

hp StorageWorks

SNMP reference guide for directors and edge switches

Part Number: AA-RQ7BC-TE

Third Edition (January 2003)

This guide introduces simple network management protocol (SNMP) and the associated commands to manage a network. It also explains SNMP management support for HP StorageWorks Directors, Edge Switches, and HA-Fabric Manager (HAFM) server.



i n v e n t

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Printed in the U.S.A.

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About This Guide

This reference guide provides information to use simple network management protocol (SNMP) for the following Hewlett-Packard (HP) products:

- HP StorageWorks Director 2/64
- HP StorageWorks Director 2/140
- HP StorageWorks Edge Switch 2/16
- HP StorageWorks Edge Switch 2/24
- HP StorageWorks Edge Switch 2/32
- HA-Fabric Manager (HAFM) application

Intended Audience

This publication is intended for operators, data center administrators, and customer support personnel who configure, operate, and maintain Hewlett-Packard HA-Fabric Directors and Edge Switches using SNMP commands.

Related Documentation

For a list of corresponding documentation, see the Related Documents section of the Release Notes that came with this product.

For the latest information, documentation, and firmware releases, please visit the HP StorageWorks website:

<http://h18006.www1.hp.com/storage/saninfrastructure.html>

For information about Fibre Channel standards, visit the Fibre Channel Industry Association website, located at <http://www.fibrechannel.org>.

Document Conventions

The conventions included in [Table 1](#) apply.

Table 1: Document Conventions

Element	Convention
Cross-reference links	Blue text: Figure 1
Key names, menu items, buttons, and dialog box titles	Bold
File names, application names, and text emphasis	<i>Italics</i>
User input, command names, system responses (output and messages)	Monospace font COMMAND NAMES are uppercase unless they are case sensitive
Variables	<i>Monospace, italic font</i>
Website addresses	Sans serif font (http://thenew.hp.com)

Symbols in Text

These symbols may be found in the text of this guide. They have the following meanings.



WARNING: Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or loss of life.



CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT: Text set off in this manner presents clarifying information or specific instructions.

NOTE: Text set off in this manner presents commentary, sidelights, or interesting points of information.

Symbols on Equipment



Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

WARNING: To reduce the risk of injury from electrical shock hazards, do not open this enclosure.



Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

WARNING: To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.



Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.



Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

WARNING: To reduce the risk of injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.



Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

WARNING: To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

Rack Stability



WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
 - The full weight of the rack rests on the leveling jacks.
 - In single rack installations, the stabilizing feet are attached to the rack.
 - In multiple rack installations, the racks are coupled.
 - Only one rack component is extended at any time. A rack may become unstable if more than one rack component is extended for any reason.
-

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

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The HP website has the latest information on this product, as well as the latest drivers. Access storage at: <http://thenew.hp.com/country/us/eng/prodserv/storage.html>. From this website, select the appropriate product or solution.

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- In the United States, call 1-800-345-1518
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- Elsewhere, see the HP website for locations and telephone numbers: <http://thenew.hp.com>.

Introduction to SNMP

Network management is a broad term, including workstation configuration, assignment of IP addresses, network design, architecture, network security, and topologies. All this can fall within the scope of a network manager.

Any protocol for managing networks must allow virtually all network devices and systems to communicate statistics and status information to network management stations (network managers). This communication must be independent of the primary network transmission medium and impose little effect on the efficiency of the network. Network managers must be able to obtain status information from managed devices, and make changes in the way the managed devices handle network traffic. Network managers must be able to do this without knowing anything about the managed device itself, SNMP management is one way of meeting these requirements.

SNMP Management

Simple network management protocol (SNMP) is a mechanism for network management that is complete, but simple. It is designed on the manager/agent paradigm, with the agent residing in the managed device. Information is exchanged between agents (devices on the network being managed) and managers (devices on the network through which management is done).

There are many possible transactions between agents and managers. These transactions vary widely with the different types of devices that can be managed. With so many varied requirements for reporting and management, the list of commands a manager must be able to issue is overwhelming, and every new manageable device can increase the list. SNMP was created to allow all these things to be easily done on any growing network.

SNMP operates on a simple fetch/store concept. With SNMP the available transactions between manager and agent are limited to a handful. The manager can request information from the agent or modify variables on the agent. The agent can respond to a request by sending information, or if enabled to do so, voluntarily notify the manager of a change of status on the agent (issue a trap).

With SNMP, administrators can manage director and switch configurations, faults, performance, accounting, and security from remote SNMP management stations.

SNMP Simplified

SNMP is the only protocol that is widely available from many vendors of Transmission Control protocol/Internet protocol (TCP/IP) networks and internetworks. SNMP:

- Allows management with a simple set of commands.
- Allows new devices added to a network to be easily managed with minimal intervention.
- Is adequate for many basic network management needs.
- Is generalized for application to networks other than TCP/IP, such as IPX and OSI.
- Provides a great deal of versatility for managing a great many types of devices.
- Allows all networks to employ the same method for management.

SNMP Commands

A manager requests information from an agent by sending a single command, the `Get` command. The `Get` command also has a variation (`GetNextRequest`) that permits more efficient operation:

- `GetRequest` – Requests the value of a specified variable on the agent. This command is used to retrieve management data.
- `GetNextRequest` – Requests the value of the next variable after the one specified in the command. This command is used to retrieve lists and tables of management data.

An agent responds to a request by sending a single command, the `GetResponse` command. This command contains the requested information.

A manager changes information (variables) in the agent by sending a single command, the `SetRequest` command. This command is used to manipulate management data.

A trap is used by an agent to report extraordinary events. Refer to [Traps and Their Purpose on page 1-5](#).

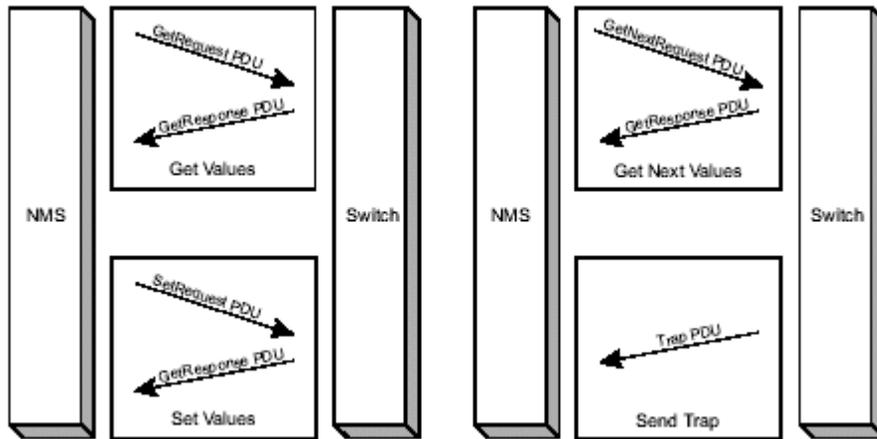


Figure 1–1: SNMP commands and responses

Why Variables Exist In a Managed Device

Variables are the means by which a director or switch (and other devices) keep track of their performance, control their own performance, and provide access to their performance for network managers. A simple example of a variable’s use is to set a port offline and turn the port back on. Some variables just hold values that indicate status (for example error counts). SNMP allows the network managers to have access to some of the same variables for network management.

For purposes of the following explanation, an object is a data variable that represents an attribute of a managed device.

How SNMP Changes Variables (Objects) in a Managed Device

An agent is the entity that interfaces to the actual object being managed ([Figure 1–2 on page 1-4](#)). The agent understands the language of SNMP and translates between the manager and the object. Objects may be retrieved and/or modified by the manager, and it is the agent’s job to return the requested object’s value. Within the agent is at least one, maybe several, collections of definitions called Management Information Bases (MIBs). When an agent supports a standard MIB, it agrees to provide and make available the variables listed in the MIB.

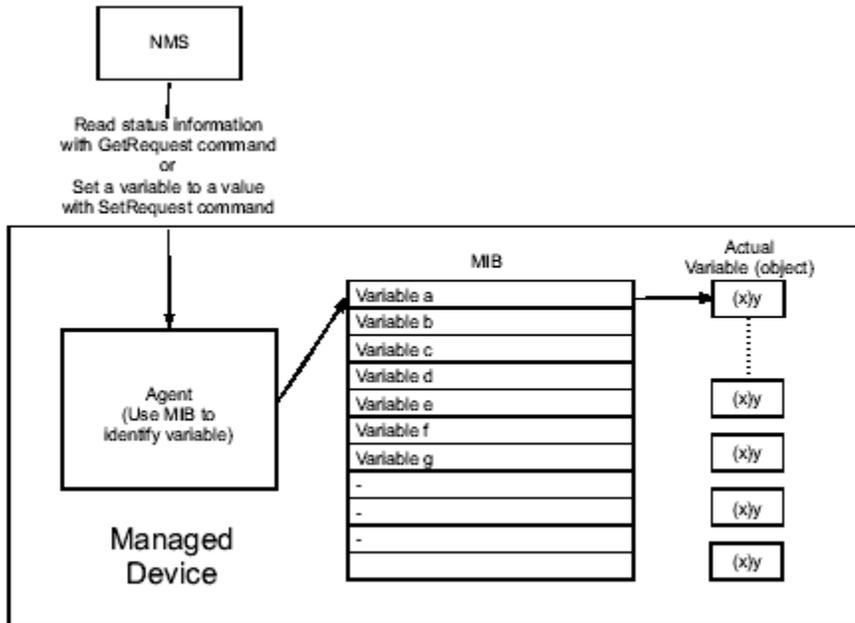


Figure 1–2: Retrieving or setting values using MIBs

Standard MIBs

Standard MIBs are those available with SNMP and designed for standard operation with a wide variety of managed devices. Chapter 2 describes the standard MIBs used by the HP StorageWorks Director 2/64, HP StorageWorks Director 2/140, HP StorageWorks Edge Switch 2/16, HP StorageWorks Edge Switch 2/24, HP StorageWorks Edge Switch 2/32, and HA-Fabric Manager (HAFM) application.

Standard MIBs are:

- MIB-II (Internet MIB) as described in RFC 1157: supported by the Director 2/64, Director 2/140, Edge Switch 2/16, Edge Switch 2/24 and Edge Switch 2/32
- Fibre Alliance (FCMGMT) MIB, version 3.1: supported by the Director 2/64, Director 2/140, Edge Switch 2/16, Edge Switch 2/24 and Edge Switch 2/32
- Fibre Channel Fabric Element (FCFE), version 1.10: supported by the Director 2/64, Director 2/140, Edge Switch 2/16, Edge Switch 2/24 and Edge Switch 2/32, and HAFM server

Private Enterprise MIBs

Private MIBs are those provided by the manufacturer of the managed devices to allow management of device-specific items. Chapter 2 describes the private MIBs in more detail.

The private enterprise MIB is the FCEOS MIB, which is used by the Director 2/64, Director 2/140, Edge Switch 2/16, Edge Switch 2/24 and Edge Switch 2/32 to support zoning, port binding, and threshold alerts.

Traps and Their Purpose

Traps are unsolicited status reports, or status change indicators a managed object sends to a network manager. The destination address for traps is a configuration item for each managed agent.

SNMP Support

This chapter explains how the Hewlett-Packard (HP) StorageWorks Director 2/64, Director 2/140, Edge Switch 2/16, Edge Switch 2/24, Edge Switch 2/32, and HA-Fabric Manager (HAFM) server support simple network management protocol (SNMP).

SNMP Management

SNMP is a transmission control protocol/internet protocol (TCP/IP) that uses the user datagram protocol (UDP) or other protocols such as UDP/IP to exchange messages between an SNMP agent (in a managed device) and a management station residing on a network. Since SNMP does not rely on the underlying communication protocols, it can be made available over other protocols.

A MIB is a hierarchical tree of groups and variables. Operators at a network management station enter a command with supported groups and variables from the MIB. Each group is a “branch” and each variable is a “leaf” within the MIB tree. The tree begins with the “root”. The MIB for the Director and Edge Switch is under the *iso* branch (refer to [Figure 2–3 on page 2-2](#)). To get to the Director and Edge Switch MIB variables, you must go through the *org*, *dod*, and *internet* sub-branches.

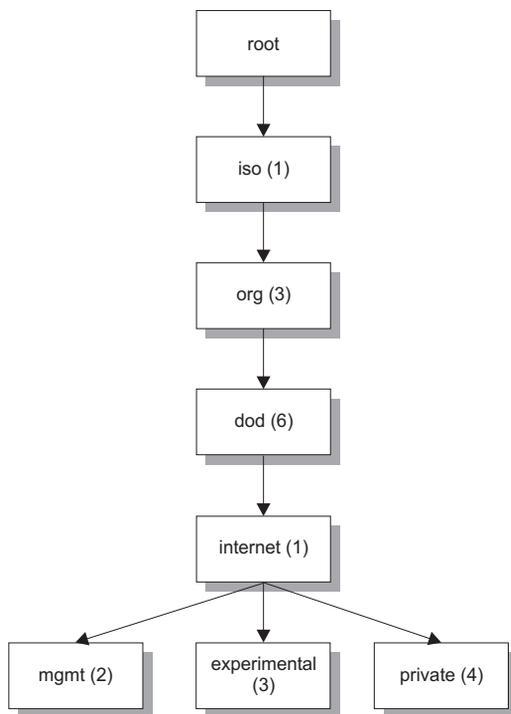


Figure 2-3: MIB tree Director

NOTE: Variables are also known as “objects.”

The Edge Switch-supported groups under *internet* are *mgmt*, *experimental*, and *private* (refer to [Figure 2-4 on page 2-3](#)). For *mgmt*, see [MIB-II Support on page 2-5](#); for *experimental* refer to [Fibre Channel Fabric Element MIB Support on page 2-90](#); and for *private*, refer to the [FCEOS Private MIB on page 2-103](#).

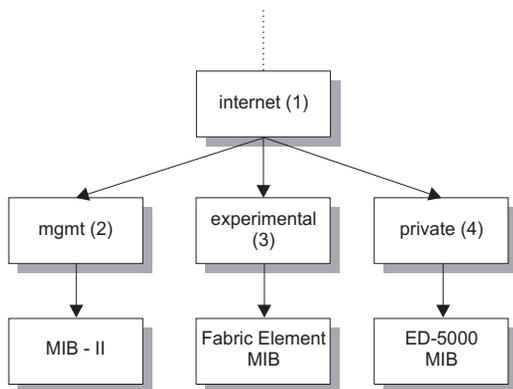


Figure 2–4: MIB Tree, experimental and private

Use the following SNMP commands with the MIB variables:

- `get`
Retrieves the value of variables at the agent.
- `set`
Sets the value of variables at the agent.
- `trap`
Notifies the management station of significant events.

Each group and variable in a MIB is assigned a object identifier. You can enter commands with variables specified as a name or a number. For example:

```
get {root, iso, org, dod, internet, mgmt, mib-2, system}
```

or

```
get {root, 1, 3, 6, 1, 2, 1, 1}
```

SNMP Support

The Director and Edge Switch-resident SNMP agents:

- Support SNMPv1 manager
- Enable access to variables in the standard MIB-II definition, the Fibre Channel Fabric Element MIB, and Director or Edge Switch Private MIB. All groups and variables in the supported MIBs are read only by SNMP management stations unless noted otherwise.
- Enable the Director or Edge Switch to send unsolicited trap messages to the network management station when specific events occur. The traps supported are:
 - Standard generic traps
 - Director and Edge Switch enterprise-specific traps

Configuration of the SNMP agent is accomplished through the Embedded Web Server (EWS) interface, command line interface (CLI), or Product Manager application.

Table 2–1: MIB Support

MIBs Supported		
MIB	EOS	HAFM
FCEOS	Yes	No
FCMGMT	Yes	Yes
FE	Yes	No
SNMP Framework	Yes	No
MIB-II	Yes	Supports only sysDescr, sysObjectID and sysUptime

SNMPv1 Transports

The Director or Edge Switch SNMP agent supports UDP/IP through the Product Manager application.

Agent Configuration

Refer to the following user guides to configure the appropriate parameters for the specific managed products.

- *hp StorageWorks ha-fabric manager user guide*
- *hp StorageWorks director 2/140 product manager user guide*
- *hp StorageWorks director 2/64 product manager user guide*
- *hp StorageWorks edge switch 2/32 product manager user guide*
- *hp StorageWorks edge switch 2/24 product manager user guide*
- *hp StorageWorks edge switch 2/16 product manager user guide*

MIB-II Support

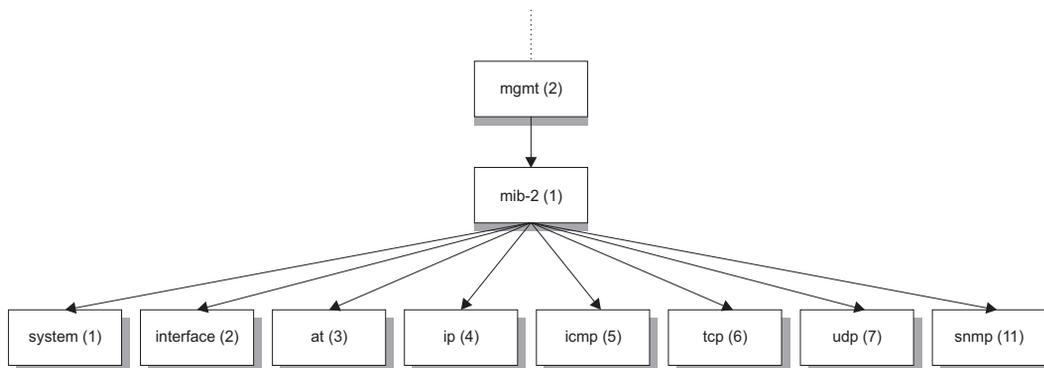


Figure 2–5: SNMP MIB-II support

The Director or Edge Switch agent supports eight groups specified in MIB-II:

- System group

The variable ID is:

{iso, org, dod, internet, mgmt, mib-2, system}

- Interface group

The interface group supports three interfaces: software loopback driver, Ethernet driver, and Fibre Channel IP driver.

The variable ID is:

{iso, org, dod, internet, mgmt, mib-2, interface}
{1,3,6,1,2,1,1}

- Address translation group

The variable ID is:

{iso, org, dod, internet, mgmt, mib-2, at}

- IP group

The variable ID is:

{iso, org, dod, internet, mgmt, mib-2, ip}

- ICMP group

The variable ID is:

{iso, org, dod, internet, mgmt, mib-2, icmp}

- TCP group

The variable ID is:

{iso, org, dod, internet, mgmt, mib-2, tcp}

- UDP group

The variable ID is:

{iso, org, dod, internet, mgmt, mib-2, udp}

- SNMP group

The variable ID is:

{iso, org, dod, internet, mgmt, mib-2, SNMP}

Fibre Channel Management MIB (version 3.1)

There are six groups of objects defined in the Fibre Channel Management (FCMGMT) MIB:

- Connectivity Unit Group
- Firmware Revisions
- Sensor Table
- Port Table
- Event Table
- Link Table
- Port Statistics
- SNS (nameserver) Table
- SNMP Trap Registration Group
- Trap Registration Table
- Fibre Channel Management Traps

A single scalar object, revisionNumber, is defined under the FCMGMT MIB base.

Table 2–2: Scalar FCMGMT Objects

Object	Provides
revisionNumber	A constant Display String value representing the revision number of the FCMGMT MIB that is supported by the HAFM server SNMP agent is returned.

HAFM Server Agent MIB Objects

The following sections define the FCMGMT MIB objects and how they are implemented in the HAFM server SNMP agent. Unless otherwise noted, all MIB objects are Read-only.

Connectivity Unit Group Objects

The Connectivity Unit Group contains information about the Director or Edge Switch that are configured in the HAFM server. The group contains five simple objects and four tables; Connectivity Unit, Firmware, Port, Sensor, and Event.

Table 2–3: Connectivity Group Table (HAFM Server)

Object Type Name	Type	Product mapping	Access	Description
fcConnUnitNumber	INTEGER	The number of managed HP units defined to the HAFM server.	R	The number of connectivity units present on this system. May be a count of the boards in a chassis or the number of full boxes in a rack.
fcConnURL	DisplayString	http://[HAFM addr]/launch/start where [HAFM addr] is the network address of the HAFM server. Loading this URL using a web browser will launch the HAFM application.	R	<p>The top-level URL of the system. If it does not exist the value is an empty string. The URL format is implementation dependent and can have keywords embedded that are preceded by a percent sign (e.g., %USER).</p> <p>The following are the defined keywords that will be recognized and replaced with data during a launch:</p> <p>USER - replace with username PASSWORD - replace with password GLOBALID - replace with globalid SERIALNO - replace with serial number</p> <p>A management application will read this object from the MIB, provide values for any of the keywords listed above that are present in the string, and then use the URL to invoke or launch the program referenced.</p>

Connectivity Unit Table

The connectivity unit table contains general information on the connectivity units. Each row in the table contains information for a particular Director.

Table 2–4: ConnUnit Table (HAFM Server)

FA Mib Object Name	Type	Implementation	Access	Return When Linkdown																		
fcConnUnitIndex	OCTET STRING(16)	An index (an array of 16 bytes) that identifies a particular HP unit that is managed by the given HAFM server. Contents: Product code, Product ID (will never be all zeros).	R	Same																		
fcConnUnitGlobalId	FcGlobalId	The units' WWN is contained in the first 8 bytes of the array. If the link between the HAFM server and the switch is down, the array element values will be all zeros.	R	Zeros																		
fcConnUnitType	FcUnitType	ED-5000: return switch(4) Directors and Edge Switches: return switch(4) ES-1000: return other(2)	R	Same																		
fcConnUnitNumPorts		ED-5000: 32 Directors and Edge Switches: 140/64/32/24/16 ES-1000: 9 Note: the object does not count the inaccessible ports	R	Zero																		
fcConnUnitState	INTEGER	<table border="0"> <tr> <td><u>HAFM</u></td> <td><u>MIB</u></td> </tr> <tr> <td>online</td> <td>online</td> </tr> <tr> <td>state(2)</td> <td></td> </tr> <tr> <td>going-offline</td> <td>offline</td> </tr> <tr> <td>state(3)</td> <td></td> </tr> <tr> <td>offline</td> <td>offline</td> </tr> <tr> <td>state(3)</td> <td></td> </tr> <tr> <td>coming-online</td> <td>online</td> </tr> <tr> <td>state(2)</td> <td></td> </tr> </table>	<u>HAFM</u>	<u>MIB</u>	online	online	state(2)		going-offline	offline	state(3)		offline	offline	state(3)		coming-online	online	state(2)		R	unknown(1)
<u>HAFM</u>	<u>MIB</u>																					
online	online																					
state(2)																						
going-offline	offline																					
state(3)																						
offline	offline																					
state(3)																						
coming-online	online																					
state(2)																						

Table 2–4: ConnUnit Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Implementation	Access	Return When Linkdown
fcConnUnitStatus	INTEGER	HAFM MIB operational ok(3) degraded warning(4) failed failed(5)	R	unknown(1)
fcConnUnitProduct	SnmpAdminString	The switch product name.	R	Same
fcConnUnitSerialNo	SnmpAdminString	OEM serial number.	R	Empty string
fcConnUnitUpTime	TimeTicks	The total time the link between the HAFM server and the managed unit has been up.	R	Zero
fcConnUnitUrl	DisplayString	http://[HAFM addr]/launch/start?[product netaddr] where [HAFM addr] is the network address of the HAFM server and [product netaddr] is the network address of the switch. The form of the switch address depends upon how it was added in the HAFM. If it was added by Name then the name must be used otherwise the IP address must be used. Loading this URL from a web browser will launch the corresponding Product Manager.	R	Same
fcConnUnitDomainId	OCTET STRING(3)	Switch Fibre Channel Address.	R	FF.FF.FF
fcConnUnitProxyMaster	INTEGER	yes(3)	R	Yes
fcConnUnitPrincipal	INTEGER	yes(3)	R	Yes
fcConnUnitNumSensors		Returns the total number of fans and power supplies listed in the sensor table.	R	Zero
fcConnUnitNumRevs		Always return 1.	R	Zero

Table 2-4: ConnUnit Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Implementation	Access	Return When Linkdown
fcConnUnitModuleId	OCTET STRING(16)	.not supported, return 16 zeros.	R	Not support
fcConnUnitName		A textual string of the name of the switch. HP switches limit this string to 24 characters.	R/W	Empty string when reading and cannot be set when setting
fcConnUnitInfo	SnmpAdminString	A textual string of the description of the switch.	R/W	Empty string when reading and cannot be set when setting
fcConnUnitControl	INTEGER	1. return unknown(1) on read operation. 2. Support: resetConnUnitWarmStart(2) offlineConnUnit(3) onlineConnUnit(4)	R/W	Cannot be set when setting; Unknown when reading
fcConnUnitContact	SnmpAdminString	A textual string of the contact info of the switch.	R/W	Empty string when reading and cannot be set when setting
fcConnUnitLocation	SnmpAdminString	A textual string of the location of the switch.	R/W	Empty string when reading and cannot be set when setting
fcConnUnitEventFilter	FcEventSeverity	Default to info(8). Settable only when the new value is within 1 to 10	R/W	Cannot be set Info(8) when reading
fcConnUnitNumEvents		Current number of events whose event severities are equal or less than the event filter value	R	Same as the link is on
fcConnUnitMaxEvents	Gauge(32bits)	Always 50	R	50

Table 2–4: ConnUnit Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Implementation	Access	Return When Linkdown
fcConnUnitEventCurrID	Gauge(32bits)	The current event index is used as the last used event id. It is wrapped to a higher number when new event occurred and restart from 1 when HAFM resets	R	Same as the link is on

Firmware Table

The firmware table contains information on the firmware revisions supported by a particular connectivity unit.

Table 2–5: Firmware Table (HAFM Server)

FA Mib Object Name	Type	Product Mapping	Access
fcConnUnitRevsIndex	Gauge(32 bits)	Throw exception when querying this object.	Not accessible
fcConnUnitRevsRevision	SnmpAdminString	The revision of the switch. When link is down: return NULL	R
fcConnUnitRevsDescription	SnmpAdminString	Return "Switch Firmware Level When link is down: return NULL	R

Sensor Table

The sensor table contains information on the status of the fan and power supply components on a given Director.

Table 2–6: Sensor Table (HAFM Server)

FA Mib Object Name	Type	Product Mapping	Access
*fcConnUnitSensorIndex	Gauge(32 bits)	Throw exception when querying this object.	Not accessible
FcConnUnitSensorName	SnmpAdminString	The textual name of the FRU.	R
fcConnUnitSensorStatus	INTEGER	This value is evaluated from FRU status. The active, backup and update-busy states are mapped to ok(3). And the failed state is mapped to failed(5).	R

Table 2–6: Sensor Table (HAFM Server) (Continued)

fcConnUnitSensorInfo	SnmpAdminString	The serial number of the FRUs. It's not supported if the module is failed.	R
fcConnUnitSensorMessage	SnmpAdminString	The textual description of the FRU status.	R
fcConnUnitSensorType	INTEGER	ED-5000: fan(4) or power-supply(5) Directors and Edge Switches: Power(5), fan(4) and fan2() ES-1000: fan(4) or power-supply(5) or thermal(8)	R
fcConnUnitSensorCharacteristic	INTEGER	Not supported and other(2) is returned	R

Port Table

The port table contains information on the physical ports on a given Director.

Table 2–7: Port Table (HAFM Server)

FA Mib Object Name	Type	Product Mapping	Access
*fcConnUnitPortIndex	Gauge(32 bits)	A number starting from 1 for each switch. It should be continuous within that switch.	R
fcConnUnitPortType	INTEGER	If the port is Not installed notPresent(3) else if the Port State is online (i.e., STAT_AVAILABLE) use the <u>operating</u> Port Type: F_Port = fPort(8) FL_Port = flPort(7) E_Port = ePort(9) H_Port = hubPort(4) B_Port = ePort(9) else use the <u>configured</u> Port Type: Gx_Port = gPort(10) G_Port = gPort(10) Fx_Port = flPort(7) F_Port = fPort(8) E_Port = ePort(9)	R

Table 2–7: Port Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Product Mapping	Access
fcConnUnitPortFCClassCap	FcPortFCClass	<p>If the port is Not installed fcConnUnitPortFCClassCap = unsupport(0x00) else if Redcloud H_Port 0x18 = class2(0x10) + class3(0x08) B_Port 0x58 = classF(0x40) + class2(0x10) + lass3(0x08) else it depends on the <u>configured</u> Port Type: Gx_Port 0x58 = classF(0x40) + class2(0x10) + class3(0x08) Fx_Port 0x18 = class2(0x10) + class3(0x08) G_Port 0x58 = classF(0x40) + class2(0x10) + class3(0x08) F_Port 0x18 = class2(0x10) + class3(0x08) E_Port 0x58 = classF(0x40) + class2(0x10) + class3(0x08)</p>	R

Table 2–7: Port Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Product Mapping	Access
fcConnUnitPortFCClassOp	FcPortFCClass	<p>If the port is Not installed fcConnUnitPortFCClassOp = unsupport(0x00) else if the Port State is offline fcConnUnitPortFCClassOp = unsupport(0x00) else it depends on the <u>operating</u> Port Type:</p> <p>FL_Port Use Class of Service specified in one or more Fabric Login's (OR'd together)</p> <p>F_Port Use Class of Service specified in Fabric Login</p> <p>E_Port 0x58 = classF(0x40) + class2(0x10) + class3(0x08)</p> <p>H_Port Use Class of Service specified in one or more Fabric Login's (OR'd together)</p> <p>B_Port 0x58 = classF(0x40) + class2(0x10) + class3(0x08)</p>	R

Table 2–7: Port Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Product Mapping	Access
fcConnUnitPortState	INTEGER	<p><u>HAFM</u> <u>MIB</u></p> <p>If port has InvalidAttachment, the port state is online. If the port not installed, the port state is unknown. If the port has a link failure, the port state is offline. If the port is available, the port state is online. If the port state is blocked, the port state is offline. If the port is unavailable, the port state is online. If the port is running internal diagnostics, the port state is diagnostics. If the port is running external loops, the port state is diagnostics. If the port experiences link reset, the port state is online. If the port experiences link failure, the port state is online. If the port shows service required, the port state is online. If the port experiences port failure, the port state is online If the port is inactive, the port state is offline. In any other cases, the port state is online (should not happen)</p> <p>The above mappings apply to ED-5000, Directors and Edge Switches and the B-port in ES-1000. The H-port in ES-1000 is undetermined When link is down: return unknown(1)</p>	R

Table 2–7: Port Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Product Mapping	Access
fcConnUnitPortStatus	INTEGER	<p><u>HAFM</u> <u>MIB</u></p> <p>If port has InvalidAttachment, the port state is online. If the port not installed, the port state is unknown. If the port has a link failure, the port state is offline. If the port is available, the port state is online. If the port state is blocked, the port state is offline. If the port is unavailable, the port state is online. If the port is running internal diagnostics, the port state is diagnostics. If the port is running external loops, the port state is diagnostics. If the port experiences link reset, the port state is online. If the port experiences link failure, the port state is online. If the port shows service required, the port state is online. If the port experiences port failure, the port state is online If the port is inactive, the port state is offline. In any other cases, the port state is online (should not happen)</p> <p>The above mappings apply to ED-5000, Directors and Edge Switches and the B-port in ES-1000. The H-port in ES-1000 is undetermined When link is down: return unknown(1)</p>	R

Table 2–7: Port Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Product Mapping	Access
fcConnUnitPortTransmitterType	INTEGER	This is mapped from the port technology as follow: not present and serial indicate unknown(1), optical sw1g and optical sw2g indicate shortwave(4). optical lw1g and optical lw2g indicate longwave(5), copper db9 and copper amp indicate copper(6), When link is down: return unknown(1)	R
fcConnUnitPortModuleType	INTEGER	ED-5000: return glm(5), i.e. oneXnine. Directors and Edge Switches: return smallFormFactor(9) ES-1000: return gbic(3), If not installed, return gbicNotInstalled(8) When link is down: return unknown(1)	R
fcConnUnitPortWwn	FcNameId	return the World Wide Name of the port. When link is down: return NULL	R
fcConnUnitPortFCId	OCTET STRING (SIZE(3))	F-port in ED-5000, Directors and Edge Switches: Fabric address of the node containing the port, in the form of [domain, area, node] is returned B-port in ES-1000 and E-port in ED-5000, Directors and Edge Switches: Right-adjusted domain returned H-port in ES-1000: zeros 1. If no fcAddress, return FF.FF.FF When link is down: return 0F.0F.0F (hex)	R

Table 2–7: Port Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Product Mapping	Access
fcConnUnitPortSerialNoSn	SnmpAdminString	Not supported. (empty string) When link is down: return NULL	R
fcConnUnitPortRevision	SnmpAdminString	Not supported. (empty string) When link is down: return NULL	R
fcConnUnitPortVendor	SnmpAdminString	Not supported. (empty string) When link is down: return NULL	R
fcConnUnitPortSpeed	Gauge(32 bits)	ED-5000 and ES-1000: return constant of 100000 kilobytes Directors and Edge Switches: 100000 for one Gig, 200000 for two Gig and zero for not established When link is down: return NULL	R
fcConnUnitPortControl	INTEGER	1. Always return unknown(1) on read. 2. Supports: Reset() GoOffline GoOnline 3. Linkdown: cannot be set When link is down: return NULL	R/W
fcConnUnitPortControl (continued)	INTEGER	1. Always return unknown(1) on read. 2. Supports: Reset() GoOffline GoOnline 3. Linkdown: cannot be set When link is down: return NULL	R/W
fcConnUnitPortName	SnmpAdminString	Cannot be set when LD and empty string in reading When link is down: return NULL	R/W

Table 2–7: Port Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Product Mapping	Access
fcConnUnitPortPhysicalNumber	Gauge(32 bits)	The internal port number starting from zero. There may be gaps between these objects for the same switch, i.e., inaccessible ports are skipped. When link is down: return NULL	R
fcConnUnitPortProtocolCap (added from Mib3.0)	OCTET STRING (2)	If the port is Not installed fcConnUnitPortProtocolCap = unsupport(0x00) else if Redcloud H_Port 1 = Loop(1) B_Port 2 = Fabric(2) else it depends on the <u>configured</u> Port Type: Gx_Port 3 = Loop(1) + Fabric(2) (available later) Fx_Port 3 = Loop(1) + Fabric(2) (available later) G_Port 2 = Fabric(2) F_Port 2 = Fabric(2) E_Port 2 = Fabric(2)	R
fcConnUnitPortProtocolOp (added from Mib3.0)	OCTET STRING (2)	If the port is Not installed fcConnUnitPortProtocolOp = unsupport(0x00) else if the Port State is offline fcConnUnitPortProtocolOp = unsupport(0x00) else it depends on the <u>operating</u> Port Type: FL_Port 1 = Loop(1) (available later) F_Port 2 = Fabric(2) E_Port 2 = Fabric(2) H_Port 1 = Loop(1) B_Port 1 = Fabric(2)	R
fcConnUnitPortNodeWwn (added from Mib3.0)	FcNameId	return switch WWN	R

Table 2-7: Port Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Product Mapping	Access
fcConnUnitPortHWState (added from Mib3.0)	INTEGER	<u>HAFM</u> <u>MIB</u> If port has InvalidAttachment, the port state is online. If the port not installed, the port state is unknown. If the port has a link failure, the port state is offline. If the port is available, the port state is online. If the port state is blocked, the port state is offline. If the port is unavailable, the port state is online. If the port is running internal diagnostics, the port state is diagnostics. If the port is running external loops, the port state is diagnostics. If the port experiences link reset, the port state is online. If the port experiences link failure, the port state is online. If the port shows service required, the port state is online. If the port experiences port failure, the port state is online If the port is inactive, the port state is offline. In any other cases, the port state is online (should not happen) The above mappings apply to ED-5000, Directors and Edge Switches and the B-port in ES-1000. The H-port in ES-1000 is undetermined When link is down: return unknown(1)	R

Event Table

The table of connectivity unit events. Errors, warnings, and information should be reported in this table.

Table 2–8: Event Table (HAFM Server)

FA Mlib Object Name	Type	Product Mapping	Access	Description
*fcConnUnitEventIndex	Gauge(32 bits)	Return the event index defined by MIB provider which follows the definition described in the connUnitEventIndex description.	R	Each connectivity unit has its own event buffer. As it wraps, it may write over previous events. This object is an index into the buffer. It is recommended that this table be read using 'getNext's to retrieve the initial table. The management application should read the event table at periodic intervals and then determine if any new entries were added by comparing the last known index value with the current highest index value. The management application should then update its copy of the event table. If the read interval is too long, it is possible that there may be events that may not be contained in the agent's internal event buffer. For example, an agent may read events 50-75. At the next read interval, fcConnUnitEventCurriD is 189. If the management app tries to read event index 76, and the agent's internal buffer is 100 entries max, event index 76 will no longer be available. The index value is an incrementing integer starting from one every time there is a table reset. On table reset, all contents are emptied and all indices are set to zero. When an event is added to the table, the event is assigned the next higher integer value than the last item entered into the table. If the index value reaches its maximum value, the next item entered will cause the index value to roll over and start at one again.

Table 2–8: Event Table (HAFM Server) (Continued)

FA Mlib Object Name	Type	Product Mapping	Access	Description
fcConnUnitREventTime	DisplayString (0..15)	Return the time when the event occurred. When link is down: return NULL	R	This is the real time when the event occurred. It has the following format. DDMMYYYY HHMMSS DD = day number, MM = month number, YYYY = year number, HH = hour number, MM= minute number, SS = seconds number If not applicable, return either a NULL string
fcConnUnitSEventTime	TimeTicks	Can be translated from connUnitREventTime When link is down: return NULL	R	This is the sysuptime timestamp when the event occurred.
fcConnUnitEventSeverity	FcEventSeverity	The mapping from ED-5000 event severity level to FcEventSeverity: <u>ED-5000</u> <u>MIB</u> informational info(8) minor error(5) major critical(4) severe emergency(2) When link is down: return NULL	R	The event severity level.
fcConnUnitEventType	INTEGER	Always return status(3). When link is down: return NULL	R	The type of this event. The values are defined as follow: unknown(1), other(2), status(3), configuration(4), topology(5).

Table 2–8: Event Table (HAFM Server) (Continued)

FA Mlib Object Name	Type	Product Mapping	Access	Description
fcConnUnitEventObject	OBJECT IDENTIFIER	Only the OID of a conUnit is returned. Other information is not supported. When link is down: return NULL	R	This is used with the fcConnUnitEventType to identify which object the event refers to. It can be the OID of a connectivity unit or of another object like fcConnUnitPortStatus[...]
fcConnUnitEventDescr	SnmpAdminString	Return the event reason code description. When link is down: return NULL	R	The description of the event.

Link Table

The link table contains information on the Fibre Channel links that exist between a particular Director and a Fibre Channel device or another switch.

Table 2–9: Link Table (HAFM Server)

FA Mlib Object Name	Type	Implementation	Access	Description
*fcConnUnitLinkIndex	Gauge(32 bits)	Agent maintains this counter for all switches.	R	This index is used to create a unique value for each entry in the link table with the same connUnitLinkUnitId. The value can only be reused if it is not currently in use and the value is the next candidate to be used. This value wraps at the highest value represented by the size of the INTEGER. This value is reset to zero when the system is Reset and the first value to be used is one.

Table 2–9: Link Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Implementation	Access	Description
fcConnUnitLinkNodeIdX	OCTET STRING (16)	The WWN of this switch or device X.	R	The node WWN of the unit at one end of the link. If the node WWN is unknown and the node is a connUnit in the responding agent then the value of this object MUST BE equal to its connUnitID.
fcConnUnitLinkPortNumberX	Integer32	The port number of device X.	R	The port number on the unit specified by connUnitLinkNodeIdX if known, otherwise -1. If the value is nonnegative then it will be equal to connUnitPortPhysicalNumber.
fcConnUnitLinkPortWwnX	OCTET STRING	The port WWN of device X. Available when the attached device to this port is in LOGIN state. Otherwise all zeroes.	R	The port WWN of the unit specified by connUnitLinkNodeIdX if known, otherwise 16 octets of binary 0.
fcConnUnitLinkNodeIdY	OCTET STRING (16)	The node WWN of device Y. Available when the attached device is in LOGIN state. Otherwise all zeroes.	R	The node WWN of the unit at the other end of the link. If the node WWN is unknown and the node is a connUnit in the responding SNMP agency then the value of this object MUST BE equal to its connUnitID.
fcConnUnitLinkPortNumberY	Integer32	The port number of device Y. Available for E/B ports. Unavailable for F/H ports (-1 is returned).	R	The port number on the unit specified by connUnitLinkNodeIdY if known, otherwise -1. If the value is nonnegative then it will be equal to connUnitPortPhysicalNumber.
fcConnUnitLinkPortWwnY	OCTET STRING	The port WWN of device Y when Y is a HP switch. ES-1000- not supported (all zeroes.)	R	The port WWN on the unit specified by connUnitLinkNodeIdY if known, otherwise 16 octets of binary 0.

Table 2–9: Link Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Implementation	Access	Description
fcConnUnitLinkAgentAddressY	OCTET STRING (16)	16 octets of binary 0. (not supported)	R	The address of an FCMGMT MIB agent for the node identified by connUnitLinkNodeIdY, if known; otherwise 16 octets of binary 0.
fcConnUnitLinkAgentAddressTypeY	Unsigned32	Zero (not supported)	R	If connUnitLinkAgentAddressY is nonzero, it is a protocol address. ConnUnitLinkAgentAddressTypeY is the 'address family number' assigned by IANA to identify the address format. (e.g., 1 is Ipv4, 2 is Ipv6). If connUnitLinkAgentAddressY is all zeros, then this value is ignored.
fcConnUnitLinkAgentPortY	Unsigned32	Zero (not supported)	R	The IP port number for the agent. This is provided in case the agent is at a non-standard SNMP port.
fcConnUnitLinkUnitTypeY	FcUnitType	Switch(4) for E or B port. Otherwise return unknown(1).	R	Type of the FC connectivity unit as defined in connUnitType.
fcConnUnitLinkConnIdY	OCTET STRING (3)	F-port: [domainId][areaCode][portNumber] E/B port: [domainId] [0] [0] H port: [alpaNumber] [0] [0]	R	This is the Fibre Channel ID of this port. If the connectivity unit is a switch, this is expected to be a Big Endian value of 24 bits. If this is loop, then it is the ALPA that is connected. If this is an E_Port, then it will only contain the domain ID. If not any of those, unknown or cascaded loop, return all bits set to 1.

Port Statistics

The port statistics table contains Fibre Channel port statistics for a given Director.

Table 2–10: Port Statistics Table (HAFM Server)

FA Mib Object Name	Type	Support			Access	Description
		Y: support N: not support B: (B port support only)	Directors and Edge Switches	ED-5000		
*fcConnUnitPortStatIndex	Gauge (32 bits)	Y	Y	Y	R	A unique value among all entries in this table, between 0 and fcConnUnitNumPort[fcConnUnitPortUnitId]
fcConnUnitPortStatCountError	Counter64	y y y n n n n n y y y y y y y	y y y y y y y y y y y y y y y	y y B B B y y y y y y y y y	R	A count of the errors that have occurred on this port.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support N: not support B: (B port support only)				
fcConnUnitPortStatCountTxObjects	Counter64	Y	Y	Y	R	The number of frames/packets/IOs/etc that have been transmitted by this port. Note: A Fibre Channel frame starts with SOF and ends with EOF. FC loop devices should not count frames passed through. This value represents the sum total for all other Tx objects.
fcConnUnitPortStatCountRxObjects	Counter64	Y	Y	Y	R	The number of frames/packets/IOs/etc that have been received by this port. Note: A Fibre Channel frame starts with SOF and ends with EOF. FC loop devices should not count frames passed through. This value represents the sum total for all other Rx objects.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support N: not support B: (B port support only)				
fcConnUnitPortStatCountTxElements	Counter64	Y	Y	Y	R	The number of octets or bytes that have been transmitted by this port. One second periodic polling of the port. This value is saved and compared with the next polled value to compute net throughput. Note, for Fibre Channel, ordered sets are not included in the count.
fcConnUnitPortStatCountRxElements	Counter64	Y	Y	Y	R	The number of octets or bytes that have been received by this port. One second periodic polling of the port. This value is saved and compared with the next polled value to compute net throughput. Note, for Fibre Channel, ordered sets are not included in the count.
fcConnUnitPortStatCountBBCreditZero	Counter64	N	N	N	R	Count of transitions in/out of BB_Credit zero state. The other side is not providing any credit. Note, this is a Fibre Channel stat only.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support N: not support B: (B port support only)				
fcConnUnitPortStatCountInputBuffersFull	Counter64	N	N	N	R	Count of occurrences when all input buffers of a port were full and outbound buffer-to-buffer credit transitioned to zero. There is no credit to provide to other side. Note, this is a Fibre Channel stat only.
fcConnUnitPortStatCountFBSYFrames	Counter64	N	N	Y	R	Count of times that FBSY was returned to this port as a result of a frame that could not be delivered to the other end of the link. This occurs if either the Fabric or the destination port is temporarily busy. Port can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat. This is the sum of all classes. If you cannot keep the by class counters, then keep the sum counters.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support	N: not support	B: (B port support only)		
fcConnUnitPortStatCountPBSYFrames	Counter64	N	N	N	R	Count of times that PBSY was returned to this port as a result of a frame that could not be delivered to the other end of the link. This occurs if the destination port is temporarily busy. PBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat. This is the sum of all classes. If you cannot keep the by class counters, then keep the sum counters.
fcConnUnitPortStatCountFRJTFrames	Counter64	N	N	N	R	Count of times that FRJT was returned to this port as a result of a Frame that was rejected by the fabric. Note, This is the total for all classes and is a Fibre Channel only stat.
fcConnUnitPortStatCountPRJTFrames	Counter64	N	N	N	R	Count of times that FRJT was returned to this port as a result of a Frame that was rejected at the destination NxPort. Note, This is the total for all classes and is a Fibre Channel only stat.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support N: not support B: (B port support only)				
fcConnUnitPortStatCountClass1RxFrames	Counter64	N	N	N	R	Count of Class 1 Frames received at this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1TxFrames	Counter64	N	N	N	R	Count of Class 1 Frames transmitted out this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1FB SYFrames	Counter64	N	N	N	R	Count of times that FBSY was returned to this port as a result of a Class 1 Frame that could not be delivered to the other end of the link. This occurs if either the Fabric or the destination port is temporarily busy. FBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support	N: not support	B: (B port support only)		
fcConnUnitPortStatCountClass1P BSYFrames	Counter64	N	N	N	R	Count of times that PBSY was returned to this port as a result of a Class 1 Frame that could not be delivered to the other end of the link. This occurs if the destination NxPort is temporarily busy. PBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1F RJTFrames	Counter64	N	N	N	R	Count of times that FRJT was returned to this port as a result of a Class 1 Frame that was rejected by the fabric. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1P RJTFrames	Counter64	N	N	N	R	Count of times that FRJT was returned to this port as a result of a Class 1 Frame that was rejected at the destination NxPort. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass2R xFrames	Counter64	Y	Y	Y	R	Count of Class 2 Frames received at this port. Note, this is a Fibre Channel only stat.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support N: not support B: (B port support only)				
fcConnUnitPortStatCountClass2TxFrames	Counter64	Y	N	N	R	Count of Class 2 Frames transmitted out this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass2FBSYFrames	Counter64	Y	Y	N	R	Count of times that FBSY was returned to this port as a result of a Class 2 Frame that could not be delivered to the other end of the link. This occurs if either the Fabric or the destination port is temporarily busy. FBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass2PBSYFrames	Counter64	Y	N	N	R	Count of times that PBSY was returned to this port as a result of a Class 2 Frame that could not be delivered to the other end of the link. This occurs if the destination NxPort is temporarily busy. PBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support	N: not support	B: (B port support only)		
fcConnUnitPortStatCountClass2FRJTFrames	Counter64	Y	Y	N	R	Count of times that FRJT was returned to this port as a result of a Class 2 Frame that was rejected by the fabric. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass2PRJTFrames	Counter64	N	N	N	R	Count of times that FRJT was returned to this port as a result of a Class 2 Frame that was rejected at the destination NxPort. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass3RxFrames	Counter64	Y	Y	Y	R	Count of Class 3 Frames received at this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass3TxFrames	Counter64	Y	N	N	R	Count of Class 3 Frames transmitted out this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass3Discards	Counter64	Y	Y	B	R	Count of Class 3 Frames that were discarded upon reception at this port. There is no FBSY or FRJT generated for Class 3 Frames. They are simply discarded if they cannot be delivered. Note, this is a Fibre Channel only stat.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support	N: not support	B: (B port support only)		
fcConnUnitPortStatCountRxMulticastObjects	Counter64	N	Y	N	R	Count of Multicast Frames or Packets received at this port.
fcConnUnitPortStatCountTxMulticastObjects	Counter64	N	Y	N	R	Count of Multicast Frames or Packets transmitted out this port.
fcConnUnitPortStatCountRxBroadcastObjects	Counter64	N	N	N	R	Count of Broadcast Frames or Packets received at this port.
fcConnUnitPortStatCountTxBroadcastObjects	Counter64	N	N	N	R	Count of Broadcast Frames or Packets transmitted out this port. On a Fibre Channel loop, count only OPN frames generated.
fcConnUnitPortStatCountRxLinkResets	Counter64	Y	Y	B	R	Count of Link resets. This is the number of LRs received. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountTxLinkResets	Counter64	Y	Y	B	R	Count of Link resets. This is the number LRs transmitted. Note, this is a Fibre Channel only stat.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support	N: not support	B: (B port support only)		
fcConnUnitPortStatCountNumberLinkResets	Counter64	Y	Y	B	R	Count of Link resets and LIPs detected at this port. The number times the reset link protocol is initiated. These are the count of the logical resets, a count of the number of primitives. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountRxOfflineSequences	Counter64	Y	Y	B	R	Count of Offline Primitive OLS received at this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountTxOfflineSequences	Counter64	Y	Y	B	R	Count of Offline Primitive OLS transmitted by this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountNumberOfflineSequences	Counter64	Y	Y	B	R	Count of Offline Primitive sequence received at this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountLinkFailures	Counter64	Y	Y	Y	R	Count of link failures. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support N: not support B: (B port support only)				
fcConnUnitPortStatCountInvalidCRC	Counter64	Y	Y	Y	R	Count of frames received with invalid CRC. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Loop ports should not count CRC errors passing through when monitoring. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountInvalidTxWords	Counter64	Y	Y	Y	R	Count of invalid transmission words received at this port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountPrimitiveSequenceProtocolErrors	Counter64	Y	Y	B	R	Count of primitive sequence protocol errors detected at this port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountLossOfSignal	Counter64	Y	Y	Y	R	Count of instances of signal loss detected at port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support	N: not support	B: (B port support only)		
fcConnUnitPortStatCountLossOfSynchronization	Counter64	Y	Y	Y	R	Count of instances of synchronization loss detected at port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountInvalidOrderedSets	Counter64	N	Y	Y	R	Count of invalid ordered sets received at port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountFramesTooLong	Counter64	N	Y	Y	R	Count of frames received at this port where the frame length was greater than what was agreed to in FLOGI/PLOGI. This could be caused by losing the end of frame delimiter. Note, this is a Fibre Channel only stat.

Table 2–10: Port Statistics Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Support			Access	Description
		Y: support N: not support B: (B port support only)				
fcConnUnitPortStatCountFramesTooShort	Counter64	Y	Y	Y	R	Count of frames received at this port where the frame length was less than the minimum indicated by the frame header - normally 24 bytes, but it could be more if the DFCTL field indicates an optional header should have been present. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountAddressErrors	Counter64	Y	Y	Y	R	Count of frames received with unknown addressing. e.x. unknown SID or DID. The SID or DID is not known to the routing algorithm. Note. This is a Fibre Channel only stat.
fcConnUnitPortStatCountDelimiterErrors	Counter64	Y	Y	N	R	Count of invalid frame delimiters received at this port. An example is a frame with a class 2 start and a class 3 at the end. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountEncodingDisparityErrors	Counter64	N	Y	N	R	Count of disparity errors received at this port. Note, this is a Fibre Channel only stat.

Name Server Table

This table is accessed either directly if the management software has an index value or via GetNexts. The value of the indexes is not required to be contiguous. Each entry created in this table will be assigned an index. This relationship is kept persistent until the entry is removed from the table or the system is reset. The total number of entries is defined by the size of the table..

Table 2–11: Name Server Table (HAFM Server)

FA Mib Object Name	Type	Access	Description
*fcConnUnitSnsPortIndex	Counter32	R	The physical port number of this SNS table entry. Each physical port has an SNS table with 1-n entries indexed by ConnUnitSnsPortIdentifier (port address)
*fcConnUnitSnsPortIdentifier	FcAddressId	R	The Port Identifier for this entry in the SNS table.
fcConnUnitSnsPortName	FcNameId	R	The Port WWN Name for this entry in the SNS table.
fcConnUnitSnsNodeName	FcNameId	R	The Node Name for this entry in the SNS table.
fcConnUnitSnsClassOfSvc	OCTET STRING (1)	R	The Classes of Service offered by this entry in the SNS table.
fcConnUnitSnsNodeIP Address	OCTET STRING (16)	R	The IPv6 formatted address of the Node for this entry in the SNS table.
connUnitSnsProcAssoc	OCTET STRING (8)	R	The Process Associator for this entry in the SNS table.
fcConnUnitSnsFC4Type	OCTET STRING (32)	R	The FC-4 Types supported by this entry in the SNS table.
fcConnUnitSnsPortType	OCTET STRING (1)	R	The Port Type of this entry in the SNS table.
fcConnUnitSnsPortIP Address	OCTET STRING (16)	R	The IPv6 formatted address of this entry in the SNS table.
fcConnUnitSnsFabricPortName	FcNameId	R	The Fabric Port name of this entry in the SNS table.
fcConnUnitSnsHardAddress	FcAddressId	R	The Hard ALPA of this entry in the SNS table.
fcConnUnitSnsSymbolicPortName	DisplayString (0..79)	R	The Symbolic Port Name of this entry in the SNS table.

Table 2–11: Name Server Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Access	Description
fcConnUnitSnsSymbolicNodeName	DisplayString (0..79)	R	The Symbolic Node Name of this entry in the SNS table.

SNMP Trap Registration Group

The trap registration group allows for the control of trap generation on the HAFM server SNMP agent. The group consists of two scalar objects and a trap registration table.

Table 2–12: Trap Registration Group Table (HAFM Server)

Object Name	Type	Access	Description
fcTrapMaxClients	Unsigned32	R	The maximum number of SNMP trap recipients supported by the connectivity unit.
fcTrapClientCount	Unsigned32	R	The current number of rows in the trap table.

Trap Registration Table

This table contains a row for each trap recipient. When the SNMP agent generates a trap a copy is sent to each of the recipients in the table depending upon the severity of the trap and the setting of the trapRegFilter object.

Table 2–13: Trap Registration Table (HAFM Server)

FA Mib Object Name	Type	Operation	Access	Description
*fcTrapRegIpAddress	IpAddress	Read: return the trap receiver's IP Write: not writable Create: create a new row. Its value is encoded in the request OID. See createAndGo for the limits of this object.	R/C	The IP address of a client registered for traps.

Table 2–13: Trap Registration Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Operation	Access	Description
*fcTrapRegPort	Unsigned32	Read: return the trap receiver's port number Write: not writable Create: create a new row. Its value is encoded in the request OID. See createAndGo for the limits of this object.	R/C	The UDP port to send traps to for this host. Normally this would be the standard trap port (162).
fcTrapRegFilter	FcEventSeverity	Read: return the filter value (1-10) Write: overwrite the old value with a new value. Only 1 – 10 is allowed Range: (1-10) unknown(1); emergency(2); alert(3); critical(4);error(5); warning(6); notify(7); info(8); debug(9); mark(10). Create: create a new row and its value is defaulted to info(8)	R/W/C	This value defines the trap severity filter for this trap host. The connUnit will send traps to this host that have a severity level less than or equal to this value.

Table 2–13: Trap Registration Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Operation	Access	Description
fcTrapRegRowState	RowStatus	<p>When read:</p> <p>(1) active if the row state is not being set to notInService(2)</p> <p>(2) notInService if management station set to this value</p> <p>(3) notReady: Based on our implementation, no entry will be missed, so this state should never happen.</p> <p>When write:</p> <p>(1) active; always settable</p> <p>(2) notInService; always settable</p> <p>(3) notReady; not allowed and a generic error will be returned.</p> <p>(4) CreateAndGo. A new row is created and the rowState is set to active(1) only when all of the following conditions hold. Otherwise, no row is created and a generic error will be returned.</p> <p>(a) the maximum number of entries (12) has not been reached.</p>	R/W/C	<p>Specifies the operational status of the row.</p> <p>A RowStatus object may take any of six defined values:</p> <ul style="list-style-type: none"> - active: traps may be sent as specified in this row; a management application may change the value of any objects in the row when the status is active. - notInService: traps will not be sent using this row. - notReady: the conceptual row exists in the agent, but is missing information necessary to send traps (i.e., if any of the other objects in the row are not present or contain invalid values); this value may not be supplied by a management application.

Table 2–13: Trap Registration Table (HAFM Server) (Continued)

FA Mib Object Name	Type	Operation	Access	Description
fcTrapRegRowState (continued)				<p>- createAndGo: supplied by a management application wishing to create a new instance of a conceptual row, supplying valid values for the all the other objects in the row, and have its status automatically set to active, making it available for use in sending traps.</p> <p>- createAndWait: supplied by a management application wishing to create a new instance of a conceptual row but not make it available for use in sending traps at that time; and,</p> <p>- destroy: supplied by a management application wishing to delete an existing conceptual row.</p>
fcTrapRegRowState (continued)		<p>(b) The length of the IpAddress array is 4 and each byte must be thin 0 and 255;</p> <p>(c) $0 \leq \text{Port Number} < 65536$. if port number is 0, default to 162.</p> <p>(5) CreateAndWait: Same as CreatAndGo except the rowState is set to notInService(2).</p> <p>(6) destroy. Always settable as long as the row exists.</p>		

Fibre Channel Management Traps

The following FCMGMT MIB traps are generated from the HAFM server when the SNMP agent is active and when one or more trap recipients have been configured in the HAFM.

Table 2–14: Trap Types (HAFM Server)

FA Mib Object Name	Type Number	Description	OID and Value	Description
fcConnUnitStatusChange	1	Generated when the switch=sonline status or operational status changes	.1.3.6.1.2.1.8888.1.1.3.1.6.connUnitId connUnitStatus, .1.3.6.1.2.1.8888.1.1.3.1.5.connUnitId connUnitState	The overall status of the connectivity unit has changed. Recommended severity level (for filtering): alert
fcConnUnitDeletedTrap	2	Generated when a switch is deleted from the HAFM.	For release 6.0 and 6.1: .1.3.6.1.2.1.8888.1.1.3.1.1.connUnitId connUnitId For release 6.2: .1.3.6.1.2.1.8888.1.1.3.1.2.connUnitId fcConnUnitGlobalID	A connUnit has been deleted from this agent. Recommended severity level (for filtering): warning
fcConnUnitEventTrap	3	Generated when a new event is generated.	.1.3.6.1.2.1.8888.1.1.7.1.1.connUnitId.eventIndex connUnitEventIndex, .1.3.6.1.2.1.8888.1.1.7.1.5.connUnitId.eventIndex connUnitEventType, .1.3.6.1.2.1.8888.1.1.7.1.6.connUnitId.eventIndex connUnitEventObject, .1.3.6.1.2.1.8888.1.1.7.1.7.connUnitId.eventIndex connUnitEventDescr	An event has been generated by the connectivity unit. Recommended severity level (for filtering): info

Table 2–14: Trap Types (HAFM Server) (Continued)

FA Mib Object Name	Type Number	Description	OID and Value	Description
fcConnUnitSensorStatusChange	4	Generated when a fan/power supply FRU status changes, or if the FRU is removed or installed.	.1.3.6.1.2.1.8888.1.1.5.1.3.unitId.sensorNumber connUnitSensorState	The overall status of the connectivity unit has changed. Recommended severity level (for filtering): alert
fcConnUnitPortStatusChange	5	Generated when a port status is changed, or the port card FRU is removed or installed.	.1.3.6.1.2.1.8888.1.1.6.1.6.connUnitId.portNumber connUnitPortStatus, .1.3.6.1.2.1.8888.1.1.6.1.5.connUnitId.portnumber connUnitPortState	The overall status of the connectivity unit has changed. Recommended severity level (for filtering): alert

Director and Switch Agent MIB Objects

The following sections define the Director/Edge Switch MIB objects and how they are implemented in the product SNMP agent.

Table 2–15: Type Definition Table (Director/Switch)

Type	Syntax	Description
FcNameId	OCTET STRING (SIZE(8))	Represents the Worldwide Name (WWN; IEEE 60-bit variety; standard part of T11 definitions for fibre channel) associated with a Fibre Channel (FC) entity.
FcGlobalId	OCTET STRING (SIZE(16))	Represents the Worldwide Name (WWN; IEEE 124-bit variety) associated with a Fibre Channel (FC) entity.
FcEventSeverity	INTEGER	The set of values which define the event severity that will be logged by this connectivity unit. Values unknown (1) through debug (9) are essentially self-explanatory; mark (10) means that all messages are logged. The values are defined as follow: unknown (1), emergency (2), alert (3), critical (4), error (5), warning (6), notify (7), info (8), debug (9), mark (10).

Table 2–15: Type Definition Table (Director/Switch) (Continued)

FcUnitType	INTEGER	The values are defined as follow: unknown (1) - cannot be determined, other (2) -- none of the following, hub (3) -- passive connectivity unit supporting loop protocol, switch (4) -- active connectivity unit supporting multiple protocols, gateway (5) -- unit that converts not only the interface but also the frame into another protocol. The assumption is that there is always two gateways connected together. For example, FC <-> ATM, converter (6) -- unit that converts from one interface to another, For example, FC <-> SCSI, hba(7) -- host bus adapter, proxyAgent (8) – software proxy-agent, storageDevice (9) -- disk, cd, tape, etc, host (10) -- host computer, storageSubsystem (11) -- raid, library, etc, module (12) -- subcomponent of a system, swDriver (13) -- software driver, storageAccessDevice (14) -- Provides storage management and access for heterogeneous hosts and heterogeneous devices.
FcPortFCClass	BITS	Represents the class(es) of service represented on a given port, in a given operational context. The values are defined as follow: unknown (0), classF (1), class1(2), class2 (3), class3 (4), class4 (5), class5 (6), class6 (7).

Connectivity Unit Group Objects

The Connectivity Unit Group contains information about the Director and Edge Switches that are configured in the HAFM server. The group contains five simple objects and four tables; Connectivity Unit, Firmware, Port, Sensor, and Event.

Table 2–16: Connectivity Unit Group Table (Director/Switch)

EMC MIB Object Name	Type	Product mapping	Access	Description
fcConnUnitNumber	INTEGER	1	R	The number of connectivity units present on this system. May be a count of the boards in a chassis or the number of full boxes in a rack.

Table 2–16: Connectivity Unit Group Table (Director/Switch) (Continued)

fcConnURL	DisplayString	http://switch's IP-addr (The switch's IP address is Supported by PCP)	R	<p>The top-level URL of the system. If it does not exist the value is an empty string. The URL format is implementation dependent and can have keywords embedded that are preceded by a percent sign (e.g., %USER).</p> <p>The following are the defined keywords that will be recognized and replaced with data during a launch:</p> <p>USER - replace with username PASSWORD - replace with password GLOBALID - replace with globalid SERIALNO - replace with serial number</p> <p>A management application will read this object from the MIB, provide values for any of the keywords listed above that are present in the string, and then use the URL to invoke or launch the program referenced.</p>
fcConnUnitSnsMaxRows	Counter32	The number of the entries of the Name Server Table.	R	The maximum number of rows in the fcConnUnitSnsTable table.

Connectivity Unit Table

The fcConnUnitTable contains general information on the system's units.

Table 2–17: fcConnUnitTable Table (Director/Switch)

EMC MIB Object Name	Type	Product Mapping	Access	Description
*fcConnUnitId	OCTET STRING	Switch=s WWN.	R	The unique identification for this connectivity unit among those within this proxy domain. The value MUST be unique within the proxy domain because it is the index variable for fcConnUnitTable. The value assigned to a given connectivity unit SHOULD be persistent across agent and unit resets. It SHOULD be the same as fcConnUnitGlobalId if fcConnUnitGlobalId is known and stable.

Table 2–17: fcConnUnitTable Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitGlobalId	FcGlobalId	Switch=s WWN. (Supported by PCP)	R	<p>An optional global-scope identifier for this connectivity unit. It MUST be a WWN for this connectivity unit or 16 octets of value zero.</p> <p>WWN formats requiring fewer than 16 octets MUST be extended to 16 octets with trailing zero octets. If a WWN is used for fcConnUnitId, the same WWN MUST be used for fcConnUnitGlobalId.</p> <p>When a non-zero value is provided, it SHOULD be persistent across agent and unit resets. It SHOULD be globally unique. It SHOULD be one of these FC-PH/PH3 formats:</p> <ul style="list-style-type: none"> IEEE (NAA=1) IEEE Extended (NAA=2) IEEE Registered (NAA=5). IEEE Registered extended (NAA=6). <p>Use of the IEEE formats allows any IEEE-registered vendor to assure global uniqueness independently. The following are some references on IEEE WWN formats:</p> <p>http://standards.ieee.org/regauth/oui/tutorials/fibreformat.html</p> <p>http://standards.ieee.org/regauth/oui/tutorials/fibrecomp_id.html</p>

Table 2–17: fcConnUnitTable Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitGlobalId (continued)				If one or more WWNs are associated with the connectivity unit via other management methods, one of them SHOULD be used for fcConnUnitGlobalId. If there is not a WWN assigned specifically to the connectivity unit, there is some merit, though not a requirement, to using a WWN assigned to (one of) its permanently attached FC/LAN interface(s). This can not risk uniqueness, though. As a counterexample, if your agent runs in a host and the host has an HBA, it is quite possible that agent, host, and HBA will all be distinct connectivity units, so the host and agent can not use the WWN of the HBA. Another example: If your hub has a built-in Ethernet port, it might be reasonable for the hub to use its LAN address (prefixed with the appropriate NAA) as its fcConnUnitId. But if the Ethernet were a replaceable PCCard, the hub should have an independent ID.
fcConnUnitType	FcUnitType	switch(4)	R	The type of this connectivity unit.
fcConnUnitNumPorts	Unsigned32	Number of ports from PROD_CNFG.	R	Number of physical ports in the connectivity unit (internal/embedded, external).
fcConnUnitState	INTEGER	online and coming-online will indicate online state (2), and offline and going-offline will indicate offline state (3).	R	This object reports the overall state of the connectivity unit. The meaning of all values is essentially self-explanatory. Any of these values may occur with any of the fcConnUnitStatus values. The values are defined as follow: unknown (1), online (2), offline (3).

Table 2–17: fcConnUnitTable Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitStatus	INTEGER	This value will be mapped from current status of switch in such a way that operational status indicates ok (3), degraded status indicates warning (4), failed status indicate failed (5). (Supported by PCP)	R	This object reports the overall status of the connectivity unit. The warning (4) value means that the connectivity unit needs attention; all other values are essentially self-explanatory. Any of these values may occur with any of the fcConnUnitState values The values are defined as follow: unknown (1), unused (2), ok (3), warning(4), failed (5)
fcConnUnitProduct	SnmpAdminString	The oem product name. (This information is stored in VPD, supported by STATUSMGR)	R	The connectivity unit vendors product model name.
fcConnUnitSerialNo	SnmpAdminString	OEM serial number. (This information is stored in VPD, supported by STATUSMGR)	R	The serial number identification for this connectivity unit.
fcConnUnitUpTime	TimeTicks	Supported by MCK	R	The number of centiseconds since the last unit initialization.
fcConnUnitUrl	DisplayString	Same as fcConnURL.	R/W	URL to launch a management application, if applicable. Otherwise empty string. In a standalone unit, this would be the same as the top level URL. This has the same definition as systemURL for keywords.

Table 2–17: fcConnUnitTable Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitDomainId	OCTET STRING (SIZE (3))	FFCCXX XX is the active domainId of the switch.	R	24 bit Fibre Channel address ID of this connectivity unit. Following the fibre channel standard, the right-most bit of the right-most octet is for the least significant bit of the address value; the left-most bit of the left-most octet, if needed, is for the most significant bit of the address value. If this value is not applicable, all bits set to 1.
fcConnUnitProxy Master	INTEGER	yes(3)	R	A value of 'yes' means this is the proxy master unit for a set of managed units. For example, this could be the only unit with a management card in it for a set of units. A standalone unit should return 'yes' for this object. The values are defined as follow: unknown (1), no (2), yes (3).
fcConnUnitPrincipal	INTEGER	Supported by Fab_contrl subsystem	R	Whether this connectivity unit is the principal unit within the group of fabric elements. If this value is not applicable, return unknown. The values are defined as follow: unknown (1), no (2), yes (3).
fcConnUnitNumSensors	Unsigned32	The number of sensors.	R	Number of sensors in the fcConnUnitSensorTable.
fcConnUnitNumRevs	Unsigned32	1	R	The number of revisions in the fcConnUnitRevsTable.
fcConnUnitModuleId	OCTET STRING(SIZE(16))	return 16 zeros.(currently not supported)	R	This is a unique id, persistent between boots, that can be used to group a set of connectivity units together into a module. The intended use would be to create a connectivity unit with a fcConnUnitType of 'module' to represent a physical or logical group of connectivity units. Then the members of the group would set the value of fcConnUnitId for this 'container' connectivity unit. fcConnUnitModuleId should be zeros if this connectivity unit is not part of a module.

Table 2–17: fcConnUnitTable Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitName	SnmpAdminString	switch=s configured name. (supported by PCP) Writable and persistent across IPL.	R/W	A name for this connectivity unit. This object value should be persistent between boots.
fcConnUnitInfo	SnmpAdminString	A textual description of the product. (supported by PCP) Writable and persistent across IPL.	R/W	Information about this connectivity unit. This object value should be persistent between boots.

Table 2–17: fcConnUnitTable Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitControl	INTEGER	Always return unknown (1) on read operation. resetConnUnitWarmStart (4), offlineConnUnit (5), and onlineConnUnit (6) will be supported by PCP. resetConnUnitWarmStart (4) indicates IPL on the switch is performed. resetConnUnitColdStart (3) is not supported.	R/W	<p>This object is used to control the addressed connectivity unit.</p> <p>NOTE: 'ColdStart' and 'WarmStart' are as defined in mib-2 and are not meant to be a factory reset.</p> <p>resetConnUnitColdStart: the addressed unit performs a 'ColdStart' reset.</p> <p>resetConnUnitWarmStart: the addressed unit performs a 'WarmStart' reset.</p> <p>offlineConnUnit: the addressed unit puts itself into an implementation-dependant 'offline' state. In general, if a unit is in an offline state, it cannot be used to perform meaningful Fibre Channel work.</p> <p>onlineConnUnit: the addressed unit puts itself into an implementation dependant 'online' state. In general, if a unit is in an online state, it is capable of performing meaningful Fibre Channel work.</p> <p>NOTE: Each implementation may chose not to support SNMP Set operations for any or all of these values. For Sets specifying varbinds for instances of this object and values not supported by a given implementation, the agent will return the SNMP WrongValue PDU error code.</p> <p>The values are defined as follow: unknown (1), invalid (2), resetConnUnitColdStart (3), resetConnUnitWarmStart (4), offlineConnUnit (5), onlineConnUnit (6).</p>

Table 2–17: fcConnUnitTable Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitContact	SnmpAdminString	Contact information for this connectivity unit. (supported by PCP) Writable and persistent across IPL.	R/W	Contact information for this connectivity unit. The contact information is intended to facilitate contacting someone in case of problems, questions, etc. (e.g., the help desk internal to a company).
fcConnUnitLocation	SnmpAdminString	The physical location of the switch. (supported by PCP) Writable and persistent across IPL.	R/W	Location information for this connectivity unit.
fcConnUnitEventFilter	FcEventSeverity	Writable and it's set to the Default value of info(8) after IPL.	R/W	This value defines the event severity that will be logged by this connectivity unit. All events of severity less than or equal to fcConnUnitEventFilter are logged in the fcConnUnitEventTable.
fcConnUnitNumEvents	Unsigned32	Number of events in the fcConnUnitEventTable. It's always <= 200, the maximum size of the event table.	R	Number of events currently in the fcConnUnitEventTable.
fcConnUnitMaxEvents	Unsigned32	200.	R	Max number of events that can be recorded at any one time in the fcConnUnitEventTable.
fcConnUnitEventCurrID	Unsigned32	The current event index is used as the last used event id.	R	The last used event id (fcConnUnitEventIndex) recorded in the fcConnUnitEventTable. When no events are presently recorded in the fcConnUnitEventTable, the value of this object MUST be zero.

Firmware Table

The firmware table lists the revisions supported by the associated connectivity units.

Table 2–18: Firmware Table (Director/Switch)

EMC MIB Object Name	Type	Product Mapping	Access	Description
*fcConnUnitRevIndex	Unsigned32	Not accessible	R	A unique value among all fcConnUnitRevsEntry with the same value of fcConnUnitId, in the range between 1 and fcConnUnitNumRevs[fcConnUnitId].
fcConnUnitRevsRevision	SnmpAdminString	XX.XX.XX (The reversion of the switch).	R	A vendor-specific value identifying a revision of a component of the connectivity unit.
fcConnUnitRevsDescription	SnmpAdminString	“Switch Firmware Level”	R	Description of a component in the fcConnUnit to which the revision corresponds.

Sensor Table

The sensor table lists the sensors supported by each connectivity unit.

Table 2–19: Sensor Table (Director/Switch)

EMC MIB Object Name	Type	Product Mapping	Access	Description
*fcConnUnitSensorIndex	Unsigned32	Not assessable.	R	A unique value among all fcConnUnitSensorEntry with the same value of fcConnUnitId, in the range between 1 and fcConnUnitNumSensors[fcConnUnitId].
fcConnUnitSensorName	SnmpAdminString	The module name of the FRU, such as FAN, PWR or THM	R	A textual identification of the sensor intended primarily for operator use.

Table 2–19: Sensor Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitSensorStatus	INTEGER	This value is evaluated from FRU status. The active, backup and update-busy states are mapped to ok(3). And the failed state is mapped to failed(5).	R	The status indicated by the sensor. The values are defined as follow: unknown (1) -- the unit cannot determine the status, other (2) -- the status does not fit any of the remaining values, ok (3) -- indicates good status, warning (4) -- indicates the unit needs attention, failed (5) B indicates the unit is non-functional.
fcConnUnitSensorInfo	SnmpAdminString	The serial number of the FRUs. It's not supported if the module is failed.	R	Miscellaneous static information about the sensor such as its serial number.
fcConnUnitSensorMessage	SnmpAdminString	The textual description of the FRU status, such as "active" or "failed".	R	This describes the status of the sensor as a message. It may also provide more resolution on the sensor indication, for example 'Cover temperature 1503K, above nominal operating range'.
fcConnUnitSensorType	INTEGER	fan (4) or power-supply (5)	R	The type of component being monitored by this sensor. The unknown (1) and other (2) values meanings analogous to those for the fcConnUnitSensorStatus object; all other values are essentially self-explanatory. The values are defined as follow: unknown (1), other (2), battery (3), fan (4), powerSupply (5), transmitter (6), enclosure (7), board (8), and receiver (9).

Table 2–19: Sensor Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitSensorCharacteristic	INTEGER	Not supported. Always other (2).	R	The characteristics being monitored by this sensor. The unknown (1) and other (2) values meanings analogous to those for the fcConnUnitSensorStatus object; emf (5) refers to electro-magnetic field; all other values are essentially self-explanatory. The values are defined as follow: unknown (1), other (2), temperature (3), pressure (4), emf (5), currentValue (6), airflow (7), frequency (8), and power (9).

Port Table

The port table provides generic information on ports for a specific fcConnUnit.

Table 2–20: Port Table (Director/Switch)

EMC MIB Object Name	Type	Product Mapping	Access	Description
*fcConnUnitPortIndex	INTEGER	Not accessible.	R	A unique value among all fcConnUnitPortEntries on this connectivity unit, between 1 and fcConnUnitNumPorts.
fcConnUnitPortType	INTEGER	It is f_port(8) if a device is connected to the port (Specified by login Server) or e_port(9) if a switch is connected to the port (Specified by Fabric Controller) otherwise it is g_port(10), if nothing is connected to the port	R	The port type refers to the protocol active on the port and can take one of the following values: unknown (1) -- cannot be determined, other (2) -- none of the following, notPresent (3) -- no port, hubPort (4) -- hub port, nPort (5) -- end port for fabric, lPort (6) -- end port for loop, flPort (7) -- public loop, fPort (8) -- fabric port, ePort (9) -- fabric expansion port, gPort (10) -- generic fabric port, domainController (1) -- domain controller, hubController (12) -- hub controller, scsi (13) -- parallel SCSI port, escon (14) -- escon port, lan (15) -- LAN port, wan (16) -- WAN port.

Table 2–20: Port Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitPortFCClassCap	FcPortFCClass	For E, G port, return (26) = class_two(8) + class_three(16) + class_f(2) For F port, return (24) = class_two(8) + class_three(16)	R	Bit mask that specifies the classes of service capability of this port. If this object is not applicable, the agent MUST return all bits set to zero.
fcConnUnitPortFCClassOp	FcPortFCClass	For E, G port, return (26) = class_two(8) + class_three(16) + class_f(2), For G port, return unknown(0), For F port, return class_two(8) or class_three(16) or both. (The class of the services is decided through Login Server database)	R	Bit mask that specifies the classes of service that are currently operational at this port. If this object is not applicable, the agent MUST return all bits set to zero.
fcConnUnitPortState	INTEGER	See PortStateMapping document: PortStateFuji2.0.doc.	R	The current state of the port hardware. The bypassed value (4) means that the port is online but is currently being isolated from the loop or fabric for some reason; the other values are essentially self-explanatory. Any value for this object may co-exist with any value for the fcConnUnitPortStatus object. The values are defined as follow: unknown (1), online (2), offline (3), bypassed (4).

Table 2–20: Port Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitPortStatus	INTEGER	See PortStateMapping document: PortStateFuji2.0.doc.	R	The current overall protocol status for the port. The warning value (4) means that the port needs attention; the notParticipating value (6) means that protocol is not being processed; the initializing value (7) means that the port is in the process of coming into service; the bypassed value (8) means that the port has been manually or automatically isolated from the loop or fabric; the other values are essentially self-explanatory. Any value for this object may co-exist with any value for the fcConnUnitPortState object. The values are defined as follow: unknown (1), unused (2), ok (3), warning (4), failure (5), notParticipating (6), initializing (7), bypassed (8).
fcConnUnitPortTransmitterType	INTEGER	This is mapped from the port technology as follow: not present and serial indicate unknown(1), optical sw1g and optical sw2g indicate shortwave(4). optical lw1g and optical lw2g indicate longwave(5), copper db9 and copper amp indicate copper(6). (Get the value from port technology owned by FPM).	R	The technology of the port transceiver. The values are defined as follow: unknown (1), other (2), unused (3), shortwave (4) longwave (5), copper (6), and scsi (7), longwaveNoOFC (8), shortwaveNoOFC (9), longwaveLED (10),

Table 2–20: Port Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitPortModuleType	INTEGER	If the port is not installed, return gbicNotInstalled (8). Otherwise return smallFormFactor (9).	R	The module type of the port connector. This object refers to the hardware implementation of the port. The embedded value (4) means 'fixed' (e.g., oneXnine). The values are defined as follow: unknown (1), other (2), gbic (3), embedded (4), glm(5), gbicSerialId (6), gbicNoSerialId (7), gbicNotInstalled (8), smallFormFactor (9).
fcConnUnitPortWwn	FcNameId	World Wide Name of the port. (Supported by PCP)	R	The World Wide Name of the port. If applicable, otherwise empty string.
fcConnUnitPortFcid	OCTET STRING (SIZE(3))	If it's F-port, return fabric address of the node in form of [domain, area, node]. (Supported by Login Server) If it's E-port, return left-adjusted domain ID of the switch.	R	This is the assigned Fibre Channel ID of this port. This value is expected to be a Big Endian value of 24 bits. If this is loop, then it is the ALPA that is connected. If this is an eport, then it will only contain the domain ID left justified, zero filled. If this port does not have a Fibre Channel address, return all bits set to 1.
fcConnUnitPortSerialNoSn	SnmpAdminString	Not applicable.	R	The serial number identification of the unit (e.g., for a GBIC). If this is not applicable, return a zero-length-string.
fcConnUnitPortRevision	SnmpAdminString	Not applicable.	R	The port revision (e.g., for a GBIC).
fcConnUnitPortVendor	SnmpAdminString	Not applicable.	R	The port vendor (e.g., for a GBIC).

Table 2–20: Port Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitPortSpeed	Gauge32	Return 100000 kilobytes for 1 Gig switches and 200000 kilobytes for 2 Gig switches.	R	The speed of the port in kilobytes per second.
fcConnUnitPortControl	INTEGER	ResetConnUnitPort(3), offlineConnUnitPort(6), onlineConnUnitPort(7), and portFailure(42501) are the only set-operations are supported. Always return unknown(1) on read. (supported by PCP)	R/W	<p>This object is used to control the addressed fcConnUnit's port. Valid commands are: Unknown (1) and invalid (2) are only used as values that are read.</p> <p>ResetConnUnitPort (3): If the addressed connectivity unit allows this operation to be performed on this port, the addressed port performs a vendor-specific 'reset' operation. Examples of these operations are: the Link Reset protocol, the Loop Initialization protocol, or a resynchronization occurring between the transceiver in the addressed port to the transceiver that the port is connected to.</p> <p>bypassConnUnitPort (4): If the addressed connectivity unit allows this operation to be performed to this port, the addressed port performs a vendor-specific 'bypass' operation. Examples of these operations are: transitioning from online to offline, a request (NON-PARTICIPATING) command to the Loop Port state machine, or removal of the port from an arbitrated loop by a hub.</p> <p>unbypassConnUnitPort (5): If the addressed connectivity unit allows this operation to be performed to this port, the addressed port performs a vendor-specific 'unbypass' operation. Examples of these operations are: the Link Failure protocol, a request (PARTICIPATING) command to the Loop Port state machine, or addition of the port to an arbitrated loop by a hub.</p>

Table 2–20: Port Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitPortControl (continued)	INTEGER	ResetConnUnitPort(3), offlineConnUnitPort(6), onlineConnUnitPort(7), and portFailure(42501) are the only set-operations are supported. Always return unknown(1) on read. (supported by PCP)	R/W	<p>offlineConnUnitPort (6): If the addressed connectivity unit allows this operation to be performed to this port, the addressed port performs a vendor-specific 'offline' operation. Examples of these operations are: disabling a port's transceiver, the Link Failure protocol, request (NON-PARTICIPATING) command to the Loop Port state machine, or removal of the port from an arbitrated loop by a hub.</p> <p>onlineConnUnitPort (7): If the addressed connectivity unit allows this operation to be performed to this port, the addressed port performs a vendor-specific 'online' operation. Examples of these operations are: enabling a port's transceiver, the Link Failure protocol, request (PARTICIPATING) command to the Loop Port state machine, or addition of the port from an arbitrated loop by a hub.</p> <p>NOTE: Each implementation may chose not to support SNMP Set operations for any or all of these values. For Sets specifying varbinds for instances of this object and values not supported by a given implementation, the agent will return the SNMP WrongValue PDU error code.</p>
fcConnUnitPortName	SnmpAdminString	Port Name	R/W	A string describing the addressed port.

Table 2–20: Port Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitPortPhysicalNumber	Unsigned32	Physical port number from 0 to Maximum port number - 1	R	This is the internal port number this port is known by. In many implementations, this should be the same as fcConnUnitPortIndex. Some implementations may have an internal port representation not compatible with the rules for table indexes. In that case, provide the internal representation of this port in this object. This value may also be used in the fcConnUnitLinkPortNumberX or fcConnUnitLinkPortNumberY objects of the fcConnUnitLinkTable.
fcConnUnitPortProtocolCap (added from Mib3.0)	OCTET STRING (SIZE (2))	Fabric(2)	R	Bit mask that specifies the driver level protocol capability of this port. If this is not applicable, return all bits set to zero. The bits have the following definition: unknown - 0, Loop - 1, Fabric - 2, SCSI - 4, TCP/IP - 8, VI - 16, FICON - 32.
fcConnUnitPortProtocolOp (added from Mib3.0)	OCTET STRING (SIZE (2))	Same as above	R	Bit mask that specifies the driver level protocol(s) that are currently operational. If this is not applicable, return all bits set to zero. This object has the same definition as fcConnUnitPortProtocolCap.
fcConnUnitPortNodeWwn (added from Mib3.0)	FcNameId	switch WWN	R	The Node World Wide Name of the port if applicable, otherwise all zeros. This should have the same value for a group of related ports. The container is defined as the largest physical entity. For example, all ports on HBAs on a host will have the same Node WWN. All ports on the same storage subsystem will have the same Node WWN.

Table 2–20: Port Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitPortHWState (added from Mib3.0)	INTEGER	See PortStateMapping document: PortStateFuji2.0.doc.	R	The hardware detected state of the port. The values are defined as follow: unknown (1), failed (2) -- port failed diagnostics, bypassed (3) -- FCAL bypass, loop only, active (4) -- connected to a device, loopback (5) -- Port in ext loopback, txfault (6) -- Transmitter fault, noMedia (7) -- media not installed, linkDown (8) -- waiting for activity (rx sync).

Event Table

The table of connectivity unit events. Errors, warnings, and information should be reported in this table.

Table 2–21: Event Table (Director/Switch)

EMC MIB Object Name	Type	Product Mapping	Access	Description
*fcConnUnitEventIndex	Unsigned32	An event index	R	Each connectivity unit has its own event buffer. As it wraps, it may write over previous events. This object is an index into the buffer. It is recommended that this table be read using 'getNext's to retrieve the initial table. The management application should read the event table at periodic intervals and then determine if any new entries were added by comparing the last known index value with the current highest index value. The management application should then update its copy of the event table. If the read interval is too long, it is possible that there may be events that may not be contained in the agent's internal event buffer.

Table 2–21: Event Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
*fcConnUnitEventIndex (continued)	Unsigned32	An event index.	R	For example, an agent may read events 50-75. At the next read interval, fcConnUnitEventCurrID is 189. If the management app tries to read event index 76, and the agent's internal buffer is 100 entries max, event index 76 will no longer be available. The index value is an incrementing integer starting from one every time there is a table reset. On table reset, all contents are emptied and all indices are set to zero. When an event is added to the table, the event is assigned the next higher integer value than the last item entered into the table. If the index value reaches its maximum value, the next item entered will cause the index value to roll over and start at one again.
fcConnUnitREventTime	DisplayString (SIZE (15))	The time when the event occurred.	R	This is the real time when the event occurred. It has the following format. DDMMYYYY HHMMSS DD = day number, MM = month number, YYYY = year number, HH = hour number, MM= minute number, SS = seconds number If not applicable, return a NULL string.
fcConnUnitSEventTime	TimeTicks	Translated from fcConnUnitREventTime.	R	This is the sysuptime timestamp when the event occurred.

Table 2–21: Event Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitEventSeverity	FcEventSeverity	The mapping from switch event severity level to FcEventSeverity : <u>SWITCH MIB</u> informational info(8) minor error(5) major critical(4) severe emergency(2)	R	The event severity level.
fcConnUnitEvent Type	INTEGER	Always status(3).	R	The type of this event. The values are defined as follow: unknown (1), other (2), status (3), configuration (4), topology (5).
fcConnUnitEvent Object	OBJECT IDENTIFIER	Only the OID of the fcConnUnit is returned. Other information is not supported.	R	This is used with the fcConnUnitEventType to identify which object the event refers to. It can be the OID of a connectivity unit or of another object like fcConnUnitPortStatus[...]
fcConnUnitEvent Descr	SnmpAdmin String	“Reason code XX”, XX is the event reason code.	R	The description of the event.

Link Table

The link table is intended to organize and communicate any information the agent which would assist a management application to discover the CONNECTIVITY UNITS in the framework and the TOPOLOGY of their interconnect. That is, the goal is to assist the management application not only to LIST the elements of the framework, but to MAP them.

With this goal, the agent SHOULD include as much as it possesses about any links from its own connectivity units to others, including links among its own units.

An agent SHOULD include partial information about links if it is not able to fully define them. For an entry to be considered to be valid, both the X (local) and the Y (remote) need to have one valid value.

If the agent is able to discover links which do not directly attach to members of its agency and its discovery algorithm gives some assurance the links are recently valid, it MAY include these links.

Link information entered by administrative action MAY be included even if not validated directly if the link has at least one endpoint in this agency, but SHOULD NOT be included otherwise.

A connectivity unit can fill the table in as best it can. One of the methods to fill this in would be to use the RNID ELS (ANSI document 99-422v0). This allows one to query a port for the information needed for the link table.

This table is accessed either directly if the management software has an index value or via GetNexts. The value of the indexes are not required to be contiguous. Each entry created in this table will be assigned an index. This relationship is kept persistent until the entry is removed from the table or the system is reset. The total number of entries are defined by the size of the table.

Table 2–22: Link Table (Director/Switch)

EMC MIB Object Name	Type	Product Mapping	Access	Description
*fcConnUnitLinkIndex	Unsigned32	A link index.	R	This value is used to create a unique value for each entry in the link table with the same fcConnUnitId. The value can only be reused if it is not currently in use and the value is the next candidate to be used. This value is allowed to wrap at the highest value represented by the number of bits. This value is reset to zero when the system is reset and the first value to be used is 1.
fcConnUnitLinkNodeIdx	OCTET STRING (SIZE(16))	The WWN of the local fcConnUnit is returned. This information is available for both E and F ports	R	The node WWN of the unit at one end of the link. If the node WWN is unknown and the node is a fcConnUnit in the responding agent then the value of this object MUST BE equal to its fcConnUnitId.
fcConnUnitLinkPortNumberX	Integer32	The fcConnUnit=local port number is returned. This information is available for both E and F ports.	R	The port number on the unit specified by fcConnUnitLinkNodeIdx if known, otherwise -1. If the value is non-negative then it will be equal to fcConnUnitPortPhysicalNumber.
fcConnUnitLinkPortWwnX	OCTET STRING	The local side port WWN on the link. This information is available for both E and F ports.	R	The port WWN of the unit specified by fcConnUnitLinkNodeIdx if known, otherwise 16 octets of binary 0.

Table 2–22: Link Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitLinkNodeldY	OCTET STRING (SIZE(16))	The attached node WWN on the link. This information is available for E ports and F ports. E port nodeldY can be retrieved from RNID, F port NodeldY is supported by FLOGI.	R	The node WWN of the unit at the other end of the link. If the node WWN is unknown and the node is a fcConnUnit in the responding SNMP agent then the value of this object MUST BE equal to its fcConnUnitId.
fcConnUnitLinkPortNumberY	Integer32	The attached port number on the link. This information is available only for E ports from ISR. For F port, -1 is returned.	R	The port number on the unit specified by fcConnUnitLinkNodeldY if known, otherwise -1. If the value is non-negative then it will be equal to fcConnUnitPortPhysicalNumber.
fcConnUnitLinkPortWwnY	OCTET STRING	The attached port WWN on the link. This information is available for F ports only. For E port, return 16 octets of binary 0.	R	The port WWN on the unit specified by fcConnUnitLinkNodeldY if known, otherwise 16 octets of binary 0.
fcConnUnitLinkAgentAddressY	OCTET STRING (SIZE(16))	Get the value from RNID, owned by Login Server.	R	The address of an FCMGMT MIB agent for the node identified by fcConnUnitLinkNodeldY, if known; otherwise 16 octets of binary 0.

Table 2–22: Link Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitLinkAgentAddressTypeY	Unsigned32	Get the value from RNID, owned by Login Server.	R	If fcConnUnitLinkAgentAddressY is non-zero, then it is a protocol address. fcConnUnitLinkAgentAddressTypeY is the 'address family number' assigned by IANA to identify the address format. (e.g., 1 is Ipv4, 2 is Ipv6).
fcConnUnitLinkAgentPortY	Unsigned32	Get the value from RNID, owned by Login Server.	R	The IP port number for the agent. This is provided in case the agent is at a non-standard SNMP port.
fcConnUnitLinkUnitTypeY	FcUnitType	If it's E port, return switch (4). Otherwise return RNID type Y.	R	Type of the FC connectivity unit as defined in fcConnUnitType.
fcConnUnitLinkConnIdY	OCTET STRING (SIZE(3))	For F ports, return Fibre Channel Address. For E ports, return left adjusted domainId of the switch.	R	This is the Fibre Channel ID of this port. If the connectivity unit is a switch, this is expected to be a 24-bit Big Endian value. If this is loop, then it is the ALPA that is connected. If this is an e-port, then it will only contain the domain ID. If not any of those, unknown or cascaded loop, return all bits set to 1.

Port Statistics Table

There is one and only one statistics table for each individual port. For all objects in statistics table, if the object is not supported by the conn unit then the high order bit is set to 1 with all other bits set to zero. The high order bit is reserved to indicate if the object is supported or not. All objects start at a value of zero at hardware initialization and continue incrementing till end of 63 bits and then wrap to zero.

Table 2–23: Port Statistics Table (Director/Switch)

EMC MIB Object Name	Type	HP Product Mapping from PSCC to SWITCH.	Access	Description
*fcConnUnitPortStatIndex	Unsigned32	A port number, starting from 1 to maximum number of ports.	R	A unique value among all entries in this table, between 0 and fcConnUnitNumPort[fcConnUnitPortUnitId]
fcConnUnitPortStatCountError	Counter64	This MIB object counts address ID errors, CRC errors, delimiter errors, frames too short, invalid transmission words, link failures, primitive sequence errors, signal losses, synchronization losses. (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	A count of the errors that have occurred on this port.

Table 2–23: Port Statistics Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	HP Product Mapping from PSCC to SWITCH.	Access	Description
fcConnUnitPortStatCountTxObjects	Counter64	stTxFrames (64 bit counter)	R	The number of frames/packets/IOs/etc. that have been transmitted by this port. Note: A Fibre Channel frame starts with SOF and ends with EOF. FC loop devices should not count frames passed through. This value represents the sum total for all other Tx objects.
fcConnUnitPortStatCountRxObjects	Counter64	stRxFrames (64 bit counter)	R	The number of frames/packets/IOs/etc. that have been received by this port. Note: A Fibre Channel frame starts with SOF and ends with EOF. FC loop devices should not count frames passed through. This value represents the sum total for all other Rx objects.
fcConnUnitPortStatCountTxElements	Counter64	stTxOctets (64 bit counter)	R	The number of octets or bytes that have been transmitted by this port. One second periodic polling of the port. This value is saved and compared with the next polled value to compute net throughput. Note, for Fibre Channel, ordered sets are not included in the count.
fcConnUnitPortStatCountRxElements	Counter64	stRxOctets (64 bit counter)	R	The number of octets or bytes that have been received by this port. One second periodic polling of the port. This value is saved and compared with the next polled value to compute net throughput. Note, for Fibre Channel, ordered sets are not included in the count.
fcConnUnitPortStatCountBBCreditZero	Counter64	Not supported	R	Count of transitions in/out of BB_Credit zero state. The other side is not providing any credit. Note, this is a Fibre Channel stat only.

Table 2–23: Port Statistics Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	HP Product Mapping from PSCC to SWITCH.	Access	Description
fcConnUnitPortStatCountInputBuffersFull	Counter64	Not supported	R	Count of occurrences when all input buffers of a port were full and outbound buffer-to-buffer credit transitioned to zero. There is no credit to provide to other side. Note, this is a Fibre Channel stat only.
fcConnUnitPortStatCountFBSYFrames	Counter64	Not supported	R	Count of times that FBSY was returned to this port as a result of a frame that could not be delivered to the other end of the link. This occurs if either the Fabric or the destination port is temporarily busy. Port can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat. This is the sum of all classes. If you cannot keep the by class counters, then keep the sum counters.
fcConnUnitPortStatCountPBSYFrames	Counter64	Not supported	R	Count of times that PBSY was returned to this port as a result of a frame that could not be delivered to the other end of the link. This occurs if the destination port is temporarily busy. PBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat. This is the sum of all classes. If you cannot keep the by class counters, then keep the sum counters.
fcConnUnitPortStatCountFRJTFrames	Counter64	Not supported	R	Count of times that FRJT was returned to this port as a result of a Frame that was rejected by the fabric. Note, this is the total for all classes and is a Fibre Channel only stat.

Table 2–23: Port Statistics Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	HP Product Mapping from PSCC to SWITCH.	Access	Description
fcConnUnitPortStatCountPRJTFrames	Counter64	Not supported	R	Count of times that FRJT was returned to this port as a result of a Frame that was rejected at the destination N_Port. Note, This is the total for all classes and is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1RxFrames	Counter64	Not supported	R	Count of Class 1 Frames received at this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1TxFrames	Counter64	Not supported	R	Count of Class 1 Frames transmitted on this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1FBSYFrames	Counter64	Not supported	R	Count of times that FBSY was returned to this port as a result of a Class 1 Frame that could not be delivered to the other end of the link. This occurs if either the Fabric or the destination port is temporarily busy. FBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1PBSYFrames	Counter64	Not supported	R	Count of times that PBSY was returned to this port as a result of a Class 1 Frame that could not be delivered to the other end of the link. This occurs if the destination N_Port is temporarily busy. PBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1FRJTFrames	Counter64	Not supported	R	Count of times that FRJT was returned to this port as a result of a Class 1 Frame that was rejected by the fabric. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass1PRJTFrames	Counter64	Not supported	R	Count of times that FRJT was returned to this port as a result of a Class 1 Frame that was rejected at the destination N_Port. Note, this is a Fibre Channel only stat.

Table 2–23: Port Statistics Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	HP Product Mapping from PSCC to SWITCH.	Access	Description
fcConnUnitPortStatCountClass2RxFrames	Counter64	stC2FramesIn (64 bit counter)	R	Count of Class 2 Frames received at this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass2TxFrames	Counter64	stC2FramesOut (64 bit counter)	R	Count of Class 2 Frames transmitted out this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass2FBSYFrames	Counter64	stC2FabricBusy (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of times that FBSY was returned to this port as a result of a Class 2 Frame that could not be delivered to the other end of the link. This occurs if either the Fabric or the destination port is temporarily busy. FBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass2PBSYFrames	Counter64	Not supported	R	Count of times that PBSY was returned to this port as a result of a Class 2 Frame that could not be delivered to the other end of the link. This occurs if the destination N_Port is temporarily busy. PBSY can only occur on SOFc1 frames (the frames that establish a connection). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass2FRJTFrames	Counter64	stC2FabricReject (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of times that FRJT was returned to this port as a result of a Class 2 Frame that was rejected by the fabric. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass2PRJTFrames	Counter64	Not supported	R	Count of times that FRJT was returned to this port as a result of a Class 2 Frame that was rejected at the destination N_Port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass3RxFrames	Counter64	stC3FramesIn (64 bit counter)	R	Count of Class 3 Frames received at this port. Note, this is a Fibre Channel only stat.

Table 2–23: Port Statistics Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	HP Product Mapping from PSCC to SWITCH.	Access	Description
fcConnUnitPortStatCountClass3TxFrames	Counter64	stC3FramesOut (64 bit counter)	R	Count of Class 3 Frames transmitted out this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountClass3Discards	Counter64	stC3Discards (64 bit counter)	R	Count of Class 3 Frames that were discarded upon reception at this port. There is no FBSY or FRJT generated for Class 3 Frames. They are simply discarded if they cannot be delivered. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountRxMulticastObjects	Counter64	Not supported	R	Count of Multicast Frames or Packets received at this port.
fcConnUnitPortStatCountTxMulticastObjects	Counter64	Not supported	R	Count of Multicast Frames or Packets transmitted out this port.
fcConnUnitPortStatCountRxBroadcastObjects	Counter64	Not supported	R	Count of Broadcast Frames or Packets received at this port.
fcConnUnitPortStatCountTxBroadcastObjects	Counter64	Not supported	R	Count of Broadcast Frames or Packets transmitted out this port. On a Fibre Channel loop, count only OPNr frames generated.
fcConnUnitPortStatCountRxLinkResets	Counter64	StLinkResetsIn (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of Link resets. This is the number of LRs received. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountTxLinkResets	Counter64	stLinkResetsOut (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of Link resets. This is the number LRs transmitted. Note, this is a Fibre Channel only stat.

Table 2–23: Port Statistics Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	HP Product Mapping from PSCC to SWITCH.	Access	Description
fcConnUnitPortStatCountNumberLinkResets	Counter64	StLinkResetsIn + stLinkResetsOut (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of Link resets and LIPs detected at this port. The number times the reset link protocol is initiated. These are the count of the logical resets, a count of the number of primitives. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountRxOfflineSequences	Counter64	StOlssIn (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of Offline Primitive OLS received at this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountTxOfflineSequences	Counter64	StOlssOut (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of Offline Primitive OLS transmitted by this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountNumberOfflineSequences	Counter64	stOlssIn + stOlssOut (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of Offline Primitive sequence received at this port. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountLinkFailures	Counter64	stLinkFailures (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of link failures. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountInvalidCRC	Counter64	stInvalidCrcs (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of frames received with invalid CRC. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Loop ports should not count CRC errors passing through when monitoring. Note, this is a Fibre Channel only stat.

Table 2–23: Port Statistics Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	HP Product Mapping from PSCC to SWITCH.	Access	Description
fcConnUnitPortStatCountInvalidTxWords	Counter64	stInvalidTxWords (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of invalid transmission words received at this port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountPrimitiveSequenceProtocolErrors	Counter64	stPrimSeqProtoErrors (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of primitive sequence protocol errors detected at this port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountLossOfSignal	Counter64	stSigLosses (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of instances of signal loss detected at port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountLossOfSynchronization	Counter64	stSynLosses (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of instances of synchronization loss detected at port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountInvalidOrderedSets	Counter64	Not supported	R	Count of invalid ordered sets received at port. This count is part of the Link Error Status Block (LESB). (FC-PH 29.8). Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountFramesTooLong	Counter64	Not supported	R	Count of frames received at this port where the frame length was greater than what was agreed to in FLOGI/PLOGI. This could be caused by losing the end of frame delimiter. Note, this is a Fibre Channel only stat.

Table 2–23: Port Statistics Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	HP Product Mapping from PSCC to SWITCH.	Access	Description
fcConnUnitPortStatCountFramesTruncated	Counter64	stFramesTooShort (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of frames received at this port where the frame length was less than the minimum indicated by the frame header - normally 24 bytes, but it could be more if the DFCTL field indicates an optional header should have been present. Note, this is a Fibre Channel only stat
fcConnUnitPortStatCountAddressErrors	Counter64	stAddrIDErrors (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of frames received with unknown addressing. e.g. unknown SID or DID. The SID or DID is not known to the routing algorithm. Note: this is a Fibre Channel only stat.
fcConnUnitPortStatCountDelimiterErrors	Counter64	stDelimiterErrors (Only supports low 32 bits of counter, high 32 bits are set to zero)	R	Count of invalid frame delimiters received at this port. An example is a frame with a class 2 start and a class 3 at the end. Note, this is a Fibre Channel only stat.
fcConnUnitPortStatCountEncodingDisparityErrors	Counter64	Not supported	R	Count of disparity errors received at this port. Note, this is a Fibre Channel only stat.

Name Server Table

This table is accessed either directly if the management software has an index value or via GetNexts. The value of the indexes is not required to be contiguous. Each entry created in this table will be assigned an index. This relationship is kept persistent until the entry is removed from the table or the system is reset. The total number of entries is defined by the size of the table.

Table 2–24: Name Server Table (Director/Switch)

EMC MIB Object Name	Type	Product Mapping	Access	Description
*fcConnUnitSnsPortIndex	Counter64 INTEGER	A port number, starting from 1 to maximum number of ports.	R	The physical port number of this SNS table entry. Each physical port has an SNS table with 1-n entries indexed by fcConnUnitSnsPortIdentifier (port address)
*fcConnUnitSnsPortIdentifier	FcAddressId	3 bytes FcAddress in the least significant bytes.	R	The Port Identifier for this entry in the SNS table.
fcConnUnitSnsPortName	FcNameId	Port WWN Name	R	The Port WWN Name for this entry in the SNS table.
fcConnUnitSnsNodeName	FcNameId	Node Name	R	The Node Name for this entry in the SNS table.
fcConnUnitSnsClassOfSvc	OCTET STRING (SIZE (1))	Class of Service that matches the FC class service convention used in name server.	R	The Classes of Service offered by this entry in the SNS table.
fcConnUnitSnsNodeIPAddress	OCTET STRING (SIZE(16))	Node IP address	R	The IPv6 formatted address of the Node for this entry in the SNS table.
fcConnUnitSnsProcessAssoc	OCTET STRING (SIZE (8))	Process Associator.	R	The Process Associator for this entry in the SNS table.
fcConnUnitSnsFC4Type	OCTET STRING (SIZE (32))	FC4 type	R	The FC-4 Types supported by this entry in the SNS table.

Table 2–24: Name Server Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcConnUnitSnsPortType	OCTET STRING (SIZE (1))	Port type	R	The Port Type of this entry in the SNS table.
fcConnUnitSnsPortIPAddress	OCTET STRING (SIZE(16))	Port IP Address	R	The IPv6 formatted address of this entry in the SNS table.
fcConnUnitSnsFabricPortName	FcNameId	Fabric Port Name	R	The Fabric Port name of this entry in the SNS table.
fcConnUnitSnsHardAddress	FcGlobalId	3 bytes address from name server in the least significant bytes	R	The Hard ALPA of this entry in the SNS table.
fcConnUnitSnsSymbolicPortName	DisplayString (SIZE (0..79))	Symbolic port name	R	The Symbolic Port Name of this entry in the SNS table.
fcConnUnitSnsSymbolicNodeName	DisplayString (SIZE (0..79))	Symbolic node name	R	The Symbolic Node Name of this entry in the SNS table.

SNMP Trap Registration Group Table

Table 2–25: SNMP Trap Registration Group Table (Director/Switch)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcTrapMaxClients	Unsigned32	The maximum number of SNMP trap recipients can be supported in the system.	R	The maximum number of SNMP trap recipients supported by the connectivity unit.
fcTrapClientCount	Unsigned32	The current number of trap recipients	R	The current number of rows in the trap table.

Trap Registration Table

The trapRegTable contains a row for each IP address/port number that traps will be sent to.

Table 2–26: TrapRegTable Table (Director/Switch)

EMC MIB Object Name	Type	Product Mapping	Access	Description
*fcTrapRegIpAddress	IpAddress	Trap recipient's IP address.	R/C	The IP address of a client registered for traps.
*fcTrapRegPort	Unsigned32	UDP port.	R/C	The UDP port to send traps to for this host. Normally this would be the standard trap port (UDP/162).
fcTrapRegFilter	FcEventSeverity	The severity filter. (This information not exposed in SNMP configuration dialog)	R/C	This value defines the trap severity filter for this trap host. The fcConnUnit will send to the designated target entity traps that have a severity level less than or equal to this value.

Table 2–26: TrapRegTable Table (Director/Switch) (Continued)

EMC MIB Object Name	Type	Product Mapping	Access	Description
fcTrapRegRowState	RowStatus	Row status.	R/C	<p>Specifies the operational status of the row.</p> <p>A RowStatus object may take any of six defined values:</p> <ul style="list-style-type: none"> - active (1): traps may be sent as specified in this row; a management application may change the value of any objects in the row when the status is active. - notInService (2): traps will not be sent using this row. - notReady (3): the conceptual row exists in the agent, but is missing information necessary to send traps (i.e., if any of the other objects in the row are not present or contain invalid values); this value may not be supplied by a management application. - createAndGo (4): supplied by a management application wishing to create a new instance of a conceptual row, supplying valid values for the all the other objects in the row, and have its status automatically set to active, making it available for use in sending traps. - createAndWait (5): supplied by a management application wishing to create a new instance of a conceptual row but not make it available for use in sending traps at that time; and, - destroy (6): supplied by a management application wishing to delete an existing conceptual row.

Trap Type Table

Table 2–27: Trap Type Table (Director/Switch)

EMC MIB Object Name	Type Number	Product Mapping	OID and Value	Description
fcConnUnitStatusChange	1	Generated when the switch=online status or operational status changes	".1.3.6.1.2.1.8888.1.1.3.1.6" + unitId fcConnUnitStatus, ".1.3.6.1.2.1.8888.1.1.3.1.5" + unitId fcConnUnitState	The overall status of the connectivity unit has changed. Recommended severity level (for filtering): alert
fcConnUnitDeletedTrap	2	Not supported on the connUnit.	N/A	An fcConnUnit has been deleted from this agent. Recommended severity level (for filtering): warning
fcConnUnitEventTrap	3	Generated when a new event is generated.	".1.3.6.1.2.1.8888.1.1.7.1.1" + unitId fcConnUnitEventIndex, ".1.3.6.1.2.1.8888.1.1.7.1.5" + unitId fcConnUnitEventType, ".1.3.6.1.2.1.8888.1.1.7.1.6" + unitId fcConnUnitEventObject, ".1.3.6.1.2.1.8888.1.1.7.1.7" + unitId fcConnUnitEventDescr	An event has been generated by the connectivity unit. Recommended severity level (for filtering): info
fcConnUnitSensorStatusChange	4	Generated when one of fans/powers status is changed.	".1.3.6.1.2.1.8888.1.1.5.1.3" + unitId + sensor_nbr fcConnUnitSensorState	The overall status of the connectivity unit has changed. Recommended severity level (for filtering): alert
fcConnUnitPortStatusChange	5	Generated when a port state/status is changed.	".1.3.6.1.2.1.8888.1.1.6.1.6" + unitId + port_nbr fcConnUnitPortStatus, ".1.3.6.1.2.1.8888.1.1.6.1.5" + unitId + port_nbr fcConnUnitPortState	The overall status of the connectivity unit has changed. Recommended severity level (for filtering): alert

Fibre Channel Fabric Element MIB Support

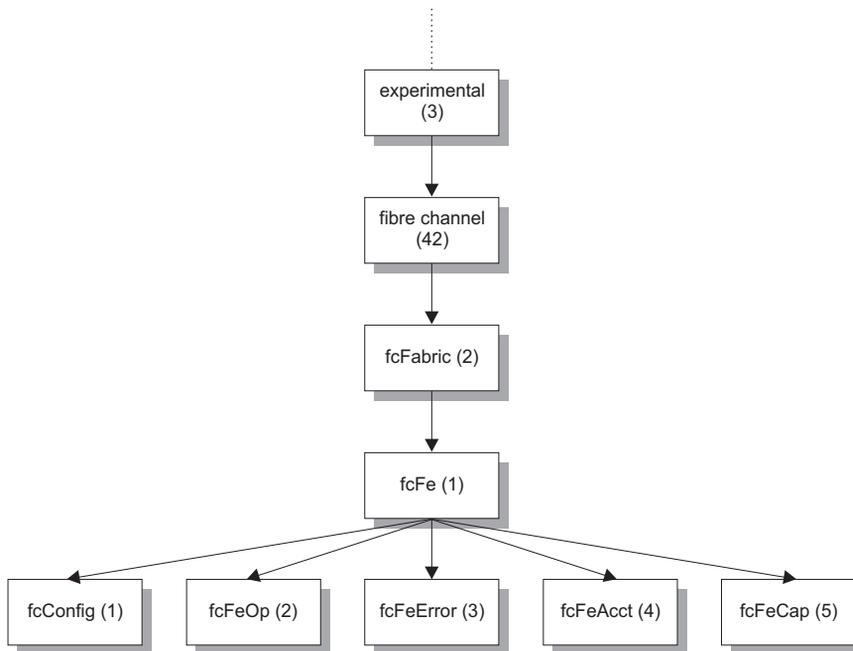


Figure 2–6: Fibre Channel Fabric Element MIB support tree

The Fibre Channel Fabric Element (FCFE) management information base (MIB) enables users on network management stations to monitor, control, and configure the Director or Edge Switch remotely using functions specifically for the Director or Edge Switch. Products support version 1.10 of the FCFE MIB. There are five groups of variables defined and supported by the agent:

- Configuration (FcFeConfig)
- Operation (FcFeOp)
- Error (FcFeError)
- Accounting (FcFeAcct)
- Capability (FcFeCap)

The following sections define the FCFE MIB variables and their output. All variables in the FCFE MIB except for `fcFxPortPhysAdminStatus`, which is defined under `fcFxPortPhysTable` in `fcFeOp` group, are read-only.

Error Group Table

This `FcPortErrorTable` displays the number of errors detected by an FxPort since the management agent initialized, enabling you to determine the quality of the link between the FxPort and its attached NxPort.

Table 2–28: Error Group

Variable	Provides the Number of:
<code>fcFxPortErrorModuleIndex</code>	This object identifies the module containing the FxPort for which this entry contains information. The index starts at 1.
<code>fcFxPortErrorFxPortIndex</code>	This object identifies the FxPort within the module. This number ranges from 1 to the value of <code>fcFeModulePortCapacity</code> for the associated module. The value remains constant for the identified FxPort until the module is re-initialized. The index starts at 1.
<code>fcFxPortLinkFailures</code>	The number of link failures detected by this FxPort.
<code>fcFxPortSyncLosses</code>	The number of loss of synchronization detected by the FxPort.
<code>fcFxPortSigLosses</code>	The number of loss of signal detected by the FxPort.
<code>fcFxPortPrimSeqProtoErrors</code>	The number of primitive sequence protocol errors detected by the FxPort.
<code>fcFxPortInvalidTxWords</code>	The number of invalid transmission word detected by the FxPort.
<code>fcFxPortInvalidCrcs</code>	The number of invalid CRC detected by the FxPort.
<code>fcFxPortDelimiterErrors</code>	The number of Delimiter Errors detected by this FxPort.
<code>fcFxPortAddressIdErrors</code>	The number of address identifier errors detected by this FxPort.
<code>fcFxPortLinkResetIns</code>	The number of Link Reset Protocol received by this FxPort from the attached NxPort.
<code>fcFxPortLinkResetOuts</code>	The number of Link Reset Protocol issued by this FxPort to the attached NxPort.
<code>fcFxPortOIsIns</code>	The number of Offline Sequence received by this FxPort.
<code>fcFxPortOIsOuts</code>	The number of Offline Sequence issued by this FxPort.

Accounting: Class 1

Table 2–29: Accounting: Class 1

Variable	Provides the Number of Class 1
fcFxPortC1AcctModuleIndex	This object identifies the module containing the FxPort for which this entry contains information. The index starts at 1.
fcFxPortC1AcctFxPortIndex	This object identifies the FxPort within the module. This number ranges from 1 to the value of fcFeModulePortCapacity for the associated module. The value remains constant for the identified FxPort until the module is re-initialized. The index starts at 1.
fcFxPortC1InConnections	The number of Class 1 connections successfully established in which the attached NxPort is the source of the connect-request. This value is fixed at 0.
fcFxPortC1OutConnections	The number of Class 1 connections successfully established in which the attached NxPort is the destination of the connect-request. This value is fixed at 0.
fcFxPortC1FbsyFrames	The number of F_BSY frames generated by this FxPort against Class 1 connect-request. This value is fixed at 0.
fcFxPortC1FrjtFrames	The number of F_RJT frames generated by this FxPort against Class 1 connect-request. This value is fixed at 0.
fcFxPortC1ConnTime	The cumulative time that this FxPort has been engaged in Class 1 connection. The amount of time of each connection is counted in octets from after a connect-request has been accepted until the connection is disengaged, either by an EOFdt or Link Reset. This value is fixed at 0.
fcFxPortC1InFrames	The number of Class 1 frames (other than Class 1 connect-request) received by this FxPort from its attached NxPort. This value is fixed at 0.
fcFxPortC1OutFrames	The number of Class 1 frames (other than Class 1 connect-request) delivered through this FxPort to its attached NxPort. This value is fixed at 0.
fcFxPortC1InOctets	The number of Class 1 octets (other than Class 1 connect-request) received through this FxPort to its attached NxPort. This value is fixed at 0.
fcFxPortC1OutOctets	The number of Class 1 octets (other than Class 1 connect-request) delivered through this FxPort to its attached NxPort. This value is fixed at 0.
fcFxPortC1Discards	This value is fixed at 0.

Accounting: Class 2

The *Fcfportc2accttable* displays class 2 accounting information for each FxPort in the fabric element recorded since the management agent initialized.

Table 2–30: Accounting: Class 2

Variable	Provides the Number of Class 2:
fcFxPortC2AcctModuleIndex	This object identifies the module containing the FxPort for which this entry contains information. The index starts at 1.
fcFxPortC2AcctFxPortIndex	This object identifies the FxPort within the module. This number ranges from 1 to the value of fcFeModulePortCapacity for the associated module. The value remains constant for the identified FxPort until the module is re-initialized. The index starts at 1.
fcFxPortC2InFrames	The number of Class 2 frames received by this FxPort from its attached NxPort.
fcFxPortC2OutFrames	The number of Class 2 frames delivered through this FxPort to its attached NxPort.
fcFxPortC2InOctets	The number of Class 2 frame octets, including the frame delimiters, received by this FxPort from its attached NxPort.
fcFxPortC2OutOctets	The number of Class 2 frame octets, including the frame delimiters, delivered through this FxPort to its attached NxPort.
fcFxPortC2Discards	The number of Class 2 frames discarded by this FxPort. This value is not supported. It's always zero.
fcFxPortC2FbsyFrames	The number of F_BSY frames generated by this FxPort against Class 2 frames.
fcFxPortC2FrjtFrames	The number of F_RJT frames generated by this FxPort against Class 2 frames.

Accounting: Class 3

The *Fcfportc3accttable* displays class 3 accounting information for each FxPort in the fabric element recorded since the management agent initialized.

Table 2–31: Accounting: Class 3

Variable	Provides the Number of Class 3:
fcFxPortC3AcctModuleIndex	This object identifies the module containing the FxPort for which this entry contains information.
fcFxPortC3AcctFxPortIndex	This object identifies the FxPort within the module. This number ranges from 1 to the value of fcFeModulePortCapacity for the associated module. The value remains constant for the identified FxPort until the module is re-initialized. The index starts at 1.
fcFxPortC3InFrames	The number of Class 3 frames received by this FxPort from its attached NxPort.

Table 2–31: Accounting: Class 3 (Continued)

Variable	Provides the Number of Class 3:
fcFxpPortC3OutFrames	The number of Class 3 frames delivered through this FxPort to its attached NxPort.
fcFxpPortC3InOctets	The number of Class 3 frame octets, including the frame delimiters, received by this FxPort from its attached NxPort.
fcFxpPortC3OutOctets	The number of Class 3 frame octets, including the frame delimiters, delivered through this FxPort to its attached NxPort.
fcFxpPortC3Discards	The number of Class 3 frames discarded by this FxPort.

Operation: FxPort Operation Table

The *Fcfportopertable* displays the operational status and parameters of the FxPorts.

Table 2–32: FxPort Operation Table

Variable	Provides:
fcFxpPortOperModuleIndex	This object identifies the module containing the FxPort for which this entry contains information. The index starts at 1.
fcFxpPortOperFxPortIndex	This object identifies the FxPort within the module. This number ranges from 1 to the value of fcFeModulePortCapacity for the associated module. The value remains constant for the identified FxPort until the module is re-initialized. The index starts at 1.
fcFxpPortID	The address identifier by which this FxPort is identified within the Fabric. The FxPort may assign its address identifier to its attached NxPort(s) during Fabric Login. Return a port id if the port is login into the fabric, otherwise this address is 000000 in Directors and Edge Switches.
fcFPortAttachedPortName	The port name of the attached NxPort, if applicable. If the value of this object is '0000000000000000'H, this FxPort has no NxPort attached to it. This variable has been deprecated and may be implemented for backward compatibility.
fcFPortConnectedPort	The address identifier of the destination FxPort with which this FxPort is currently engaged in a either a Class 1 or loop connection. If the value of this object is '000000'H, this FxPort is not engaged in a class 1 connection. This variable has been deprecated and may be implemented for backward compatibility. This address is fixed at 0x000000.
fcFxpPortBbCreditAvailable	The number of buffers currently available for receiving frames from the attached port in the buffer-to-buffer flow control. The value should be less than or equal to fcFxpPortBbCredit.

Table 2–32: FxPort Operation Table (Continued)

Variable	Provides:
fcFxPortOperMode	The current operational mode of the FxPort. This value is fport(2) if the port_state_data is unavailable or the port is an F_Port, or unknown(1) for the other port state.
fcFxPortAdminMode	The desired operational mode of the FxPort. This value is fport(2) if the port_state_data is unavailable or the port is an F_Port, or unknown(1) for the other port state.

Operation: FxPort Physical Level Table

The *Fcfportphstable* displays the physical level status and parameters for each FxPort in the fabric element.

Table 2–33: Operation: FxPort Physical Level

Variable	Provides:
fcFxPortPhysModuleIndex	This object identifies the module containing the FxPort for which this entry contains information. The index starts at 1.
fcFxPortPhysFxPortIndex	This object identifies the FxPort within the module. This number ranges from 1 to the value of fcFeModulePortCapacity for the associated module. The value remains constant for the identified FxPort until the module is re-initialized. The index starts at 1.
fcFxPortPhysAdminStatus	The desired state of the FxPort. A management station may place the FxPort in a desired state by setting this object accordingly. The testing(3) state indicates that no operational frames can be passed. When a Fabric Element initializes, all FxPort start with fcFxPortPhysAdminStatus in the offline(2) state. As the result of either explicit management action or per configuration information accessible by the Fabric Element, fcFxPortPhysAdminStatus is then changed to either the online(1) or testing(3) states, or remains in the offline state. The values are defined as follow: online(1) -- place port online, offline(2) -- take port offline, testing (3). This MIB variable is maintained by both the portState, ps*, defined in FPM and the PORT_BLOCKED_STATE, pstate*, defined in PCP. The psNotInstalled shows that the port is not exist. The psIntDiags and psExtLoop indicate the testing(3) state. The pstateUNBLOCKD and pstateBLOCKD indicate the online(1) and offline(2) respectively.

Table 2–33: Operation: FxPort Physical Level (Continued)

Variable	Provides:
fcFxPortPhysOperStatus	The current operational status of the FxPort. The testing(3) indicates that no operational frames can be passed. If fcFxPortPhysAdminStatus is offline(2) then fcFxPortPhysOperStatus should be offline(2). If fcFxPortPhysAdminStatus is changed to online(1) then fcFxPortPhysOperStatus should change to online(1) if the FxPort is ready to accept Fabric Login request from the attached NxPort; it should proceed and remain in the link-failure(4) state if and only if there is a fault that prevents it from going to the online(1) state. The values are defined as follow: online(1) -- Login may proceed, offline(2) -- Login cannot proceed, testing(3) -- port is under test, link-failure(4) -- failure after online/testing.
fcFxPortPhysLastChange	The value of sysUpTime at the time the FxPort entered its current operational status. A value of zero indicates that the FxPort's operational status has not changed since the agent last restarted. This is $SS_TIM_RD_TICKS(MILLISEC) * 10$.
fcFxPortPhysRttov	The Receiver_Transmitter_Timeout value of the FxPort. This is used by the receiver logic to detect Loss of Synchronization. This value is fixed at 100ms.

Operation: Fabric Login Table

The *Fcflogintable* displays the service parameters for each FxPort in the fabric element that have been established from the most recent fabric login (implicit or explicit).

Table 2–34: Operation: Fabric Login

Variable	Provides:
fcFxlogiModuleIndex	This object identifies the module containing the FxPort for which this entry contains information. The index starts at 1.
fcFxlogiFxPortIndex	This object identifies the FxPort within the module. This number ranges from 1 to the value of fcFeModulePortCapacity for the associated module. The value remains constant for the identified FxPort until the module is re-initialized. The index starts at 1.
fcFxlogiNxPortIndex	The object identifies the associated NxPort in the attachment for which the entry contains information.
fcFxPortFcphVersionAgreed	The version of FC-PH that the FxPort has agreed to support from the Fabric Login.
fcFxPortNxPortBbCredit	The total number of buffers available for holding Class 1 connect-request, Class 2 or Class 3 frames to be transmitted to the attached NxPort. It is for buffer-to-buffer flow control in the direction from FxPort to NxPort. The buffer-to-buffer flow control mechanism is indicated in the respective fcFxPortBbCreditModel.

Table 2–34: Operation: Fabric Login (Continued)

Variable	Provides:
fcFxpPortNxPortRxDataFieldSize	The Receive Data Field Size of the attached NxPort. This is a binary value that specifies the largest Data Field Size for an FT_1 frame that can be received by the NxPort. The value is in number of bytes and ranges from 128 to 2112 inclusive.
fcFxpPortCosSuppAgreed	A variable indicating that the attached NxPort has requested the FxPort for the support of classes of services and the FxPort has granted the request.
fcFxpPortIntermixSuppAgreed	A variable indicating that the attached NxPort has requested the FxPort for the support of Intermix and the FxPort has granted the request. This flag is only valid if Class 1 service is supported. The values are defined as follow: yes(1) and no(2). This is always no(2).
fcFxpPortStackedConnModeAgreed	A variable indicating whether the FxPort has agreed to support stacked connect from the Fabric Login. This is only meaningful if Class 1 service has been agreed. This is always none(1).
fcFxpPortClass2SeqDelivAgreed	A variable indicating whether the FxPort has agreed to support Class 2 sequential delivery from the Fabric Login. This is only meaningful if Class 2 service has been agreed. The values are defined as follow: yes(1) and no(2).
fcFxpPortClass3SeqDelivAgreed	A flag indicating whether the FxPort has agreed to support Class 3 sequential delivery from the Fabric Login. This is only meaningful if Class 3 service has been agreed. The values are defined as follow: yes(1) and no(2).
fcFxpPortNxPortName	The port name of the attached NxPort, if applicable. If the value of this object is '0000000000000000'H, this FxPort has no NxPort attached to it. This is the world wide Name of the attached to NxPort. It's same as fcFPortAttachedPortName.
fcFxpPortConnectedNxPort	The address identifier of the destination FxPort with which this FxPort is currently engaged in a either a Class 1 or loop connection. If the value of this object is '000000'H, this FxPort is not engaged in a connection. This is fixed at '000000'H.
fcFxpPortBbCreditModel	This object identifies the BB_Credit model used by the FxPort. The regular model refers to the Buffer-to-Buffer flow control mechanism defined in FC-PH [1] is used between the FxPort and the NxPort. For FL_Ports, the Alternate Buffer-to-Buffer flow control mechanism as defined in FC-AL [4] is used between the FL_Port and any attached NL_Ports. This is fixed at regular(1).

Configuration Group

Configuration group incorporates three scalar MIB variables, a module table, and a configuration table.

- FcFabricName
The Name_Identifier of the Fabric to which this Fabric Element belongs.
- FcElementName
The Name_Identifier of the Fabric Element.
- FcFeModuleCapacity
The maximum number of modules in the Fabric Element, regardless of their current state.

Module Table

The module table contains the configuration parameters of a port module.

Table 2–35: Module Table

Variable	Provides:
fcFeModuleIndex	This object identifies the module within the Fabric Element for which this entry contains information. This value is never greater than fcFeModuleCapacity. The index starts at 1.
fcFeModuleDescr	A textual description of the module.
fcFeModuleObjectID	The vendor's authoritative identification of the module. This value may be allocated within the SMI enterprises subtree (1.3.6.1.4.1) and provides a straight-forward and unambiguous means for determining what kind of module is being managed. For example, this object could take the value 1.3.6.1.4.1.99649.3.9 if vendor 'Neufe Inc.' was assigned the subtree 1.3.6.1.4.1.99649, and had assigned the identifier 1.3.6.1.4.1.99649.3.9 to its 'FeFiFo-16 PlugInCard. This is a fixed object identifier assigned from the HP enterprise subtree (1.3.6.1.4.1.289.2.1.1.2).
fcFeModuleOperStatus	This object indicates the operational status of the module: online(1) -- the module is functioning properly; offline(2) -- the module is not available; testing(3) -- the module is under testing; and faulty(4) -- the module is defective in some way. The status is evaluated from fcFPortPhysOperStatus as following order: testing(3): the module is under testing if all four ports on the current module are testing; faulty(4): the module is defective if any of the ports on the current module is faulty. online(1): the module is functioning properly if any of the ports on the current module is online or testing; offline(2): the module is not available if any of the ports on the current module is offline.

Table 2–35: Module Table (Continued)

Variable	Provides:
fcFeModuleLastChange	This object contains the value of sysUpTime when the module entered its current operational status. A value of zero indicates that the operational status of the module has not changed since the agent last restarted.
fcFeModuleFxpPortCapacity	The number of FxPort that can be contained within the module. Within each module, the ports are uniquely numbered in the range from 1 to fcFeModuleFxpPortCapacity inclusive. However, the numbers are not required to be contiguous. This is AS_glob.prod_cnfg_ptr->ports_per_module
fcFeModuleName	The Name_Identifier of the module. This is the port module world wide name.

Configuration Table

The configuration table displays the configuration parameters of the FxPorts.

Table 2–36: Configuration Table

Variable	Provides:
fcFxCnfModuleIndex	This object identifies the module containing the FxPort for which this entry contains information. The index starts at 1.
fcFxCnfFxpPortIndex	This object identifies the FxPort within the module. This number ranges from 1 to the value of fcFeModulePortCapacity for the associated module. The value remains constant for the identified FxPort until the module is re-initialized. The index starts at 1.
fcFxpPortName	The name identifier of this FxPort. Each FxPort has a unique port name within the address space of the Fabric. This is the WWN assigned to the port.
fcFxpPortFcpVersionHigh	The highest or most recent version of FC-PH that the FxPort is configured to support.
fcFxpPortFcpVersionLow	The lowest or earliest version of FC-PH that the FxPort is configured to support.
fcFxpPortBbCredit	The total number of receive buffers available for holding Class 1 connect-request, Class 2 or 3 frames from the attached NxPort. It is for buffer-to-buffer flow control in the direction from the attached NxPort (if applicable) to F_Port.
fcFxpPortRxBufSize	The largest Data_Field Size (in octets) for an FT_1 frame that can be received by the FxPort. This is fixed at 2112.
fcFxpPortRatov	The Resource_Allocation_Timeout Value configured for the FxPort. This is used as the timeout value for determining when to reuse an NxPort resource such as a Recovery_Qualifier. It represents E_D_TOV (see next object) plus twice the maximum time that a frame may be delayed within the Fabric and still be delivered.
fcFxpPortEdtov	The E_D_TOV value configured for the FxPort. The Error_Detect_Timeout Value is used as the timeout value for detecting an error condition.

Table 2–36: Configuration Table (Continued)

Variable	Provides:
fcFxPortCosSupported	A value indicating the set of Classes of Service supported by the FxPort. This is fixed at CLASS_2 CLASS_3 (0x0C).
fcFxPortIntermixSupported	A flag indicating whether or not the FxPort supports an Intermixed Dedicated Connection. The values are defined as follow: yes(1) and no(2). This is fixed at no(2).
fcFxPortStackedConnMode	A value indicating the mode of Stacked Connect supported by the FxPort. This is fixed at none(1).
fcFxPortClass2SeqDeliv	A flag indicating whether or not Class 2 Sequential Delivery is supported by the FxPort. The values are defined as follow: yes(1) and no(2). This is fixed at yes(1).
fcFxPortClass3SeqDeliv	A flag indicating whether or not Class 3 Sequential Delivery is supported by the FxPort. The values are defined as follow: yes(1) and no(2). This is fixed at yes(1).
fcFxPortHoldTime	The maximum time (in microseconds) that the FxPort shall hold a frame before discarding the frame if it is unable to deliver the frame. The value 0 means that the FxPort does not support this parameter. This is equal to quarter of E_D_TOV.
fcFxPortBaudRate	The FC-0 baud rate of the FxPort.
fcFxPortMedium	The FC-0 medium of the FxPort.
fcFxPortTxType	The FC-0 transmitter type of the FxPort. Note: Long distance laser is mapped to unknown(1) and long wave laser (LC version) is mapped to longWaveLaser(2).
fcFxPortDistance	The FC-0 distance range of the FxPort transmitter.

Capability Group Table

The *Fccfportcaptable* displays the capabilities of each FxPort within the fabric element.

Table 2–37: Capability Group Table

Object Name	Type	Provided By	Access	Description
fcFxPortCapFxPortIndex	FcFeFxPortIndex	SNMP	R	This object identifies the FxPort within the module. The number ranges from 1 to the value of fcFeModulePortCapacity for the associated module. The value remains constant for the identified FxPort until the module is re-initialized.
FcFxPortCapFcpVersionHigh	FcphVersion	FC2	R	The highest or most recent version of FC-PH that the FxPort is capable of supporting. For values see FcFxPortFcpVersionHigh.
FcFxPortCapFcpVersionLow	FcphVersion	FC2	R	The lowest or earliest version of FC-PH that the FxPort is capable of supporting. For values see FcFxPortFcpVersionHigh.
FcFxPortCapBbCreditMax	FcBbCredit	SNMP	R	The maximum number of receive buffers available for holding Class 1 connect-request, Class 2 or Class 3 frames from the attached NxPort. This value is fixed at 16.
FcFxPortCapBbCreditMin	FcBbCredit	SNMP	R	The minimum number of receive buffers available for holding Class 1 connect-request, Class 2 or Class 3 frames from the attached NxPort. The value is fixed at 1.
FcFxPortCapRxDDataFieldSizeMax	FcRxDDataFieldSize	SNMP	R	The maximum size in bytes of the data field in a frame that the FxPort is capable of receiving from its attached NxPort. This value is fixed at 2112.
FcFxPortCapRxDDataFieldSizeMin	FcRxDDataFieldSize	SNMP	R	The minimum size in bytes of the data field in a frame that the FxPort is capable of receiving from its attached NxPort. This value is fixed at 2112.
FcFxPortCapCos	FcCosCap	SNMP	R	A value indicating the set of Classes of Service that the FxPort is capable of supporting. This value is fixed at CLASS_2 CLASS_3 (0x0C).

Table 2–37: Capability Group Table (Continued)

Object Name	Type	Provided By	Access	Description
FcFxPortCapIntermix	INTEGER	SNMP	R	A flag indicating whether or not the FxPort is capable of supporting the intermixing of Class 2 and Class 3 frames during a Class 1 connection. This flag is only valid if the port is capable of supporting Class 1 service. The values are defined as follows: yes(1) and no(2). This value is fixed at no(2).
FcFxPortCapStackedConnMode	FcStackedConnMode	SNMP	R	A value indicating the mode of Stacked Connect request that the FxPort is capable of supporting. This value is fixed at none(1).
FcFxPortCapClass2SeqDeliv	INTEGER	SNMP	R	A flag indicating whether or not the FxPort is capable of supporting Class 2 Sequential Delivery. This value is fixed at yes(1),
FcFxPortCapClass3SeqDeliv	INTEGER	SNMP	R	A flag indicating whether or not the FxPort is capable of supporting Class 3 Sequential Delivery. This value is fixed at yes(1).
FcFxPortCapHoldTimeMax	MicroSeconds	SNMP	R	The maximum holding time (in microseconds) that the FxPort is capable of supporting This value is not supported. It is always zero.
FcFxPortCapHoldTimeMin	MicroSeconds	SNMP	R	The minimum holding time (in microseconds) that the FxPort is capable of supporting. This value is not supported. It is always zero.
FcFxPortCapBaudRates	FcOBaudRateCap	FPM	R	A value indicating the set of baud rates that the FxPort is capable of supporting. This variable has been deprecated and may be implemented for backward compatibility.
FcFxPortCapMedia	FcOMediaCap	FPM	R	A value indicating the set of media that the FxPort is capable of supporting.

FCEOS Private MIB

Six groups of MIB are defined and supported in the FCEOS Private MIB:

- System group (fcEosSys)
- Field replaceable unit (FRU) group (fcEosFru)
- Fibre Channel port group (fcEosPort)
- Port Binding group (fcEosPortBinding)
- Zoning group (fcEosZoning)
- Threshold Alerts (fcEosThresholdAlerts)

The tables that appear in the following sections define variables available in the private MIB. All variables are read-only unless noted otherwise.

System Group

Table 2–38: System Group Variables

Variable	Provides:
fcEosSysCurrentDate	Current date information.
fcEosSysBootDate	Date and time of the last IPL of the Director.
fcEosSysFirmwareVersion	Current version of the firmware.
fcEosSysTypeNum	ASCII type number of the Director.
fcEosSysModelNum	ASCII model number of the Director.
fcEosSysMfg	ASCII manufacturer of the Director.
fcEosSysPlantOfMfg	ASCII plant of manufacturer of the Director.
fcEosSysEcLevel	ASCII EC level ID of the Director.
fcEosSysSerialNum	ASCII OEM serial number of the Director.
fcEosSysOperStatus	The current operational status of the Director. The values are defined as follows: operational (1), redundant-failure (2), minor-failure (3), major-failure (4), not-operational (5).
fcEosSysState	If the edOperStatus of the Director is operational, the Director is in one of the four states: online(1), coming-online(2), offline(3), and going-offline(4).
fcEosSysAdmStatus (read-write)	The desired administrative status of the Director. A management station may place the Director in a desired state by setting this object accordingly. The desired administrative statuses are online(1) and offline(2). Online means setting the Director to be accessible by an external Fibre Channel port, and offline means setting the Director to be inaccessible.
fcEosSysConfigSpeed	Switch/Director speed capability. A user-initiated option to adjust the system-wide port speed capability (either 1-gig or 2-gig).

Field Replaceable Unit (FRU) Group

Table 2–39: FRU Group Table Variables

Variable	Provides:
fcEosFruCode	Field replaceable unit. A hardware component of the product that is replaceable as an entire unit. Each module defined in this MIB has a fixed FRU code. The values are defined as follows: fru-bkplane(1) - backplane; fru-ctp(2) - control processor card; fru-sbar(3) - serial crossbar; fru-fan2(4) - center fan module; fru-fan(5) - fan module; fru-power(6) - power supply module; fru-reserved(7) - reserved (not used); fru-gls(8) - longwave, single-mode, LC connector, 1 Gig; fru-gsml(9) - shortwave, multi-mode, LC connector, 1 Gig; fru-gxxl(10) - mixed, LC connector, 1 Gig; fru-gsfl(11) - SFO pluggable, 1Gig; fru-gsf2(12) - SFO pluggable, 2 Gig; fru-glsr(13) - longwave, single-mode, MT-RJ connector, 1 Gig; fru-gsmr(14) - shortwave, multi-mode, MT-RJ connector, 1 Gig; fru-gxxr(15) - mixed, MT-RJ connector, 1 Gig; fru-fint1(16) - FxPort, internal, 1 Gig.
fcEosFruPosition	Position of the module.
fcEosFruStatus	Operational status of the module. The active(1) state indicates that the current module is active. The backup(2) state indicates that the backup module is used. The update-busy (3) state indicates that the module is in the updating process. The failed(4) state indicates that the current module is failed.
fcEosFruPartNumber	Part number of the module.
fcEosFruSerialNumber	Serial number of the module.
fcEosFruPowerOnHours	Number of the hours that the FRU has been in operation.
fcEosFruTestDate	Final test date of the module.

Fibre Channel Port Group

This group contains information about the physical state, operational status, performance and error statistics of each Fibre Channel ports on the Director.

Table 2–40: Fibre Channel Port Group Table Variables

Variable	Provides:
fcEosPortIndex	The fixed physical port number on the Edge Switch or Director.
fcEosPortPhyState	Physical state of the port.
fcEosPortOpStatus	Operational status of the port. The values are defined as follows: online(1), offline(2), testing(3), and faulty(4). The online state indicates that user frames can be passed.

Table 2–40: Fibre Channel Port Group Table Variables (Continued)

Variable	Provides:
fcEosPortAdmStatus (read-write)	The desired state of the port. A management station may place the port in a desired state by setting this object accordingly. The testing (3) state indicates that no user frames can be passed. As the result of either explicit management action or per-configuration information accessible by the Director, edFcPortAdmStatus is then changed to either the online (1) or testing (3) states, or remains in the offline state.
fcEosPortConnector	Supported connector types of the port. The values are defined as follow: unknown(1), lc(2), mt-rj(3), mu(4)
fcEosPortDistance	A bit map to represent distance types of the Port. bit 0 unknown, bit 1-3 reserved, bit 4 long distance (l), bit 5 intermediate distance (i), bit 6 short distance (s), bit 7 very long distance.
fcEosPortType	Supported transceiver types of the port. The values are defined as follows: unknown (1), longDistance(2) -- (LL-V), longWaveLaser-LL(3) -- (LL), shortWaveLaser-OFC(4) -- (SL), shortWaveLaser-noOFC(5) -- (SN), longWaveLaser-LC(6) -- (LC).
fcEosPortMedia	A bit map to represent transmission media of the port. bit 0 single mode (sm), bit 1 reserved, bit 2 multimode 50m (m5), bit 3 multimode 62.5 (m6), bit 4-7 reserved.
fcEosPortSpeedCap	A bit map to represent the speed of optical transceiver. bit 0 - 100 Mbytes/Sec. bit 1 - reserved bit 2 - 200 Mbytes/Sec. bit 3 - reserved bit 4 - 400 Mbytes/Sec. bit 5-7 - reserved.
fcEosPortConfigSpeed	The configured port speed. The values are: 1-gig = 1, 2-gig = 2, negotiate = 3.
fcEosPortSpeed	A bit map to represent transmission speed of the port. bit 0 100 Mbytes/Sec, bit 1 reserved, bit 2 200 Mbytes/Sec, bit 3 reserved, bit 4, 400 Mbytes/Sec, bit 5-7 reserved.
fcEosPortTxWords32	The number of class 2 & class 3, 4-byte words within frames that the port has transmitted. (Primitive signals and primitive sequence are not included.)
fcEosPortRxWords32	The number of class 2 & class 3, 4-byte words within frames that the port has received. (Primitive signals and primitive sequence are not included.)
fcEosPortTxFrames32	The number of class 2 & class 3 (Fibre Channel) frames that the port has transmitted.
fcEosPortRxFrames32	The number of class 2 & class 3 (Fibre Channel) frames that the port has received.

Table 2–40: Fibre Channel Port Group Table Variables (Continued)

Variable	Provides:
fcEosPortTxThroughput	The Bps (bytes per second) transmission rate of the port.
fcEosPortRxThroughput	The Bps (bytes per second) reception rate of the port.
fcEosPortTxC2Words32	The number of class 2 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
fcEosPortRxC2Words32	The number of class 2 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
fcEosPortTxC2Frames32	The number of class 2 & class 3 (Fibre Channel) frames that the port has transmitted.
fcEosPortRxFrames	The number of class 2 & class 3 (Fibre Channel) frames that the port has received.
fcEosPortTxThroughput	The Bps (bytes per second) transmission rate of the port.
fcEosPortRxThroughput	The Bps (bytes per second) reception rate of the port.
fcEosPortTxC2Words32	The number of class 2 4-byte words that the port has transmitted. (Primitive signals and primitive sequence are not included.)
fcEosPortRxC2Words32	The number of class 2 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
fcEosPortTxC2Frames32	The number of Class 2 frames that the port has transmitted.
fcEosPortRxC2Frames32	The number of Class 2 frames that the port has received.
fcEosPortTxC2Octets32	The number of Class 2 Octets that the port has transmitted.
fcEosPortRxC2Octets32	The number of Class 2 Octets that the port has received.
fcEosPortTxC3Words32	The number of class 3 4-byte words that the port has transmitted. (Primitive signals and primitive sequence are not included.)
fcEosPortRxC3Words32	The number of class 3 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
fcEosPortTxC3Frames32	The number of Class 3 frames that the port has transmitted.
fcEosPortRxC3Frames32	The number of Class 3 frames that the port has received.
fcEosPortTxC3Octets32	The number of Class 3 Octets that the port has transmitted.
fcEosPortRxC3Octets32	The number of Class 3 Octets that the port has received.
fcEosPortC3Discards32	The number of Class 3 frames that the port has discarded.
fcEosPortDiscardFrames	The number of frames that the port has discarded.
fcEosPortTxLinkResets	The number of link resets initiated by this Director port.
fcEosPortRxLinkResets	The number of link resets initiated by the attached NxPort.
fcEosPortTxOLSS	The number of offline sequences initiated by this Director port.

Table 2–40: Fibre Channel Port Group Table Variables (Continued)

Variable	Provides:
fcEosPortRxOLSs	The number of offline sequences initiated by the attached NxPort.
fcEosPortSyncLosses	The number of loss of synchronization timeout.
fcEosPortSigLosses	The number of times that a Loss of Signal is detected.
fcEosPortProtocolErrors	The number of protocol errors detected.
fcEosPortInvalidTxWords	The number of Invalid Transmission words that the port has received.
fcEosPortLinkFailures	The number of transitions to an LFx state.
fcEosPortCrcs	The number of CRC errors detected from frames received.
fcEosPortTruncs	The number of frames shorter than the Fibre Channel minimum.
fcEosPortTxWords64	A 64 bit counter for the number of words within frames that the port has transmitted. (Primitive signals and primitive sequence are not included.)
fcEosPortRxWords64	A 64 bit counter for the number of words within frames that the port has received. (Primitive signals and primitive sequence are not included.)
fcEosPortTxFrames64	A 64 bit counter for the number of (Fibre Channel) frames that the port has transmitted.
fcEosPortRxFrames64	A 64 bit counter for the number of (Fibre Channel) frames that the port has received.
fcEosPortTxC2Words64	A 64 bit counter for the number of class 2 4-byte words that the port has transmitted. (Primitive signals and primitive sequence are not included.)
fcEosPortRxC2Words64	A 64 bit counter for the number of class 2 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
fcEosPortTxC2Frames64	A 64 bit counter for the number of Class 2 frames that the port has transmitted.
fcEosPortRxC2Frames64	A 64 bit counter for the number of Class 2 frames that the port has received.
fcEosPortTxC2Octets64	A 64 bit counter for the number of Class 2 Octets that the port has transmitted.
fcEosPortRxC2Octets64	A 64 bit counter for the number of Class 2 Octets that the port has received.
fcEosPortTxC3Words64	A 64 bit counter for the number of class 3 4-byte words that the port has transmitted. (Primitive signals and primitive sequence are not included.)
fcEosPortRxC3Words64	A 64 bit counter for the number of class 3 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
fcEosPortTxC3Frames64	A 64 bit counter for the number of Class 3 frames that the port has transmitted.
fcEosPortRxC3Frames64	A 64 bit counter for the number of Class 3 frames that the port has received.
fcEosPortTxC3Octets64	A 64 bit counter for the number of Class 3 Octets that the port has transmitted.
fcEosPortRxC3Octets64	A 64 bit counter for the number of Class 3 Octets that the port has received.

Table 2–40: Fibre Channel Port Group Table Variables (Continued)

Variable	Provides:
fcEosPortC3Discards64	A 64 bit counter for the number of Class 3 frames that the port has discarded

Port Binding Group

Table 2–41: Port Binding Group Table

Variable	Provides:
fcEosPortBindingIndex	The fixed port number on the Director. It ranges from 1 to the number of physical ports that can be supported by the Director.
fcEosPortBindingFlag	The flag indicates whether or not Port Binding is in effect for an individual port. The values are: yes (1), and no (2).
fcEosPortConfiguredWWN	The authorized port WWN for attached servers and storage systems (F ports), or the authorized Director WWN for attached Directors (E ports).
fcEosPortAttachedWWN	The WWN of the device currently attached to the port whether it has successfully connected or is currently being rejected due to a port binding violation.

Zoning Group

Table 2–42: Zoning Group Table

Variable	Provides:
fcEosActiveZoneSetName	The active zone set name.
fcEosActiveZoneCount	The count of zones included in the active zone set.
fcEosDefaultZoneSetState	The state of the default zone set. 1 = enabled. 2 = disabled.
fcEosActiveZoneSetState	The state of the default zone set. 1 = enabled. 2 = disabled.
fcEosHardwareEnforcedZoning	Indicates if zoning is hardware enforced (1=Hardzoning, 0=Nameserver zoning only).

Table 2–43: Active Zone Table

Variable	Provides:
fcEosZoneIndex	Zone index number. This number will range from 1 to the number of zones specified by the ActiveZoneCount.
fcEosZoneName	The name of the zone.
fcEosZoneMemberCount	The number of members included in the zone.

Table 2–44: Active Member Table

Variable	Provides:
fcEosZoneIndex	The index of the zone this member belongs to.
fcEosMemberIndex	Member index number. This number will range from 1 to the number of members specified by the corresponding ZoneMemberCount.
fcEosMemberType	Indicates the addressing method for this member (1=WWN, 2=Port Number).
fcEosMemberWWN	The WWN name as an 8-character string. This value is only valid if the member type is 1, otherwise it will default to 0.
fcEosMemberDomainID	The domain ID. This value is only valid if the member type is 2, otherwise it will default to 0.
fcEosMemberPortNumber	The port number. This value is only valid if the member type is 2, otherwise it will default to 0.

Threshold Alert Group

Table 2–45: Threshold Alerts Table

Variable	Provides:
fcEosTAIndex	This object is used to identify which threshold has been triggered.
fcEosTAName	The threshold alert name.
fcEosTASState	The current state of the threshold (enabled=1, disabled=2).
fcEosTAType	The type of the threshold. (throughput=1, counter=2)
fcEosTAPortType	A threshold can be set on a list of physical port numbers or on all the ports of the specified type (list=1, ePorts=2, fPorts=3, flPorts=4)
fcEosTAPortList	A bitmap that identifies which ports this threshold alert applies to (only valid when the threshold alert port type = list). The left-most bit represents port 0.
fcEosTAInterval	The number of minutes in a threshold alert interval.
fcEosTATriggerValue	If the alert type is a Throughput Threshold Alert, this is the percent of utilization (1-100) required to trigger an alert. If the alert type is a Counter Threshold Alert, this is the counter delta required to trigger an alert.
fcEosTTADirection	Specifies the throughput direction of the threshold (transmit=1, receive=2, either=3). This only applies when the alert type is Throughput Threshold Alert.
fcEosTTATriggerDuration	Specifies the amount of time during a threshold alert interval that the trigger must be exceeded before an alert is generated. This only applies when the alert type is Throughput Threshold Alert.
fcEosCTACounter	Specifies statistical counter or counter set to be monitored. This object is not supported in the current release.

Generic Traps

The following generic traps can be received from the Director:

- **coldStart**
Reports that the SNMP agent is reinitializing due to a power-on reset.
- **warmStart**
Reports that the agent is reinitializing due to an IML or IPL.
- **authenticationFailure**
An indication that the agent has received an improperly authenticated protocol message. By default, this trap is disabled but may be enabled using the Product Manager.

Enterprise Specific Trap

The following enterprise-specific traps can be received from the Director:

- **fcEosPortScn**
An fcEosPortScn (1) is generated whenever a Fc_Port changes its operational state. For instance, the Fc_Port goes from on-line to offline.
- **fcEosFruScn**
An fcEosFruScn (2) is generated whenever a FRU status changes its operational state.
- **fcEosPortBindingViolation**
An fcEosPortBindingViolation (3) is generated whenever the Director detects that a port Binding Violation occurs.
- **fcEosThresholdAlert**
An fcEosThresholdAlert (4) is generated whenever a threshold alert occurs.

Table 2–46: Enterprise-specific Traps

Trap	Trap Type Enterprise	Variable
fcEosPortScn	mcDataTrap	{fcEosPortOpStatus}
fcEosFruScn	mcDataTrap	{fcEosFruStatus}
fcEosPortBindingViolation	mcDataTrap	{fcEosPortAttachedWWN}
fcEosThresholdAlert	mcDataTrap	{fcEosPortIndex, fcEosTAIndex}

Glossary

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

access control

Method of control (with associated permissions) by which a set of devices can access other devices across a network. *See also* persistent binding and zoning.

active zone set

Single zone set that is active in a multi-switch fabric. It is created when you enable a specified zone set. This zone set is compiled by checking for undefined zones or aliases.

agent

Software that processes queries on behalf of an application and returns replies.

alarm

Simple network management protocol (SNMP) message notifying an operator of a network or device problem.

alias server

Fabric software facility that supports multicast group management.

arbitration

Process of selecting one device from a collection of devices that request service simultaneously.

audit log

Log summarizing actions (audit trail) made by the user.

backplane

The backplane provides 48 VDC power distribution and connections for all logic cards.

BB_Credit

See buffer-to-buffer credit.

beaconing

Use of light-emitting diodes on ports, port cards, field-replaceable units, Directors, and Edge Switches to aid in the fault-isolation process; when enabled, active beaconing causes LEDs to flash for selected components.

BER

See bit error rate.

bidirectional

In Fibre Channel, the capability to simultaneously communicate at maximum speeds (100 Mbps) in both directions over a link.

bit error rate (BER)

Ratio of received bits that contain errors to total of all bits transmitted.

blocked port

Devices communicating with the port are prevented from logging into a Director or Edge Switch; or communicating with other devices attached to the Director or Edge Switch. A blocked port continuously transmits the offline sequence.

broadcast

Send a transmission to all N_Ports on a fabric. *See also* multicast.

broadcast frames

Data packet, also known as a broadcast packet, whose destination address specifies all computers on a network.

buffer

Storage area for data in transit. Buffers compensate for differences in processing speeds between devices. *See also* buffer-to-buffer credit.

buffer-to-buffer credit (BB_Credit)

See buffer-to-buffer credit. Indicates the maximum number of frames a port can transmit without receiving a receive ready signal from the receiving device.

call-home

Product feature which requires installation of HP Proactive Service software and enables the HAFM server to automatically transmit system events (failure information) to an HP customer support center. The HP support center server accepts calls from the HAFM server, logs reported events, and can notify one or more support center representatives.

Class F Fibre Channel service

Used by switches to communicate across interswitch links (ISLs) to configure, control, and coordinate a multi-switch fabric.

Class 2 Fibre Channel service

Provides a connectionless (not dedicated) service with notification of delivery or nondelivery between two N_Ports. In-order delivery of frames is not guaranteed.

Class 3 Fibre Channel service

Provides a connectionless (not dedicated) service without notification of delivery or nondelivery between two N_Ports. Also known as datagram.

community profile

Information that specifies which management objects are available to what management domain or SNMP community name.

concurrent maintenance

Ability to perform maintenance tasks, such as removal or replacement of field-replaceable units (FRUs), while normal operations continue without interruption. *See also* nondisruptive maintenance.

configuration data

Configuration data includes: identification data, port configuration data, operating parameters, SNMP configuration, and zoning configuration. A configuration backup file is required to restore configuration data if the control processor (CTP) card in a nonredundant Director is removed and replaced.

connectionless

Nondedicated link. Typically used to describe a link between nodes which allows the switch to forward Class 2 or Class 3 frames as resources (ports) allow.

control processor (CTP) card

Circuit card that contains the Director microprocessor. The CTP card also initializes hardware components of the system after power-on. A 10 Mbps RJ-45 twisted pair connector is located on the CTP card to connect to an Ethernet LAN and communicate with the HAFM server or a specific management station.

control unit

A device that controls the reading, writing, or displaying of data at one or more input/output units.

CRC

See cyclic redundancy check.

CTP card

See control processor card.

cyclic redundancy check (CRC)

System of error checking performed at both the sending and receiving station using the value of a particular character generated by a cyclic algorithm. When the values generated at each station are identical, data integrity is confirmed.

DASD

Acronym for direct access storage device.

datagram

See Class 3 Fibre Channel service.

default zone

Contains all attached devices that are not members of a separate zone.

destination identifier (D_ID)

Address identifier that indicates the targeted destination of a data frame.

device

Product (server or storage), connected to a managed Director or Edge Switch, that is not controlled directly by the Product Manager application. *See also* node.

D_ID

See destination identifier.

Director

An intelligent, redundant, high-port count Fibre Channel switching device providing any-to-any port connectivity between nodes (end devices) in a switched fabric. Directors send data frames between nodes in accordance with the address information present in the frame headers of those transmissions.

DNS name

Host or node name for a device or managed product that is translated to an internet protocol (IP) address through a domain name server.

domain ID

Number (1 through 31) that uniquely identifies a switch in a multi-switch fabric. A distinct domain ID is automatically allocated to each switch in the fabric by the principal switch.

domain name service (DNS)

See DNS name.

E_D_TOV

See error detect time-out value.

E_Port

See expansion port.

embedded web server

Administrators or operators with a browser-capable PC and Internet connection can monitor and manage a Director or Edge Switch through an embedded web server interface. The interface provides a GUI similar to Product Manager applications, and supports Director and Edge Switch configuration, statistics monitoring, and basic operation.

error detect time-out value (E_D_TOV)

User-specified value that defines the time a Director or Edge Switch waits for an expected response before declaring an error condition.

Ethernet

A widely implemented local area network (LAN) protocol that uses a bus or star topology and serves as the basis for the IEEE 802.3 standard, which specifies the physical and software layers. Baseband LAN allows multiple station access to the transmission medium at will without prior coordination and which avoids or resolves contention.

Ethernet hub

A customer-supplied device used to LAN-connect the HAFM server and managed Directors or Edge Switches.

event code

Error code that provides the operator with information concerning events that indicate degraded operation or failure of a Director or Edge Switch.

event log

Record of significant events that have occurred at the Director or Edge Switch, such as FRU failures, degraded operation, and port problems.

expansion port (E_Port)

Physical interface on a Fibre Channel switch within a fabric, that attaches to an expansion port (E_Port) on another Fibre Channel switch to form a multi-switch fabric.

fabric

Fibre Channel entity that interconnects node ports (N_Ports_) and is capable of routing (switching) Fibre Channel frames using the destination ID information in the Fibre Channel frame header accompanying the frames.

fabric element

An active Director, Edge Switch, or node in a Fibre Channel switched fabric.

fabric port (F_Port)

Physical interface on a Director or Edge Switch that connects to an N_Port through a point-to-point full duplex connection.

failover

Automatic and nondisruptive transition of functions from an active FRU that has failed to a backup FRU.

fiber

Physical media types supported by the Fibre Channel specification, such as optical fiber, copper twisted pair, and coaxial cable.

fiber optics

Branch of optical technology concerned with the transmission of light pulses through fibers made of transparent materials such as glass, fused silica, and plastic.

Fibre Channel

Integrated set of standards recognized by the American national Standards Institute (ANSI) which defines specific protocols for flexible information transfer. Logically, a point-to-point serial data channel, structured for high performance.

field-replaceable unit (FRU)

Assembly removed and replaced in its entirety when any one of its components fails.

firmware

Embedded program code that resides and executes on a Director or Edge Switch.

F_Port

See fabric port.

FRU

See field-replaceable unit.

gateway address

A unique string of numbers (in the format xxx.xx.xxx.xxx) that identifies a gateway on the network.

generic port (G_Port)

Physical interface on a Director or Edge Switch that can function either as a fabric port (F_Port) or an expansion port (E_Port) depending on the port type to which it connects.

G_Port

See generic port.

high-availability fabric manager (HAFM) application

Application that implements the management user interface for HP Fibre Channel switching products, and as a launching point for Product Manager applications. The application runs locally on the HAFM server or on a remote workstation.

high-availability fabric manager (HAFM) server

Notebook computer shipped with a Director or Edge Switch that runs the HAFM and Product Manager applications.

HAFM application

See high-availability fabric manager application.

HAFM server

See high-availability fabric manager server.

hardware log

Record of FRU insertions and removals for a Director or Edge Switch.

HBA

See host bus adapter.

heterogeneous fabric

A fabric with both HP and non-HP products.

high availability

A performance feature characterized by hardware component redundancy and hot-swappability (enabling non-disruptive maintenance). High-availability systems maximize system uptime while providing superior reliability, availability, and serviceability.

hop

Data transfer from one fabric node to another node.

homogeneous fabric

A fabric consisting of only HP products.

hop count

The number of hops a unit of information traverses in a fabric.

host bus adapter (HBA)

Logic card that provides a link between the server and storage subsystem, and that integrates the operating systems and I/O protocols to ensure interoperability.

hot-swapping

Removing and replacing a device's components while the device continues to operate normally.

hub

In Fibre Channel, a device that connects nodes into a logical loop by using a physical star topology.

IML

See initial machine load.

initial machine load (IML)

Hardware reset for a Director or Edge Switch, initiated by pushing the button on a Director CTP card or Edge Switch bezel.

initial program load (IPL)

Process of initializing the device and causing the operating system to start. Initiated through a menu in the Product Manager, this option performs a hardware reset on the active CTP only.

internet protocol address

Unique string of numbers (in the format xxx.xxx.xxx.xxx) that identifies a device on a network.

interoperability

Ability to communicate, execute programs, or transfer data between various functional units over a network.

interswitch link (ISL)

Physical E_Port connection between two Directors or Edge Switches in a fabric.

IP address

See internet protocol address.

IPL

See initial program load.

ISL

See interswitch link.

jumper cable

Optical cable that provides physical attachment between two devices or between a device and a distribution panel. *Contrast with* trunk cable.

latency

When used in reference to a Fibre Channel switching device, latency refers to the amount of time elapsed between receipt of a data transmission at a switch's incoming F_Port (from the originating node port) to retransmission of that data at the switch's outgoing F_Port (to the destination N_Port). The amount of time it takes for data transmission to pass through a switching device.

LIN

See link incident.

link incident (LIN)

Interruption to a Fibre Channel link due to loss of light or other cause.

logical unit number (LUN)

In Fibre Channel addressing, a logical unit number is a number assigned to a storage device which, in combination with the storage device's node port's world wide name, represents a unique identifier for a logical device on a storage area network.

loopback plug

In a fiber optic environment, a type of duplex connector used to wrap the optical output signal of a device directly to the optical input.

loopback test

Test that checks attachment or control unit circuitry, without checking the mechanism itself, by returning the output of the mechanism as input.

LUN

See logical unit number.

MAC address

See Media Access Control address.

maintenance port

Connector on the Director or Edge Switch where a PC running an ASCII terminal emulator can be attached or dial-up connection made for specialized maintenance support.

managed product

Hardware product that can be managed with the HAFM application. For example, the Director 2/64 is a managed product. *See also* device.

management information base (MIB)

Related set of software objects (variables) containing information about a managed device and accessed via SNMP from a network management station.

Management Services application

Software application that provides back-end product-independent services to the HAFM application. Management Services runs only on the HAFM server, and cannot be downloaded to remote workstations.

management session

A management session exists when a user logs on to the HAFM application. The application can support multiple concurrent management sessions. The user must specify the network address of the HAFM server at logon time.

Media Access Control (MAC) address

Hardware address of a node (device) connected to a network.

MIB

See management information base.

multicast

Delivery of a single transmission to multiple destination N_Ports. Can be one to many or many to many. All members of the group are identified by one IP address. *See also* broadcast.

multi-switch fabric

Fibre Channel fabric created by linking more than one Director or Edge Switch in a fabric.

name server

Program that translates names from one form into another. For example, the domain name service (DNS) translates domain names into IP addresses.

name server zoning

N_Port access management that allows N_Ports to communicate if and only if they belong to a common name server zone.

network address

Name or address that identifies a managed product on a transmission control protocol/internet protocol (TCP/IP) network. The network address can be either an IP address in dotted-decimal notation (containing four three-digit octets in the format xxx.xxx.xxx.xxx), or a domain name (as administered on a customer network).

nickname

Alternate name assigned to a world wide name for a node, Director, or Edge Switch in a fabric.

node

In Fibre Channel terminology, node refers to an end device (server or storage device) that is or can be connected to a switched fabric.

node port (N_Port)

Physical interface within an end device which can connect to an F_Port on a switched fabric or directly to another N_Port (in point-to-point communications).

nondisruptive maintenance

Ability to service FRUs (including maintenance, installation, removal and replacement) while normal operations continue without interruption. *See also* concurrent maintenance.

N_Port

See node port.

offline sequence (OLS)

Sequence sent by the transmitting port to indicate that it is attempting to initialize a link and has detected a problem in doing so.

OLS

See offline sequence.

optical cable

Fiber, multiple fibers, or a fiber bundle in a structure built to meet optical, mechanical, and environmental specifications. *See also* jumper cable, optical cable assembly, and trunk cable.

out-of-band management

Transmission of management information using frequencies or channels (Ethernet) other than those routinely used for information transfer (Fibre Channel).

password

Unique string of characters known to the computer system and to a user who must specify it to gain full or limited access to a system and to the information stored within it.

persistent binding

A form of server-level access control that uses configuration information to bind a server to a specific Fibre Channel storage volume (or logical device) using a unit number.

port

Receptacle on a device to which a cable leading to another device can be attached.

port card

Field-replaceable hardware component that provides the port connections for fiber cables and performs specific device-dependent logic functions.

port card map

Map showing numbers assigned to each port card by card slot.

port name

Name that the user assigns to a particular port through the Product Manager.

POST

See power-on self test.

power-on self test (POST)

Series of self-tests executed each time the unit is booted or reset.

preferred domain ID

Domain ID that a Director or Edge Switch is assigned by the principal switch in a switched fabric. The preferred domain ID becomes the active domain ID except when configured otherwise by the user.

principal switch

The Director or Edge Switch that allocates domain IDs to itself and to all other switches in a fabric. There is always one principal switch in a fabric. If a switch is not connected to any other switches, it acts as its own principal switch.

Product Manager application

Application that implements the management user interface for a specified Director 2/64, Director 2/140, Edge Switch 2/16, Edge Switch 2/24 or Edge Switch 2/32. When a product instance is opened from the HAFM application's Product View, the Product Manager application is invoked.

R_A_TOV

See resource allocation time-out value.

redundancy

Performance characteristic of a system or product whose integral components are backed up by identical components to which operations will automatically failover in the event of a component failure. Redundancy is a vital characteristic of virtually all high-availability (24 hours per day, seven days per week) computer systems and networks.

remote notification

A process by which a system is able to inform remote users and/or workstations of certain classes of events that occur on the system. E-mail notification and the configuration of SNMP trap recipients are two examples of remote notification programs that can be implemented on director-class switches.

remote user workstation

Workstation, such as a PC, using the HAFM and Product Manager applications that can access the HAFM server over a LAN connection.

resource allocation time-out value (R_A_TOV)

User-specified value used to time out operations that depend on the maximum possible time that a frame could be delayed in a fabric and still be delivered.

RFI

Acronym for radio frequency interface.

SAN

See storage area network.

SBAR

See serial crossbar assembly.

segmented E_Port

E_Port that has ceased to function as an E_Port within a multi-switch fabric due to an incompatibility between the fabrics that it joins. *See also* expansion port.

serial crossbar (SBAR) assembly

Responsible for Fibre Channel frame transmission from any Director port to any other Director port. Connections are established without software intervention.

SFP

Acronym for small form factor pluggable (a type of Fibre Channel connector). *See also* universal port module card.

simple Network management protocol (SNMP)

A protocol that specifies a mechanism for network management that is complete, yet simple. Information is exchanged between agents, which are the devices on the network being managed, and managers, which are the devices on the network through which the management is done.

SNMP

See simple network management protocol.

SNMP community

Also known as SNMP community string. An SNMP community is a cluster of managed products (in SNMP terminology, hosts) to which a server or managed product running the SNMP agent belongs.

SNMP community name

The name assigned to a given SNMP community. Queries from an SNMP management station to a device running an SNMP agent will only elicit a response if those queries are addressed with the correct SNMP community name.

storage area network (SAN)

A high-performance data communications environment that interconnects computing and storage resources so that the resources can be effectively shared and consolidated.

subnet mask

Used by a computer to determine whether another computer with which it needs to communicate is located on a local or remote network. The network mask depends upon the class of networks to which the computer is connecting. The mask indicates which digits to look at in a longer network address and allows the router to avoid handling the entire address.

switch

An intelligent but nonredundant, low-port count Fibre Channel switching device providing any-to-any port connectivity between nodes (end devices) in a switched fabric. Switches send data frames between nodes in accordance with the address information present in the frame headers of those transmissions.

switchover

Changing a backup FRU to the active state, and the active FRU to the backup state.

TCP/IP

See transmission control protocol/internet protocol.

topology

Logical and/or physical arrangement of stations on a network.

transmission control protocol/internet protocol (TCP/IP)

A suite of communication protocols used to connect host systems to the Internet. *See also* network address.

trap

Unsolicited notification of an event originating from an SNMP managed device and directed to an SNMP network management station.

trap host

SNMP management workstation that is configured to receive traps.

trunk cable

Cable consisting of multiple fiber pairs that do not directly attach to an active device. This cable usually exists between distribution panels. *See also* optical cable, *contrast with* jumper cable.

unblocked port

Devices attached to an unblocked port can login to the Director or Edge Switch and communicate with devices attached to any other unblocked port.

unicast

Communication between a single sender and a single receiver over a network. Compare to *multicast* (communication between any sender and the nearest of a group of receivers).

universal port module (UPM) card

Each Director 2/64 or 2/140 UPM card provides four 2.125 Gbps Fibre Channel connections through duplex small form factor (SFF) pluggable fiber-optic transceivers.

UPM card

See universal port module card.

vital product data (VPD)

System-level data stored by the backplane in the electrically erasable programmable read-only memory. This data includes serial numbers and identifies the manufacturer.

VPD

See vital product data.

world wide name (WWN)

Eight-byte address that uniquely identifies a switch, or a node (end device) on global networks.

WWN

See world wide name.

zone

Set of devices that can access one another. All connected devices may be configured into one or more zones. Devices in the same zone can see each other. Those devices that occupy different zones cannot.

zone member

Specification of a device to be included in a zone. A zone member can be identified by the port number of the Director or Edge Switch to which it is attached or by its world wide name. In multi-switch fabrics, identification of end-devices/nodes by world wide name is preferable.

zone set

See zone.

zoning

Grouping of several devices by function or by location. All devices connected to a connectivity product, such as the Director or Edge Switch, may be configured into one or more zones. *See also zone.*

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