StorageWorks by Compaq

SAN Director
SNMP Guide

Part Number: AA-RQ7BA-TE

First Edition (February 2002)

This guide introduces the SNMP protocol and its commands used to manage a network. It also explains how SD-64 and the SDCM Server support SNMP management.

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SAN Director SNMP Guide
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About This Guide

This publication is part of a documentation suite that supports the StorageWorks SAN Director 64.

Text Conventions

This document uses the following conventions to distinguish elements of text:

Keys	Keys appear in boldface. A plus sign (+) between two keys indicates that they should be pressed simultaneously.
USER INPUT	User input appears in a different typeface and in uppercase.
FILENAMES	File names appear in uppercase italics.
Menu Options, Command Names, Dialog Box Names	These elements appear in initial capital letters.
COMMANDS, DIRECTORY NAMES, and DRIVE NAMES	These elements appear in upper case. **NOTE:** UNIX commands are case sensitive and will not appear in uppercase.
Type	When you are instructed to *type* information, type the information **without** pressing the **Enter** key.
Enter	When you are instructed to enter information, type the information and then press the **Enter** key.

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 loss of information.

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

These icons may be located on equipment in areas where hazardous conditions may exist.

Any 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. If this surface is contacted, the potential for injury exists.

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 equipment is supplied by multiple sources of power.

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

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 manual material handling.

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.
- The stabilizing feet are attached to the rack if it is a single rack installations.
- The racks are coupled together in multiple rack installations.
- A rack may become unstable if more than one component is extended for any reason. Extend only one component at a time.

Getting Help

If you have a problem and have exhausted the information in this guide, you can get further information and other help in the following locations.

Compaq Technical Support

In North America, call the Compaq Technical Phone Support Center at 1-800-OK-COMPAQ. This service is available 24 hours a day, 7 days a week.

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

Outside North America, call the nearest Compaq Technical Support Phone Center. Telephone numbers for world wide Technical Support Centers are listed on the Compaq website. Access the Compaq website by logging on to the Internet at http://www.compaq.com.

Be sure to have the following information available before you call Compaq:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Add-on boards or hardware
- Third-party hardware or software
- Operating system type and revision level
- Detailed, specific questions

Compaq Website

The Compaq website has latest information on this product as well as the latest drivers. You can access the Compaq website by logging on to the Internet at http://www.compaq.com/storage.

Compaq Authorized Reseller

For the name of your nearest Compaq Authorized Reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the Compaq website for locations and telephone numbers.

Chapter 1

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 being resident 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 the Director configuration, 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 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 previous Get 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.

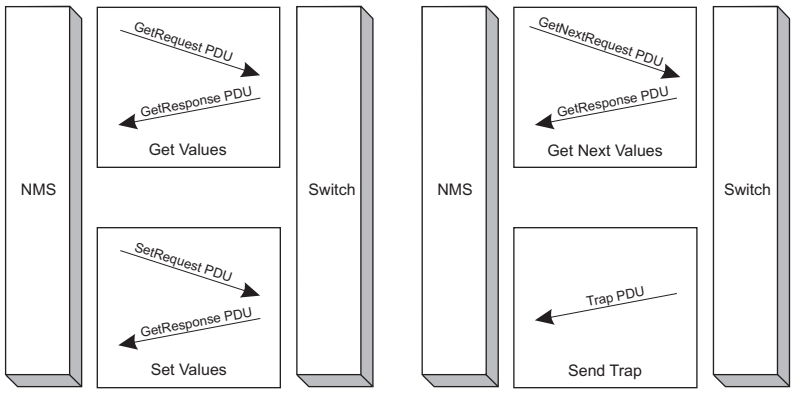

Figure 1–1: SNMP Commands and Responses

Why Variables Exist In a Managed Device

Variables are the means by which a Director (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 turn off a port (set the variable to 2), or turn the port back on (set the variable to 1). 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 some resource or other aspect 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 must be retrieved and/or modified by the manager, and it is the agent's job to identify and make available the correct object. Within the agent is at least one, maybe several, collections of definitions called Management Information Bases

(MIBs). Standard MIBs, available with SNMP, provide standard definitions for the variables within the managed object that are used for network monitoring and management. When a managed object supports a standard MIB, it agrees to provide and make available the applicable variables listed in the standard MIB.

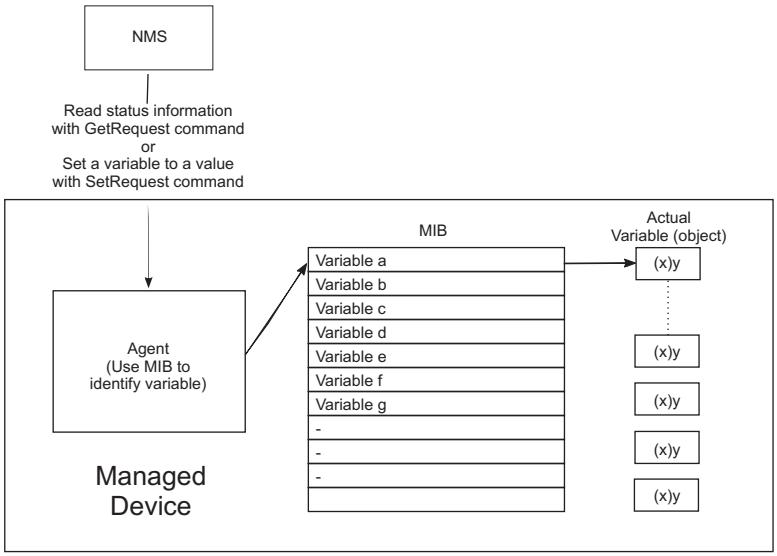

Figure 1–2: Retrieving or Setting Values Using MIBs

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 Compaq SAN Director 64 (SD-64) and the SANworks Director Connectivity Manager (SDCM), as noted.

Standard MIBs supported are:

- MIB-II (Internet MIB) as described in RFC 1157: supported by the SD-64.
- Fibre Alliance (FCMGMT) MIB, version 3.1: supported by SDCM Server and the SD-64.
- Fibre Channel Fabric Element (FCFE), version 1.10: supported by the SD-64 and SDCM Server.

Private Enterprise MIBs

Private enterprise MIBs are those provided by the manufacturer of the managed devices to allow management of device-specific items not supported by the standard MIBs. Chapter 2 describes the private enterprise MIBs in more detail.

The private enterprise MIB is the ef6000 MIB, used by the SD-64 Director (updated 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. To send traps, a managed object's agent must be designated as active. Passive agents wait for a request from the manager before sending information. The destination address for traps is a configuration item for each managed agent.

Two types of traps can be sent.

1. An information trap that sends the information describing a change of status to the manager. This trap contains trap identification integers and time values.
2. A single event trap that sends a simple notification of an important event, and relies on the manager to request the relevant information before sending it. This trap contains trap identification integers and time values, as well as object identifiers and values.

SNMP encourages use of the second type of trap to reduce the load on a network. Both types of trap provide the information to the manager, but the second type allows the manager to wait until higher priority tasks are accomplished and poll for additional information in its own time.

Chapter 2

SNMP Support

This chapter provides an explanation of how the SD-64 and the SDCM Server support SNMP management.

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 is under the *iso* branch (refer to Figure 2–1 on page 2-2). To get to the Director MIB variables, you must go through the *org, dod,* and *internet* sub-branches.

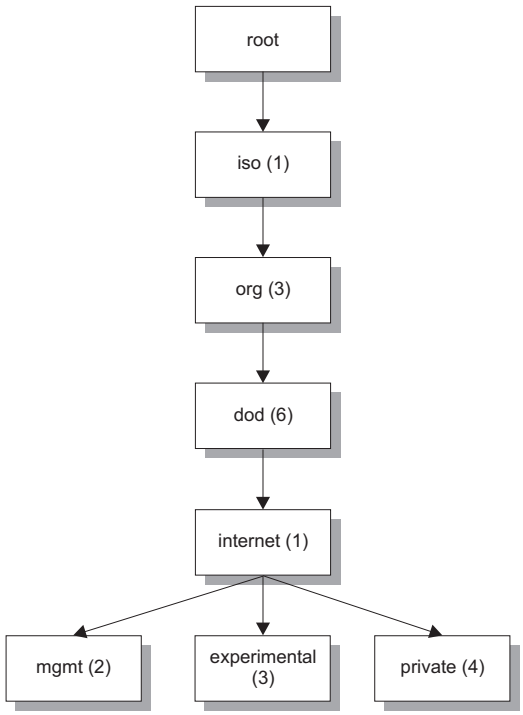

Figure 2–1: MIB Tree (Director)

NOTE: Variables are also known as “objects.”

The Director-supported groups under *internet* are *mgmt, experimental,* and *private (*refer to Figure 2–2). For *mgmt*, see MIB-II Support on page 2-5; for *experimental* refer to Fibre Channel Fabric Element MIB Support on page 2-19; and for *private*, refer to the SD-64 Private Enterprise MIB (EF-6000) on page 2-29.

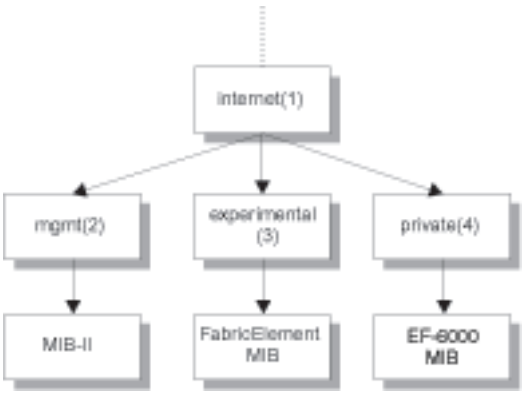

Figure 2–2: MIB Tree, experimental and private

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 numerical address. 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 resident SNMP agent and connection:

- Supports SNMPv1 manager.
- Enables access to variables in the standard MIB-II definition, the Fibre Channel Fabric Element MIB, and Director Private Enterprise MIB. All groups and variables in the supported MIBs are read only by SNMP management stations unless noted otherwise.

- Enables the Director to send unsolicited trap messages to the network management station when specific events occur on the Director. The traps supported are:
  - Standard generic traps
  - Director enterprise-specific traps

Access to the Director resident SNMP agent is through the Director Product Manager.

SNMPv1 Transports

The Director SNMP agent supports UDP/IP through the Director Product Manager. This transport provides immediate "plug-and-play" support for the Director.

Agent Configuration

In the Product Manager for the Director, use the *Configure Identification* and *Configure SNMP* dialog boxes by selecting options from the *Configure* menu to configure the following parameters:

- Configure Identification dialog box
  - sysContact (contact person)
  - sysName (Director's name)
  - sysLocation (location)
  - fcFPortPhysAdminStatus (administrative status of an F_Port)
- Configure SNMP dialog box
  - SNMPv1 communities (up to six)
  - Trap recipients (one per community)
  - Write authorization for sysContact, sysName, sysLocation, fcFPortPhysAdminStatus.
  - Enable authorization traps. This enables traps to be sent when unauthorized stations try to access Director SNMP information.
  - Override default user datagram (UDP) port numbers for trap recipients.

The first three parameters can also be configured using the **SNMPv1 SET** command with an appropriate community.

To access Director-specific variables, download the required private enterprise MIB. Download the MIBs for SNMP management stations from the SDCM Server's Web page. The uniform resource locator (URL) for the Web page depends on the SDCM Server's host name on your network. To access MIB-II and Fabric Element variables, download the Fibre Channel Fabric Element MIB.

MIB-II Support

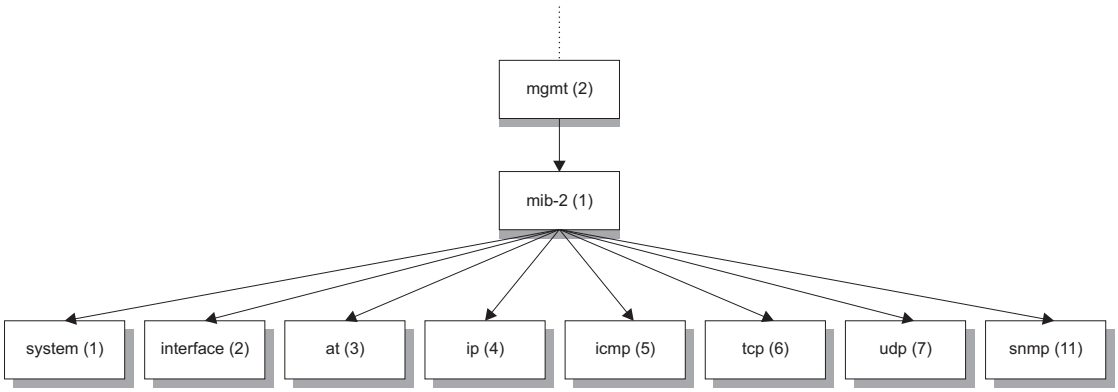

Figure 2–3: SNMP MIB-II Support

The Director 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

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

- Connectivity Unit (connSet).
- SNMP Trap Registration (trapReg).
- Port Statistics (statSet).

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

Table 2–1: Scalar FCMGMT Objects

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

The following sections define the FCMGMT MIB objects and how they are instrumented in the SDCM 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 switches that are configured in the SDCM Server. The group contains five simple objects and four tables: Connectivity Unit, Firmware, Port, Sensor, and Event.

Table 2–2: Connectivity Unit Group Objects

Object	Provides
uNumber	The number of managed connectivity units (Directors) defined to the SDCM Server.
systemURL	The http://[SDCM addr]/cgi-bin/launch.exe string is returned, where SDCM addr is the IP address of the SDCM Server. If SDC Manager Version 1.1 or higher is installed on the PC, accessing this URL from a browser will start the SDC Manager application.
StatusChangeTime (deprecated)	The value of statusChangeTime is updated whenever the status or state of any Director managed by the SDCM Server changes. Use of this object was deprecated in version 2.0 of the MIB.
ConfigurationChangeTime (deprecated)	Not supported. Use of this object was deprecated in the 2.0 version of the MIB.
connUnitTableChangeTime (deprecated)	This value is updated whenever a managed unit is added or deleted from SDC Manager. Use of this object was deprecated in version 2.0 of the MIB.

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

Table 2–3: Connectivity Unit Table

Object	Provides
ConnUnitId	This is an octet string that identifies a particular Director managed by a given SDCM Server.
connUnitGlobalId	The Node WWN of the Director is contained in the first 8 octets of the returned octet string. If the link between the SDCM Server and the switch is down, the string values are all zeros.
ConnUnitType	A constant value of switch(4) is returned.
ConnUnitNumports	The port capacity of 32 is returned for the Director.
ConnUnitState	The overall state of the connectivity unit is returned. unknown(1), online(2), offline(3). The mapping of Director on-line states to MIB ConnUnitStates: Director — MIB online — online state(2) going-offline — offline state(3) offline — offline state(3) coming-online — online state(2). unknown(1) is returned when the link between the SDCM Server and the Director is down.
ConnUnitStatus	The overall status of the connectivity unit is returned. unknown(1), unused(2), ok(3), warning(4) – needs attention, and failed(5). The mapping of Director operational status values to MIB ConnUnitStatus: Director — MIB operational — ok(3) degraded — warning(4) failed — failed(5) unknown(1) is returned when the link between the SDCM Server and the Director is down.
ConnUnitProduct	Product name is returned.

Table 2–3: Connectivity Unit Table (Continued)

Object	Provides
ConnUnitSn	The serial number for this connectivity unit.
ConnUnitUpTime	The total time the link between the SDCM Server and the Director has been up.
ConnUnitUrl	http://[SDCM IP addr]/cgi-bin/launch.exe?[product netaddr] where [product netaddr] is either the host name of the switch or the IP addr of the Director. The form of the address depends upon how the switch was added to the SDC Manager. If it was added by Name then the name will appear otherwise the IP address will appear. If SDC Manager Version 1.1 or higher is installed on the PC, accessing this URL from a browser will start the SDC Manager application.
ConnUnitDomainId	The value 0xFFCCdd is returned where dd is the domain id of the Director.
ConnUnitProxyMaster	yes(1) is returned
ConnUnitPrincipal	yes(3) is returned if the Director is the principal switch in the fabric otherwise no(2) is returned.
ConnUnitNumSensors	3 is always returned.
connUnitStatusChangeTime (deprecated)	The total time since the last status change on this switch.
ConnUnitConfigurationChangeTime (deprecated)	Not supported.
ConnUnitNumRevs	1 is always returned.
ConnUnitNumZones (deprecated)	0 is always returned.
ConnUnitModuleId	Not applicable to Director; an array of 16 zeros is returned.
ConnUnitName Read/write	On a read (Get) the configured name for the Director is returned. This object is writable.
ConnUnitInfo Read/write	On a read (Get) the configured description of the Director is returned. This object is writable.

Table 2–3: Connectivity Unit Table (Continued)

Object	Provides
ConnUnitControl Read/write	On a read (Get) unknown(1) is always returned. This object is writable. ResetConnUnitWarmStart(2), offlineConnUnit(3), and onlineConnUnit(4) controls are supported. resetConnUnitWarmStart(2) causes the Director to IPL. offlineConnUnit(3) causes the Director to go offline. onlineConnUnit(4) causes the Director to go online. resetConnUnitColdStart is not supported.
ConnUnitContact Read/write	On a read (Get) the configured Contact information of the Director is returned. This object is writable.
ConnUnitLocation Read/write	On a read (Get) the configured physical location of the Director is returned. This object is writable.
ConnUnitEventFilter	This value defines the event severity that will be logged by this connectivity unit. All events of severity less than or equal to connUnitEventFilter are logged in connUnitEventTable.
ConnUnitNumEvents	Number of events in the connUnitEventTable.
connUnitMaxEvents	The maximum number events in the connUnitEventTable is returned.
connUnitEventCurrID	The current event index is used as the last used event id.

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

Table 2–4: Firmware Table

Object	Provides
connUnitRevsUnitId	The connUnitId of the Director associated with this entry. This table is indexed by this object and the ConnUnitRevsIndex object.

Table 2–4: Firmware Table (Continued)

ConnUnitRevsIndex	1 is always returned. Each Director supports only one revision component.
connUnitRevsRevId	The revision of the switch firmware.
ConnUnitRevsDescription	Switch firmware is returned.

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

Table 2–5: Sensor Table

Object	Provides
connUnitSensorUnitId	The connUnitId of the Director associated with this entry. This table is indexed by this object and the connUnitSensorIndex object.
connUnitSensorIndex	Two kinds of sensors (one fan and two power supplies) are supported in this table. The range of the index is 1-3.
connUnitSensorName	The module name of the FRU, “FAN” or “PWR”
connUnitSensorStatus	The status indicated by the sensor. The values are defined as follows: unknown(1), other(2), ok(3), warning(4), failed(5). The value returned is based upon the Director FRU status. The active, backup and update-busy states are mapped to ok(3). And the failed state is mapped to failed(5).
connUnitSensorInfo	The serial number of the FRU is returned. No value is returned if the module is failed.
connUnitSensorMessage	The textual description of the FRU status.
connUnitSensorType	Either fan(4) or power-supply(5) is returned.
connUnitSensorCharacteristic	The value, other(2), is always returned.

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

Table 2–6: Port Table

Object	Provides
*connUnitPortUnitId	The connUnitId of the Director associated with this entry. This table is indexed by this object and the connUnitPortIndex object.
*connUnitPortIndex	The fixed physical port number +1. The index values range from 1 to 32.
connUnitPortType	The value returned will be one of the following: f_port(8), e_port(9), or g_port(10).
connUnitPortFCClassCap	The value returned is a bit map of the FC class capabilities of the port. For f_port types a constant of 12 (class_two(4) | class_three(8) is returned. For e_port and g_port types 13 is returned (class_f(1) | class_2(4) | class_3(8)) is returned.
connUnitPortFCClassOp	For f_port types the current operating class information is returned. For g_port types unknown(0) is returned. For e_port types 13 is returned (class_f(1) | class_2(4) | class_3(8)) is returned.
connUnitPortState	This is mapped from the port status reported by SDCM. For uninstalled ports, unknown(1) is returned. If the port is blocked, offline(3) is returned. All other status values are mapped to online(2).

Table 2–6: Port Table (Continued)

Object	Provides
connUnitPortStatus	This is also mapped from the port status reported by SDCM. For uninstalled ports unused(2) is returned. STAT_LINK_FAIL_LOL, STAT_INTERNAL_DIAGS, STAT_EXTERNAL_LOOP, STAT_LINK_RESET map to linkdown(6). STAT_AVAILABLE and STAT_BLOCKED map to ok(3). STAT_UNAVAILABLE, STAT_LINK_FAILURE, portStatus.isInvalidAttachment() map to warning(4). STAT_SERVICE_REQUIRED, STAT_PORT_FAIL map to failure(5).
connUnitPortTransmitterType	This is mapped from the port technology information stored by SDCM as follows: Not present and serial map to unknown(1). Optical sw1g and optical sw2g map to shortwave(4). Optical lw1g and optical lw2g map to longwave(5). Copper db9 and copper amp map to copper(6),
connUnitPortModuleType	A constant of glm(5), i.e., oneXnine, is returned.
connUnitPortWwn	The port World Wide Name is returned.
connUnitPortFCId	Fabric address of the port is returned.
connUnitPortSn	Not applicable. Empty string is returned.
connUnitPortRevision	Not applicable. Empty string is returned.
connUnitPortVendor	Port card vendor information from the VPD data is returned.
connUnitPortSpeed	A constant of 100000 kilobytes is returned.
connUnitPortControl (read/write)	On read (Get) operations unknown(1) is always returned. Write (Set) operations of reset(3), goOffline(6), goOnline(7) are supported.

Table 2–6: Port Table (Continued)

Object	Provides
ConnUnitPortName (read/write)	On read operations, the configured textual name of the port is returned.
connUnitPortPhysicalNumber	The physical port number is returned.
connUnitPortStatObject	Always returns the object identifier (OID) of the first object in the connUnitPortStatFabricTable.

Table 2–7: Event Table

Object	Provides
*connUnitEventUnitId	The connUnitId of the Director associated with this entry. This table is indexed by this object and the connUnitEventIndex object.
*connUnitEventIndex	A unique integer value that identifies a particular event on a particular Director. Event index values wrap (get reused) at 2,147,483,647.
ConnUnitEventId (deprecated)	Not supported.
connUnitREventTime	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.
connUnitSEventTime	This is the sysuptime timestamp when the event occurred. The format is the same as for connUnitREventTime.
connUnitEventSeverity	The mapping from the Director event severity level to FcEventServerity is as follows: Director — Value Returned informational — info(8) minor — error(5) major — critical(4) severe — emergency(2)
connUnitEventType	The value status(3) is always returned.

Table 2–7: Event Table (Continued)

Object	Provides
connUnitEventObject	The OID of the reporting connUnit is returned.
connUnitEventDescr	The SDCM event reason code description is returned.

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 2–8: Link Table

Object	Provides
*connUnitLinkUnitId	The connUnitId of the Director associated with this entry. This table is indexed by this object and the connUnitLinkIndex object.
*connUnitLinkIndex	This index is a unique integer value that identifies an instance of a link on a particular Director. Index values are assigned as links become known to the SDC SNMP agent. Index values are reset at SDC SNMP agent initialization time.
connUnitLinkNodeIdX	The WWN of the local connUnit is returned. This information is available for both E and F ports.
connUnitLinkPortNumberX	The connUnit's local port number is returned. This information is available for both E and F ports.
connUnitLinkPortWwnX	The WWN associated with the local port number is returned. This information is available for both E and F ports.
connUnitLinkNodeIdY	The node WWN associated with the remote node on this link. This information is available for E ports only.
connUnitLinkPortNumberY	The port number associated with the remote port on this link. This information is available for E ports only.
connUnitLinkPortWwnY	The port WWN associated with the remote port on this link. This information is available for F ports only.

Table 2–8: Link Table (Continued)

Object	Provides
connUnitLinkAgentAddressY	Not supported
connUnitLinkAgentAddressTypeY	Not supported
connUnitLinkAgentPortY	Not supported
connUnitLinkUnitTypeY	If the port is an E_Port, switch (4) is returned. Otherwise, unknown (1) is returned.
connUnitLinkConnIdY	For F_Ports, the 24-bit Fibre Channel address is returned. For E_Ports, the domain ID of the attached Director is returned.

Fabric Statistics

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

Table 2–9: Fabric Statistics Table

Object	Provides
connUnitPortStatFabricUnitId	The connUnitId of the Director associated with this entry. This table is indexed by this object and the connUnitPortStatFabricIndex object.
connUnitPortStatFabricIndex	Values returned range from 1 to 32, and represents the physical port number + 1.
connUnitPortStatFabricCountError	The sum of address ID errors, CRC errors, delimiter errors, encoding disparity errors, frame EOF errors, frames too long, frames too short, invalid ordered sets, invalid transmission words, link failures, and primitive sequence errors is returned.
connUnitPortStatFabricCountTxFrame	The count of transmitted frames is returned.
connUnitPortStatFabricCountRxFrame	The count of received frames is returned
connUnitPortStatFabricCountTxOctets	Not supported
connUnitPortStatFabricCountRxOctets	Not supported

SNMP Trap Registration Group

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

Table 2–10: SNMP Trap Registration Group

Object	Provides
trapMaxClients	The maximum number of trap recipients is returned. For the Director this value is a constant 12.
trapClientCount	The current number of trap recipients is returned.

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 2–11: Trap Registration Table

Object	Provides
trapReglpAddress	The IP address of the trap recipient. This table is indexed by this object and by trapRegPort
trapRegPort	The UDP port number of the trap recipient.
TrapRegFilter Read/write	This value defines the trap severity filter for this trap recipient. The agent will send traps to this host that have a severity level less than or equal to this value. The default value of this object is warning(6).
TrapRegRowState Read/write	On read operations rowInactive(2) or rowActive(3) is returned. Write operations are supported. RowDestroy(1) causes the trap recipient to be removed from the table. RowInactive(2) causes the sending of traps to the recipient to be suspended. RowActive(3) causes a trap recipient that had previously been set to inactive to become active again.

Fibre Channel Management Traps

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

Table 2–12: Fibre Channel Management Traps

Trap	Indication
connUnitStatusChange	This trap is generated when either the connUnitState or connUnitStatus changes for a particular Director. Both the connUnitState and connUnitStatus objects are included as trap data.
connUnitDeletedTrap	This trap is generated when a Director is removed from the SDCM Server. The connUnitId of the deleted Director is included as trap data.
connUnitEventTrap	This trap is generated when an event is logged in a Director's event table. connUnitEventIndex, connUnitEventType, connUnitEventObject, and connUnitEventDescr objects are included as trap data.
connUnitSensorStatusChange	This trap is generated when one of the sensors changes status. The connUnitSensorState object is included as trap data.
connUnitPortStatusChange	This trap is generated when one of the ports changes status. The connUnitPortStatus, connUnitPortState objects are included as trap data.

Fibre Channel Fabric Element MIB Support

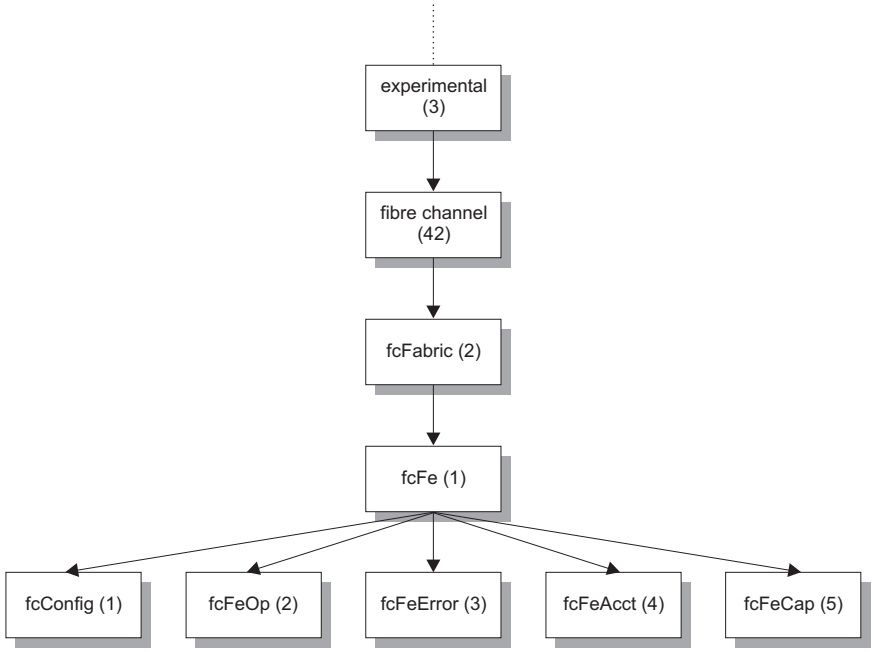

Figure 2–4: Fibre Channel Fabric Element MIB Support Tree

The Fibre Channel Fabric Element (FCFE) management information base (MIB) enables users on network management stations to monitor, control, and configure the Director remotely using functions specifically for the Director. The Director and the SDCM Server 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 *Fcfporterrrortable* displays the number of errors detected by an F_Port since the management agent initialized, enabling you to determine the quality of the link between the F_Port and its attached N_Port.

Table 2–13: Error Group

Variable	Provides the Number of:
fcFxPortErrorModuleIndex	Module index.
fcFxPortErrorPortIndex	Port index.
LinkFailures	Link failures detected by the F_Port.
SyncLosses	Synchronization losses detected by the F_Port.
SignalLosses	Signal loss errors detected by the F_Port.
PrimSeqProtErrors	Primitive sequence protocol errors detected by the F_Port.
InvalidTxwords	The number of invalid transmission words detected by the F_Port.
InvalidCRCs	The number of invalid cyclic redundancy checks (CRC) detected by the F_Port.
DelimiterErrors	Delimiter errors detected by the F_Port.
AddressIdErrors	Address identifier detected by the F_Port.
LinkResetIns	Link reset protocol received by the F_Port from the attached N_Port.
LinkResetOuts	Link reset protocol errors issued by the F_Port to the attached N_Port.
OlsIns	Offline sequences received by the F_Port.
OlsOutss	Offline sequences issued by the F_Port.

Accounting: Class 1

Class 1 is not supported.

Accounting: Class 2

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

Table 2–14: Accounting: Class 2

Variable	Provides the Number of Class 2:
ModuleIndex	Module index.
PortIndex	Port index.
InFrames	Frames received by the F_Port from its attached N_Port.
OutFrames	Frames delivered through the F_Port to its attached N_Port.
InOctets	Frame octets, including frame delimiters, received by the F_Port from its attached N_Port.
OutOctets	Frame octets, including frame delimiters, delivered through the F_Port to its attached N_Port.
Discards	Frames discarded by this F_Port.(not supported).
BusyFrames	F_BSY frames generated by the F_Port against class 2 frames.
RejectFrames	F_RJT frames generated by the F_Port against class 2 frames.

Accounting: Class 3

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

Table 2–15: Accounting: Class 3

Variable	Provides the Number of Class 3:
ModuleIndex	Module index.
PortIndex	Port index.
InFrames	Frames received by the F_Port from its attached N_Port.
OutFrames	Frames delivered through the F_Port to its attached N_Port.

Table 2–15: Accounting: Class 3 (Continued)

Variable	Provides the Number of Class 3:
InOctets	Frame octets, including frame delimiters, received by the F_Port from its attached N_Port.
OutOctets	Frame octets, including frame delimiters, delivered through the F_Port to its attached N_Port.
Discards	Frames discarded by the F_Port.

Operation: F_Port Operation Table

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

Table 2–16: F_Port Operation Table

Variable	Provides:
ModuleIndex	Module index.
PortIndex	Port index.
Port ID	Address identifier for the F_Port in the fabric. The F_Port may assign its address identifier to its attached N_Port during fabric login.
AttachPortName	Port name of the attached N_Port, if applicable. If the value of this variable is *00000000*, the F_Port has no N_Port attached.
ConnectedPort	Address identifier of the destination F_Port to which the F_Port has a class 1 connection. If the value of this variable is *000000H*, the F_Port is not engaged in a class 1 connection. Always return 000000H.
BBCreditAvailable	Number of buffers currently available for receiving frames from the attached port in the buffer-to-buffer flow control.
OperMode	The current operational mode of the F_Port.
AdminMode	The desired operational mode of the F_Port.

Operation: F_Port Physical Level Table

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

Table 2–17: Operation: F_Port Physical Level

Variable	Provides:
ModuleIndex	Module index.
FxPortIndex	Port index.
AdminStatus	Desired state of the F_Port. The testing (3) state indicates no operational frames can be passed. When a fabric element initializes, all F_Ports start with *fcFPortPhysAdminStatus* in the offline (2) state. As the result of either explicit management action or per-configuration information accessible by the fabric element, *fcFPortPhysAdminStatus* is then changed to either the online (1) or testing (3) states or remains in the offline (2) state.
OperStatus	Operational status of the F_Port. The testing (3) state indicates no operational frames can be passed. If *fcFPortPhysAdminStatus* is offline (2), then *fcFPortPhysOperStatus* should be offline (2). If *fcFPortPhysAdminStatus* is changed to online (1) then *fcFPortPhysOperStatus* should change to online (1). If the F_Port is ready to accept a fabric login request from the attached N_Port, 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.
LastChange	Value of *sysUpTime* at the time the F_Port entered its operational status. A value of zero indicates the F Port's operational status has not changed since the agent last started.
R_T_TOV	Receiver_Transmitter Timeout value of the F_Port used by the receiver logic to detect loss of synchronization.

Operation: Fabric Login Table

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

Table 2–18: Operation: Fabric Login

Variable	Provides:
fcFxlogiModuleIndex	Module index.
fcFxlogiFxPortIndex	Port index.
fcFxlogiNxPortIndex	Node port index.
FC-PHversAgrd	Version of FC-PH that the F_Port has agreed to support from the fabric login.
N_PtBBCredit	Total number of buffers available for holding a class 1 connect-request, or class 2 or class 3 frames to be transmitted to the attached N_Port. It is for buffer-to-buffer flow control in the direction from F_Port to N_Port.
N_PtRxDFldSz	Receive data field size of the attached N_Port. This is a binary value that specifies the largest data field size for an FT_1 frame that can be received by the N_Port. The value is in bytes ranging from 128 to 2112.
COSSuptAgrd	Flag indicating that the attached N_Port has requested the F_Port for the support of classes of services and the F_Port granted the request. It's a bit map of classes of services.
IntrmixSptAgrd	Flag indicating the attached N_Port has requested the F_Port for the support of intermix and the F_Port has granted the request. This flag is only valid if class 1 service is supported. If the flag is set at (no) 2, the request is not granted; if set at (yes)1, the request is granted. The value is always (no) 2.
StackdConnAgrd	Flag indicating whether the F_Port has agreed to support stacked connect from the fabric login. This is only meaningful if class 1 service has been agreed upon. Always return (none) 1.
C2SeqDelAgrd	Flag indicating whether the F_Port has agreed to support class 2 sequential delivery from the fabric login. This is only meaningful if class 2 service is agreed upon. If the flag is set at (no) 2, the F_Port has not agreed; if set at (yes) 1, the F_Port has agreed.
C3SeqDelAgrd	Flag indicating whether the F_Port has agreed to support class 3 sequential delivery from the fabric login. This is only meaningful if class 3 service is agreed upon. If the flag is set at (no) 2, the F_Port has not agreed; if set at (yes) 1, the F_Port has agreed.

Table 2–18: Operation: Fabric Login (Continued)

Variable	Provides:
PortName	The port name of the attached NxPort. It is the world wide name of the attached NxPort.
ConnectedNxPort	The address identifier of the destination FxPort with which this FxPort is currently engaged in either a class 1 or loop connection. Since the FxPort is not engaged in a connection, it is always '000000'H.
BbCreditModel	A flag 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 F_Port and the N_Port. It is fixed at regular(1) for the Director.

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.

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

Table 2–19: Module Table

Variable	Provides:
ModuleIndex	Module index.
Descr	A textual description of the module that should contain printable ASCII characters.
ObjectID	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 straightforward and unambiguous means for determining what kind of module is being managed.

Table 2–19: Module Table (Continued)

Variable	Provides:
OperStatus	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.
LastChange	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.
FPortCapacity	The number of ports that can be contained within the module. Within each module, the ports are uniquely numbered in the range from 1 to *fcFeModuleFPortCapacity* inclusive.
ModuleName	The name identifier of the module.

The configuration table displays the configuration parameters of the F_Ports.

Table 2–20: Configuration Table

Variable	Provides:
ModuleIndex	Module index.
FxPortIndex	Port index.
Name	Name identifier of the F_Port. Each F_Port has a unique port name in the address space of the fabric.
FC-PHVersHigh	Highest or most recent version of FC-PH that the F_Port is configured to support.
FC-PHVersLow	Lowest or earliest version of FC-PH that the F Port is configured to support.
BBCredit	Total number of receive buffers available for holding a class 1 connect-request, or class 2 or 3 frames from the attached N_Port. It is for buffer-to-buffer flow control in the direction from the attached N_Port (if applicable) to the F_Port.
RxBufferSize	Largest Data_Field size (in octets) for an FT 1 frame that can be received by the F_Port.

Table 2–20: Configuration Table (Continued)

Variable	Provides:
R_A_TOV	Resource allocation time out value configured for the F_Port. This is used as the timeout value for determining when to reuse an N_Port resource such as a Recovery_Qualifier. It represents E_D_TOV (see next variable) plus twice the maximum time a frame may be delayed within the fabric and still be delivered.
E_D_TOV	Error detect time out value configured for the F_Port. The Error_Detect_Timeout Value is used as the timeout value for detecting an error condition.
ClassSvcSupt	Value indicating the set of classes of service supported by the F_Port.
IntermixSupt	Flag indicating if the F_Port supports an intermixed dedicated connection. The flag is always at no(2).
StackedConMode	Value indicating the mode of stacked connect supported by the F_Port. The value is always at none(1).
C2SeqDelivery	Flag indicating if class 2 sequential delivery is supported by the F_Port.
C3SeqDelivery	Flag indicating if class 3 sequential delivery is supported by the F_Port.
HoldTime	Maximum time (in microseconds) the F_Port holds a frame before discarding the undeliverable frame. The value 0 means that the F_Port does not support this parameter.
BaudRate	FC-0 baud rate of the F_Port.
Medium	FC-0 medium of the F_Port.
TxType	FC-0 transmitter type of the F_Port.
Distance	FC-0 distance range of the F_Port transmitter.

Capability Group Table

The *Fccfportcaptable* displays the capabilities of the F_Port within the fabric element.

Table 2–21: Capability Group Table

Variable	Provides
CapModuleIndex	Module index.
FxPortIndex	Port index.
FC-PHVersionHigh	Highest or most recent version of FC-PH that the FxPort is capable of supporting.
FC-PHVersLow	Lowest or earliest version of FC-PH that the F_Port is capable of supporting.
BBCreditMax	Maximum number of receive buffers available for holding a class 1 connect-request, or class 2 or class 3 frames from the attached N_Port.
BBCreditMin	Minimum number of receive buffers available for holding a class 1 connect-request, or class 2 or class 3 frames from the attached N_Port.
RxDataFldSzMax	Maximum size in bytes of the data field in a frame that the F_Port is capable of receiving from its attached N_Port.
RxDataFldSzMin	Minimum size in bytes of the data field in a frame that the F_Port is capable of receiving from its attached N_Port.
Cos	Value indicating the set of classes of service the F_Port is capable of supporting.
Intermix	Flag indicating if the F_Port 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. Fixed at no(2).
StackedConMode	Value indicating the mode of stacked connect request that the F_Port is capable of supporting. Fixed at none(1).
C2SeqDelivery	Flag indicating if the F_Port is capable of supporting class 2 sequential delivery.
C3SeqDelivery	Flag indicating whether or not the F_Port is capable of supporting class 3 sequential delivery.
HoldTimeMax	Maximum holding time (in microseconds) the F_Port is capable of supporting. (Not supported.)
HoldTimeMin	Minimum holding time (in microseconds) the F_Port is capable of supporting. (Not supported.)
BaudRates	Value indicating the set of baud rates the F_Port is capable of supporting.
Media	Value indicating the set of media the F_Port is capable of supporting.

SD-64 Private Enterprise MIB (EF-6000)

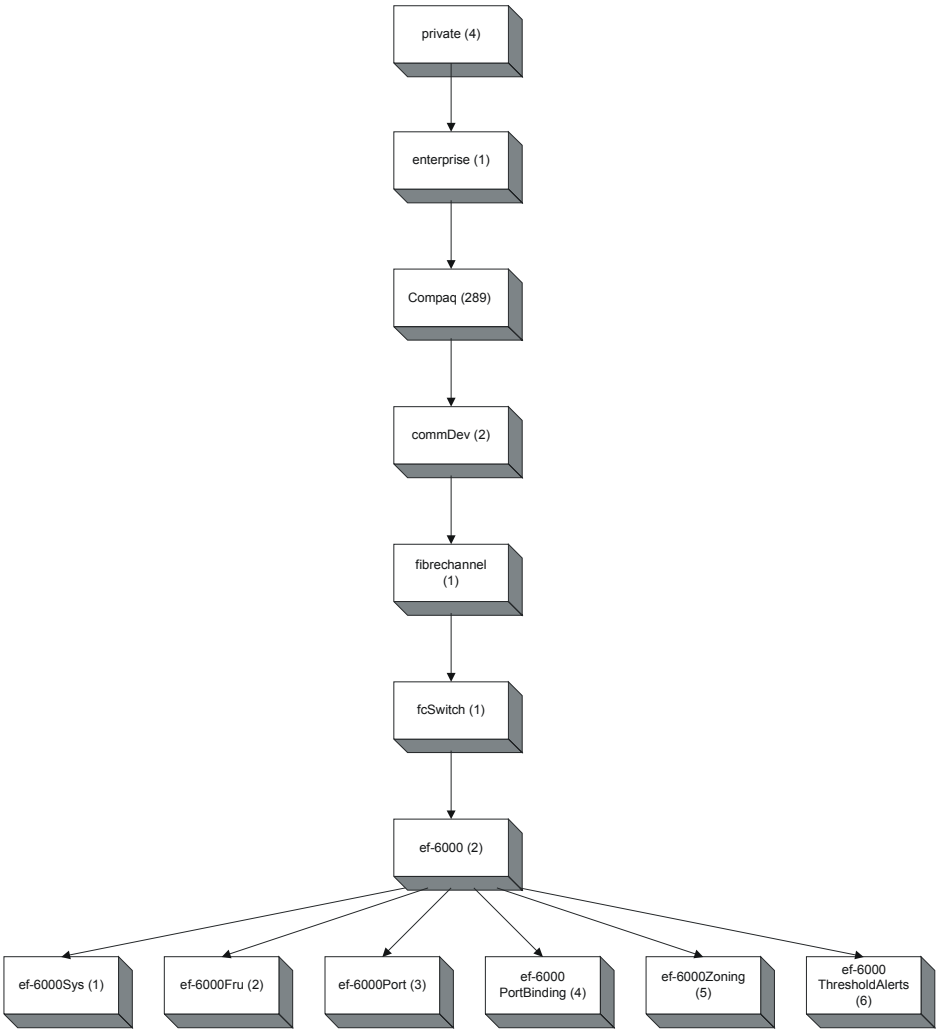

Figure 2–5: EF-6000 Private Enterprise MIB Support

Three groups of MIB are defined and supported in the EF-6000 Private Enterprise MIB:

- System group (ef6000Sys)
- Field replaceable unit (FRU) group (ef6000Fru)

- Fibre Channel port group (ef6000Port)

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

System Group

Table 2–22: System Group Variables

Variable	Provides:
ef6000SysCurrentDate	Current date information.
ef6000SysBootDate	Date and time of the last IPL of the Director.
ef6000SysFirmwareVersion	Current version of the firmware.
ef6000SysTypeNum	ASCII type number of the Director.
ef6000SysModelNum	ASCII model number of the Director.
ef6000SysMfg	ASCII manufacturer of the Director.
ef6000SysPlantOfMfg	ASCII plant of manufacturer of the Director.
ef6000SysEcLevel	ASCII EC level ID of the Director.
ef6000SysOemSerialNum	ASCII OEM serial number of the Director.
ef6000SysOperStatus	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).
ef6000SysState	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).
ef6000SysAdmStatus (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.

Field Replaceable Unit (FRU) Group

Table 2–23: FRU Group Table Variables

Variable	Provides:
ef6000FruCode	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-glsl(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) - F_Port, internal, 1 Gig.
ef6000FruPosition	Position of the module.
ef6000FruStatus	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.
ef6000FruPartNumber	Part number of the module.
ef6000FruSerialNumber	Serial number of the module.
ef6000FruPowerOnHours	Number of the hours that the FRU has been in operation.
ef6000FruTestDate	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 2–24: Fibre Channel Port Group Table Variables

Variable	Provides:
ef6000PortIndex	Director port number.
ef6000PortPhyState	Physical state of the port.
ef6000PortOpStatus	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.
ef6000PortAdmStatus (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 switch, *edFcPortAdmStatus* is then changed to either the online (1) or testing (3) states, or remains in the offline state.
ef6000PortConnector	Supported connector types of the port. The values are defined as follow: unknown(1), lc(2), mt-rj(3), mu(4)
ef6000PortDistance	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.
ef6000PortType	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).
ef6000PortMedia	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.
ef6000PortSpeed	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.

Table 2–24: Fibre Channel Port Group Table Variables (Continued)

Variable	Provides:
ef6000PortTxWords	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.)
ef6000PortRxWords	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.)
ef6000PortTxFrames	The number of class 2 & class 3 (Fibre Channel) frames that the port has transmitted.
ef6000PortRxFrames	The number of class 2 & class 3 (Fibre Channel) frames that the port has received.
ef6000PortTxThroughput	The Bps (bytes per second) transmission rate of the port.
ef6000PortRxThroughput	The Bps (bytes per second) reception rate of the port.
ef6000PortTxC2Words	The number of class 2 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
ef6000PortRxC2Words	The number of class 2 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
ef6000PortTxFrames	The number of class 2 & class 3 (Fibre Channel) frames that the port has transmitted.
ef6000PortRxFrames	The number of class 2 & class 3 (Fibre Channel) frames that the port has received.
ef6000PortTxThroughput	The Bps (bytes per second) transmission rate of the port.
ef6000PortRxThroughput	The Bps (bytes per second) reception rate of the port.
ef6000PortTxC2Words	The number of class 2 4-byte words that the port has transmitted. (Primitive signals and primitive sequence are not included.)
ef6000PortRxC2Words	The number of class 2 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
ef6000PortTxC2Frames	The number of Class 2 frames that the port has transmitted.
ef6000PortRxC2Frames	The number of Class 2 frames that the port has received.
ef6000PortTxC2Octets	The number of Class 2 Octets that the port has transmitted.

Table 2–24: Fibre Channel Port Group Table Variables (Continued)

Variable	Provides:
ef6000PortRxC2Octets	The number of Class 2 Octets that the port has received.
ef6000PortTxC3Words	The number of class 3 4-byte words that the port has transmitted. (Primitive signals and primitive sequence are not included.)
ef6000PortRxC3Words	The number of class 3 4-byte words that the port has received. (Primitive signals and primitive sequence are not included.)
ef6000PortTxC3Frames	The number of Class 3 frames that the port has transmitted.
ef6000PortRxC3Frames	The number of Class 3 frames that the port has received.
ef6000PortTxC3Octets	The number of Class 3 Octets that the port has transmitted.
ef6000PortRxC3Octets	The number of Class 3 Octets that the port has received.
ef6000PortC3Discards	The number of Class 3 frames that the port has discarded.
ef6000PortDiscardFrames	The number of frames that the port has discarded.
ef6000PortTxLinkResets	The number of link resets initiated by this Director port.
ef6000PortRxLinkResets	The number of link resets initiated by the attached N_port.
ef6000PortTxOLSs	The number of offline sequences initiated by this Director port.
ef6000PortRxOLSs	The number of offline sequences initiated by the attached N_port.
ef6000PortSyncLosses	The number of loss of synchronization timeout.
ef6000PortSigLosses	The number of times that a Loss of Signal is detected.
ef6000PortProtocolErrors	The number of protocol errors detected.
ef6000PortInvalidTxWords	The number of Invalid Transmission words that the port has received.
ef6000PortLinkFailures	The number of transitions to an LFx state.
ef6000PortCrcs	The number of CRC errors detected from frames received.
ef6000PortTruncs	The number of frames shorter than the Fibre Channel minimum.

Port Binding Group

Table 2–25: Port Binding Group Table

Variable	Provides:
ef6000PortBindingIndex	The fixed port number on the switch. It ranges from 1 to the number of physical ports that can be supported by the switch.
ef6000PortBindingFlag	The flag indicates whether or not Port Binding is in effect for an individual; port. The values are: yes (1), and no (2).
ef6000PortConfiguredWWN	The authorized port WWN for attached servers and storage systems (F ports), or the authorized switch WWN for attached switches (E ports).
ef6000PortAttachedWWN	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 2–26: Zoning Group Table

Variable	Provides:
ef6000ActiveZoneSetName	The active zone set name.
ef6000ActiveZoneCount	The count of zones included in the active zone set.
ef6000DefaultZoneSetState	The state of the default zone set.
ef6000ActiveZoneSetState	The state of the default zone set.
ef6000HardwareEnforcedZoning	Indicates if zoning is hardware enforced (1=Hardzoning, 0=Nameserver zoning only).

Table 2–27: Active Zone Table

Variable	Provides:
ef6000ZoneIndex	Zone index number. This number will range from 1 to the number of zones specified by the ActiveZoneCount.
ef6000ZoneName	The name of the zone.
ef6000ZoneMemberCount	The number of members included in the zone.

Table 2–28: Active Member Table

Variable	Provides:
ef6000ZoneIndex	The index of the zone this member belongs to.
ef6000MemberIndex	Member index number. This number will range from 1 to the number of members specified by the corresponding ZoneMemberCount.
ef6000MemberType	Indicates the addressing method for this member (1=WWN, 2=Port Number).
ef6000MemberWWN	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.
ef6000MemberDomainID	The domain ID. This value is only valid if the member type is 2, otherwise it will default to 0.
ef6000MemberPortNumber	The port number. This value is only valid if the member type is 2, otherwise it will default to 0.

Threshold Alert Group

Table 2–29: Threshold Alerts Table

Variable	Provides:
ef6000TAIndex	This object is used to identify which threshold has been triggered.
ef6000TAName	The threshold alert name.
ef6000TAState	The current state of the threshold (enabled=1, disabled=2).
ef6000TAType	The type of the threshold. (throughput=1, counter=2).
ef6000TAPortType	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).
ef6000TAPortList	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.
ef6000TAInterval	The number of minutes in a threshold alert interval.
ef6000TATrggerValue	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.
ef6000TTADirection	Specifies the throughput direction of the threshold (transmit=1, receive=2, either=3). This only applies when the alert type is Throughput Threshold Alert.
ef6000TTATriggerDuration	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.
ef6000CTACounter	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:

- ef6000PortScn

  An *ef6000PortScn* is generated whenever a Fc_Port changes its operational state. For instance, the Fc_Port goes from on-line to offline.

- ef6000FruScn

  An *ef6000FruScn* is generated whenever a FRU status changes its operational state.

- ef6000PortBindingViolation

  An *ef6000PortBindingViolation* is generated whenever the switch detects that a port Binding Violation occurs.

- ef6000ThresholdAlert

  An ef6000ThresholdAlert is generated whenever a threshold alert occurs

Table 2–30: Enterprise-Specific Trap Definitions

Trap	Trap Type Enterprise	Variable
ef6000PortScn	compaqTrap	{ef6000PortOpStatus}
ef6000FruScn	compaqTrap	{ef6000FruStatus}
ef6000PortBindingViolation	compaqTrap	{ef6000PortAttachedWWN}
ef6000ThresholdAlert	compaqTrap	{ef6000PortIndex, ef6000TAIndex}

Glossary

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

A

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 FRU

A redundant field-replaceable unit that is currently operating as the active and not the backup FRU. *Contrast with* backup FRU.

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.

authentication

Verification of identity for a person or process.

B

backplane

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

backup FRU

When an active FRU fails, an identical backup FRU takes over operation automatically (failover) to maintain Director and Fibre Channel link operation. *Contrast with* active FRU.

BB_Credit

See buffer-to-buffer credit.

beaconing

Use of light-emitting diodes on ports, port cards, field-replaceable units, and Directors 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 the Director or communicating with other devices attached to the Director. A blocked port continuously transmits the offline sequence.

bridge

Device that connects and passes packets between two network segments that use the same communications protocol.

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.

C

call-home

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

channel

Point-to-point link that transports data from one point to the other.

channel path

A single interface between a central processor and one or more control units along which signals and data can be sent to perform I/O requests.

class of Fibre Channel service

Defines the level of connection dedication, acknowledgment, and other characteristics of a connection. Class F, Class 2, and Class 3 services are supported.

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.

connector

See optical fiber connector.

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 SDCM 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.

D

DASD

Acronym for direct access storage device.

datagram

See Class 3 Fibre Channel service.

default

Pertaining to an attribute, value, or option that is assumed when none is explicitly specified.

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, that is not controlled directly by the SD-64 Product Manager application. *See also* node.

diagnostics

Procedures used by computer users and service personnel to diagnose hardware or software error conditions.

dialog box

Dialog box is a window containing informational messages or data fields to be modified or filled in with desired options.

D_ID

See destination identifier.

Director

An intelligent Fibre Channel switching device providing any-to-any port connectivity between nodes (end devices) on a switched fabric. The Director sends data transmissions (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

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 through an embedded web server interface. The interface provides a GUI similar to the SD-64 Product Manager application, and supports Director configuration, statistics monitoring, and basic operation.

error detect time-out value (E_D_TOV)

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

error message

Software message that indicates an error was detected. *See also* information message and warning message.

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 SDCM server and managed Directors.

event code

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

event log

Record of significant events that have occurred at the Director, 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. *See also* segmented E_Port.

F

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 switch, Director, or node in a Fibre Channel switched fabric.

Fabric Manager application

Application that implements the management user interface for Fibre Channel fabrics. When a fabric instance is opened from the SDCM application's Fabric View, the Fabric Manager application is invoked.

fabric port (F_Port)

Physical interface on the Director 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.

FCC-IOC

See Fibre Channel input/output controller.

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.

fiber port module (FPM) card

Each fiber port module card provides four Fibre Channel connections through duplex small form factor (SFF) pluggable fiber-optic transceivers.

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.

Fibre Channel input/output controller (FCC-IOC)

A device that controls the embedded Fibre Channel port and configures the ports' ASICs.

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 the Director.

FPM card

See fiber port module card.

F_Port

See fabric port.

FRU

See field-replaceable unit.

G

gateway

A multi-homed host used to route network traffic from one network to another, and to pass network traffic from one protocol to another.

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 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.

H

hardware log

Record of FRU insertions and removals for the Director.

HBA

See host bus adapter.

heterogeneous fabric

A fabric with both Compaq and non-Compaq 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 Compaq 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.

I

IML

See initial machine load.

information message

Software message that indicates to a user that a function is performing normally or has completed normally. *See also* error message and warning message.

initial machine load (IML)

Hardware reset for all installed CTP cards on the Director. It does not affect other hardware. It is initiated by pushing the white button on a Director's CTP card.

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.

interface

Hardware, software, or both, linking systems, programs, or devices.

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 in a fabric.

IP address

See internet protocol address.

IPL

See initial program load.

ISL

See interswitch link.

J

jumper cable

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

L

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

Physical connection between two devices in a switched fabric.

link incident (LIN)

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

load balancing

Ability to evenly distribute traffic over multiple interswitch links within a fabric. Load balancing on Compaq Directors takes place automatically.

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.

M

MAC address

See Media Access Control address.

maintenance port

Connector on the Director 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 SDCM application. For example, the SD-64 Director 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 SDCM application. Management Services runs only on the SDCM server, and cannot be downloaded to remote workstations.

management session

A management session exists when a user logs on to the SDCM application. The application can support multiple concurrent management sessions. The user must specify the network address of the SDCM 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 switching device within a fabric.

N

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 or Director in the 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.

O

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.

optical cable assembly

Optical cable that is connector-terminated. *See also* jumper cable and optical cable.

optical fiber connector

Hardware component that transfers optical power between two optical fibers or bundles and is designed to be repeatedly connected and disconnected.

out-of-band management

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

P

packet

Logical unit of information (usually in the form of a data frame) transmitted on a network. It contains a header (with all relevant addressing and timing information), the actual data, and a trailer (which contains the error checking function, usually in the form of a cyclic redundancy check).

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.

path

In a network, any route between any two ports.

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 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 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 name

User-configurable identifier assigned to a managed product. Typically, this name is stored on the product itself. For the SD-64 Director, the product name can also be accessed by an SNMP manager as the system name.

R

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 access link

Connection to a device or program on a computer network via a (geographically) remote workstation.

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 SDCM and SD-64 Product Manager applications that can access the SDCM 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.

S

SAN

See storage area network.

SANworks Director Connectivity Manager (SDCM) application

Application that implements the management user interface for Compaq Fibre Channel switching products, and as a launching point for the SD-64 Product Manager and Fabric Manager applications. The application runs locally on the SDCM server or on a remote workstation.

SANworks Director Connectivity Manager (SDCM) server

Notebook computer shipped with a Director to run the SDCM, SD-64 Product Manager, and Fabric Manager applications.

SBAR

See serial crossbar assembly.

SC

Acronym for subscriber connector.

SD-64 Product Manager application

Application that implements the management user interface for a specified SD-64 Director. When a product instance is opened from the SDCM application's Product View, the SD-64 Product Manager application is invoked.

SDCM application

See SANworks Director Connectivity Manager application.

SDCM server

See SANworks Director Connectivity Manager server.

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.

SEL

Acronym for system error light.

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.

SFF

Acronym for small form factor (a type of Fibre Channel connector). *See also* fiber 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.

SSP

See system services processor.

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.

switchover

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

switch priority

Value configured into each switch in a fabric that determines its relative likelihood of becoming the fabric's principal switch.

system services processor (SSP)

Controls the RS-232 maintenance port, the Ethernet port, and the operator panel of a Fibre Channel Director.

T

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, c*ontrast with* jumper cable.

U

unblocked port

Devices attached to an unblocked port can login to the Director 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* and *anycast* (communication between any sender and the nearest of a group of receivers).

V

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.

W

warning message

Software message that indicates a possible error was detected. *See als*o error message and information message.

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.

Z

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 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, may be configured into one or more zones. *See also* zone.

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