer indexing each FC port in a given role

qsrFcPortNodeWwn

Syntax: PhysAddress
Access: read-only
Description: The WWN of the node that contains this port

qsrFcPortWwn

Syntax: PhysAddress
Access: read-only
Description: The WWN for this port

qsrFcPortId

Syntax: PhysAddress
Access: read-only
Description: The interface’s 24-bit Fibre Channel address identifier

qsrFcPortType

Syntax: Unsigned32
Access: read-only
Description: The type of a Fibre Channel port, as indicated by the use of the appropriate value assigned by IANA. The IANA-maintained registry for Fibre Channel port types is available at [http://www.iana.org/assignments/fcport-types](http://www.iana.org/assignments/fcport-types).
**qsrFcLinkStatus**

**Syntax**
QsrLinkStatus

**Access**
read-only

**Description**
The current link status for this port

**qsrFcLinkRate**

**Syntax**
QsrLinkRate

**Access**
read-only

**Description**
The current link rate for this port

**Sensor table**
A list of all sensors on the mpx110.

**qsrSensorTable**

**Syntax**
QsrSensorEntry

**Access**
not-accessible

**Description**
A list of all sensors on the mpx110. There are as many entries (rows) in this table as there are sensors.

**qsrSensorEntry**

**Syntax**
QsrSensorEntry

**Access**
not-accessible

**Description**
Each entry (row) corresponds to a single sensor.
**QsrSensorEntry**

A sensor entry consists of the following sequence of objects:

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Syntax Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>qsrSensorType</td>
<td>INTEGER</td>
<td>The type of data being measured by this sensor</td>
</tr>
<tr>
<td>qsrSensorIndex</td>
<td>Unsigned32</td>
<td>A positive integer identifying each sensor of a given type</td>
</tr>
<tr>
<td>qsrSensorUnits</td>
<td>INTEGER</td>
<td>The unit of measurement for the sensor</td>
</tr>
<tr>
<td>qsrSensorValue</td>
<td>Integer32</td>
<td>The current value of the sensor</td>
</tr>
<tr>
<td>qsrUpperThreshold</td>
<td>Integer32</td>
<td>The upper-level threshold for this sensor</td>
</tr>
<tr>
<td>qsrLowerThreshold</td>
<td>Integer32</td>
<td>The lower-level threshold for this sensor</td>
</tr>
<tr>
<td>qsrSensorState</td>
<td>INTEGER</td>
<td>Not-accessible</td>
</tr>
</tbody>
</table>
qsrSensorState

Syntax: INTEGER
Access: read-only
Description: The state of this sensor, indicating the health of the system.
- unknown — The sensor value/threshold(s) 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 exceeded a threshold.

Notifications
The mpx110 has six notification types. The following sections describe these notifications and the objects they use.

Notification objects
This section defines the objects used in notifications.

qsrEventSeverity

Syntax: INTEGER
Access: accessible-for-notify
Description: Indicates the severity of the event. The value clear specifies that a condition that caused an earlier trap is no longer present.

qsrEventDescription

Syntax: SnmpAdminString
Access: accessible-for-notify
Description: A textual description of the event that occurred

qsrEventTimeStamp

Syntax: DateAndTime
Access: accessible-for-notify
Description: Indicates when the event occurred

Agent startup notification
The agent startup notification indicates that the agent on the mpx110 has started running. The command is qsrAgentStartup, and uses the object qsrEventTimeStamp.

Agent shutdown notification
The agent shutdown notification indicates that the agent on the mpx110 is shutting down. The command is qsrAgentShutdown, and uses the object qsrEventTimeStamp.

Network port-down notification
The network port-down notification (qsrNwPortDown) indicates that the specified network port is down. If the port comes up, this event is sent with the qsrEventSeverity object set to clear.
qsrNwPortDown uses the following objects:

- qsrNwLinkStatus
- qsrEventTimeStamp
- qsrEventSeverity

**Fibre Channel port-down notification**

The Fibre Channel port-down notification indicates that the specified Fibre Channel port is down. If the port comes up, this event is sent with the qsrEventSeverity object set to clear.

qsrFcPortDown uses the following objects:

- qsrFcLinkStatus
- qsrEventTimeStamp
- qsrEventSeverity
Sensor notification

The sensor notification (qsrSensorNotification) indicates that the state of the specified sensor is not normal. Once the sensor returns to normal, this event is sent with the qsrEventSeverity object set to clear.

qsrSensorNotification uses the following objects:

- qsrSensorValue
- qsrSensorState
- qsrEventTimeStamp
- qsrEventSeverity

Generic notification

The generic notification (qsrGenericEvent) is used to report events other than the defined event types. It provides a description object that identifies the event.

qsrGenericEvent uses the following objects:

- qsrEventTimeStamp
- qsrEventSeverity
- qsrEventDescription
D Saving and restoring the mpx110 configuration

This appendix describes how to save and restore mpx110 configuration information. The mpx110 configuration information is saved as a .bin or .tgz file, depending on the save method used to restore the mpx110 persistent data. The mpx110 configuration information is saved and restored using the mpx110 manager GUI or mpx110 CLI commands.

NOTE: As with any important database, the mpx110 persistent data should be saved periodically to avoid data loss from hardware or software errors. It is also important to save the configuration information before replacing the mpx110.

Saving the mpx110 configuration

Using the mpx110 GUI to save configuration information allows you to save the file to any location available to the server running the GUI.

Using the mpx110 CLI command to save the configuration information places the file in the mpx110’s FTP directory. You must then move the file using FTP from the mpx110.

Saving the configuration using the mpx110 GUI

To save the configuration using the mpx110 GUI:

1. Select **File > Save FRU**.
   The Save FRU dialog box appears.
2. Click **Save**.
3. Enter a file name and select a location to save to.
   
   **NOTE:** Do not change the Files of Type value.
4. Enter the password config, and then click **OK**.
   The configuration is saved to the selected location.

Saving the configuration using the mpx110 CLI

To save the configuration using the mpx110 CLI:

1. Log in to the mpx110 using a Telnet session to the management port or the console port.
   Username: guest
   Password: password
2. Enter the following command:
   mpx110> admin start
3. Enter config as the password.
4. Enter the following command:
   mpx110 (admin) #> fru save
   FRU save completed. Configuration File is HP_StorageWorks_mpx110_FRU.bin. Please use FTP to extract the file out from the System.
   
   **NOTE:** The FRU creates a .bin file containing the mpx110’s persistent data, configuration, and LUN mappings. The file is stored in the mpx110’s /var/ftp directory. You must then FTP the .tar file from the mpx110.
5. Establish an FTP connection to the mpx110 management port and login:
   Username: ftp
   Password: ftp
6. Enter the following command to set the FTP transfer type to binary:
   
   `ftp> bin`

7. Enter the following command to retrieve the HP_StorageWorks_mpx110_FRU.bin file:
   
   `ftp> get HP_StorageWorks_mpx110_FRU.bin`

---

**Restoring the mpx110 configuration**

Use the Full Configuration Restore option to fully restore the mpx110 configuration. The restored configuration takes effect after the mpx110 is rebooted.

**NOTE:** Always use the Full Configuration Restore option with the mpx110.

---

**Restoring the configuration using the mpx110 GUI**

To restore the configuration using the mpx110 GUI:

1. Select **File > Restore FRU**.
   
   The Restore FRU dialog box appears.

2. Click **Browse** and select the appropriate file name to restore.

3. Select **Full Configuration Restore** or **Partial Restore (Mappings)**.

4. Click **Start**.
   
   The Security Check dialog box appears.

5. Enter the password `config`, and then click **OK**.

6. Reboot the system for the configuration to take effect.

---

**Restoring the configuration using the mpx110 CLI**

To restore the configuration using the mpx110 CLI:

1. Establish an FTP connection to the mpx110 management port and login:
   
   Username: `ftp`
   
   Password: `ftp`

2. Enter the following command to set the FTP transfer type to binary:
   
   `ftp> bin`

3. Enter the following command to move the HP_StorageWorks_mpx110_FRU.bin file onto the FTP:
   
   `ftp> put HP_StorageWorks_mpx110_FRU.bin`

4. Log in to the mpx110 using a Telnet session to the management port or console port:
   
   Username: `guest`
   
   Password: `password`

5. Enter the following command:
   
   `mpx110> admin start`

6. Enter `config` as the password.

7. Enter the following command:
   
   `mpx110 (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.

8. Reboot the system for the configuration to take effect.
E Regulatory compliance and safety

This appendix contains regulatory compliance and safety information for the mpx110.

Regulatory compliance

Federal Communications Commission notice for 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 instruction manual, 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 his own expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user’s authority to operate the equipment.

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 your product, visit http://www.hp.com/

For questions regarding this FCC declaration, contact us by mail or telephone:

- Hewlett-Packard Company
  P.O. Box 692000, Mailstop 510101
  Houston, TX 77269–2000
- 1–281–514–3333

To identify this product, refer to the part, Regulatory Model Number, or product number found on the product.

Modifications

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

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.

Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, your product has been assigned a unique Regulatory Model Number. The RMN 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 RMN. The Regulatory Model Number should not be confused with the marketing name or model number of the product.

Laser device

All HP systems equipped with a laser device comply with safety standards, including IEC 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous light.
Laser safety warning

⚠️ WARNING! To reduce the risk of exposure to hazardous radiation:
- Do not try to open the laser device 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 laser device.

Laser product label

The optional label in Figure 58 (page 146) or equivalent may be located on the surface of the HP supplied laser device.

**Figure 58 Class 1 laser product label**

[CLASS 1 LASER PRODUCT]

This optional label indicates that the product is classified as a CLASS 1 LASER PRODUCT. This label may appear on the laser device installed in your product.

International notices and statements

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 classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union notice

Products bearing the CE Marking comply with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community and if this product has telecommunication functionality, the R&TTE Directive (1995/5/EC).

Compliance with these directives implies conformity to the following European Norms (the equivalent international standards and regulations are in parentheses):
- EN55022 (CISPR 22) – Electromagnetic Interference
- EN55024 (IEC61000-4-2, IEC61000-4-3, IEC61000-4-4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11) – Electromagnetic Immunity
- EN61000-3-2 (IEC61000-3-2)—Power Line Harmonics
- EN61000-3-3 (IEC61000-3-3)—Power Line Flicker
- EN60950 (IEC60950)—Product Safety
- Also approved under UL 60950/CSA C22.2 No. 60950–00, Safety of Information Technology Equipment.
Battery replacement notice

Your switch is equipped with a lithium manganese dioxide, a vanadium pentoxide, or an alkaline internal battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Replacement is to be done by an HP authorized...
service provider using the HP spare part designated for this product. For more information about battery replacement or proper disposal, contact an HP authorized service provider.

⚠️ **WARNING!** Your switch contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. There is risk of fire and burns if the battery pack is not properly handled. To reduce the risk of personal injury:
- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 60°C.
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace only with the HP spare part designated for this product.

Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. To forward them to recycling or proper disposal, please use the public collection system or return them to HP, an authorized HP Partner, or their agents.

For more information about battery replacement or proper disposal, contact an HP authorized reseller or service provider.

**Taiwan battery recycling notice**

The Taiwan EPA requires dry battery manufacturing or importing firms in accordance with Article 15 of the Waste Disposal Act to indicate the recovery marks on the batteries used in sales, giveaway, or promotion. Contact a qualified Taiwanese recycler for proper battery disposal.

**Power cords**

The power cord set must meet the requirements for use in the country where the product was purchased. If the product is to be used in another country, purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the diameter of the wire must be a minimum of 1.00 mm² or 18 AWG, and the length of the cord must be between 1.8 m (6 ft) and 3.6 m (12 ft). If you have questions about the type of power cord to use, contact an HP authorized service provider.

**NOTE:** Route power cords so that they will not be walked on and cannot be pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cords exit from the product.

**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。
<table>
<thead>
<tr>
<th>Glossary</th>
<th>Description</th>
</tr>
</thead>
</table>
| **C**      | CHAP  | Challenge Handshake Authentication Protocol  
|            |      | An authentication technique for confirming the identity of one computer to another.               |
|            | CmdSN | Command sequence number                                                                       |
| **F**      | Fabric Connect                               | Connecting a server or mpx 110 Fibre Channel port to a Fibre Channel switch to access the EVA or XP Fibre Channel ports. |
|            | FC    | Fibre Channel technology  See also Fibre Channel.                                               |
|            | FCIP  | Fibre Channel over Internet Protocol                                                            |
| **G**      | GbE   | Gigabit Ethernet  
|            |      | Packet-based signaling technology that transmits data at throughput speeds of up to 1,000 Mb/s or 1 Gb/s. |
| **H**      | high availability                           | Refers to the availability of resources in a computer system if there are component failures in the system. |
| **I**      | IEC   | International Electrotechnical Commission                                                           |
|            | initiator | A device that begins an iSCSI transaction by issuing a command to another device (the iSCSI target), giving it a task to perform. |
|            | IP    | Internet Protocol  
|            |      | The standard Internet protocol for moving packets of information from one computer to another. Commonly combined with TCP in the phrase TCP/IP. |
|            | IP SAN | A SAN created using the iSCSI protocol to connect servers and storage over a GbE network  
|            |      | See also iSCSI.                                                                                 |
|            | iSCSI | Internet SCSI  
|            |      | An IP-based standard for linking data storage devices over a network and transferring data by carrying SCSI commands over IP networks. |
|            | iSCSI CRC | iSCSI cyclic redundancy check  
|            |      | A shortened cyclic code check used for error detection.                                         |
|            | iSNS  | Internet Storage Name Service  
|            |      | A protocol designed to facilitate the automated discovery, management, and configuration of iSCSI and Fibre Channel devices on a TCP/IP network. |
| **L**      | LIP   | Fibre Channel loop initialization procedure                                                      |
M

MAC  Media access address
MIB  Management information base
mpx110  Serves as the FCIP data transport that transfers data to and from the local and remote storage systems.
MTU  Maximum transmission unit
MWS  Minimum window size

N

NTP  Network Time Protocol

P

PDU  Power distribution unit
POST  Power-on self-test

Q

QoS  Quality of service. A traffic management feature.

R

RCS  Remote copy set
RPC  Remote procedure call
RTT  Round-trip time

S

SAN  Storage area network. An intelligent infrastructure that connects heterogeneous servers with shared, heterogeneous storage systems.
SCSI  small computer system interface
   A parallel interface standard used to attach peripheral devices to computers.
switch  An IP network communications device that routes packets (messages or fragments of messages) between nodes across virtual circuits.

T

target  An iSCSI device that executes a command from an iSCSI initiator to perform some task.
TCP  Transmission Control Protocol
teaming  The concept of multiple network adapters working together as a single network adapter. See also virtual network adapter.
TOE  TCP Offload Engine
   Hardware that replaces a NIC and shifts TCP packet processing tasks from the server CPU to specialized TCP processors on the network adapter or storage device.

V

virtual network adapter  Multiple network adapters working together as a single network adapter; also referred to as teaming.
VLAN  virtual local area network
   A network of computers that behave as if they are connected to the same wire, even though they may be physically located on different segments of a LAN.
VP  Virtual port
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