

# StorageWorks by Compaq

## **Fibre Channel SAN Switch**

Management Guide

Second Edition (November 2001)  
Part Number: AA-RMMJB-TE  
**Compaq Computer Corporation**

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# About This Guide

This guide is designed as a tool for managing Compaq Fibre Channel SAN Switches. This section covers:

- [Related Documents, page xxvii](#)
- [Text Conventions, page xxviii](#)
- [Symbols in Text, page xxix](#)
- [Getting Help, page xxix](#)

## Related Documents

In addition to this guide, refer to the Compaq StorageWorks documentation listed in [Table 1](#).

**Table 1: Related Documents**

Document Title	Part Number
<i>Fabric Watch Version 2.4.1 User Guide</i>	AA-RR79A-TE
<i>Extended Fabric Version 2.4.1 User Guide</i>	AA-RR7DA-TE
<i>Fibre Channel SAN Switch Management Guide</i>	AA-RMMJB-TE
<i>Fibre Channel SAN Switch 8 Installation and Hardware Guide</i>	EK-BCP24-IA.C01
<i>Fibre Channel SAN Switch 8-EL Installation and Hardware Guide</i>	AA-RMMHB-TE
<i>Fibre Channel SAN Switch 16 Installation and Hardware Guide</i>	EK-BCP28-1A.C01
<i>Fibre Channel SAN Switch 16-EL Installation and Hardware Guide</i>	AA-RNAPB-TE
<i>Fibre Channel SAN Switch Remote Switch Services Installation and Hardware Guide</i>	EK-SANRS-AA.C01
<i>Fibre Channel SAN Switch Integrated/32 and SAN Switch Integrated/64 Installation and Hardware Guide</i>	AA-RPDFB-TE
<i>Command Console for Hubs, Switches, and Tape Controllers Getting Started Guide</i>	AA-RHDAD-TE

## Text Conventions

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

<b>Keys</b>	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
<i>FILENAMES</i>	File names appear in italic, initial capital letters except when case-sensitive.
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. <b>NOTE:</b> UNIX commands are case sensitive and will not appear in uppercase.
Type	When you are instructed to <i>type</i> information, type the information <b>without</b> pressing the <b>Enter</b> key.
Enter	When you are instructed to enter information, type the information and then press the <b>Enter</b> 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.

---

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**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.

## Getting Help

If you have a problem and cannot locate 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 the 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

## Overview

A Fibre Channel switch connects storage devices, hosts, and servers in a Storage Area Network (SAN). Choosing the right management application allows you to optimize the performance of your SAN. This guide describes the switch management options that support the Compaq StorageWorks Fibre Channel SAN Switch products.

## Switch Management

Compaq provides seven different ways to access and manage Fibre Channel switches. [Table 1-1](#) summarizes the different management tools.

**Table 1-1: Switch Management Access Methods**

Method	Description	Local	In-Band* (Fibre Channel)	Out-of-band (Ethernet)
Network View, See Chapter 2	Managed remotely using Simple Network Management Protocol (SNMP) or the Web.	No	Yes	Yes
StorageWorks Command Console (SWCC), See Chapter 3	Managed remotely using Simple Network Management Protocol (SNMP) or the Web.	No	Yes	Yes
Web Management Tools, See Chapter 4	Managed remotely through the Web.	No	Yes	Yes
Simple Network Management Protocol (SNMP), See Chapter 5	Transmission Control Protocol/Internet Protocol (TCP/IP) used to exchange management information.	No	Yes	Yes

**Table 1-1: Switch Management Access Methods (Continued)**

Method	Description	Local	In-Band* (Fibre Channel)	Out-of-band (Ethernet)
Telnet, See Chapter 5	Managed remotely using a TCP/IP connection	No	Yes	Yes
Single Ethernet Port, See Chapter 5	Use one out-of-band connection and set up remaining switches for Remote in-band management	No	Yes	Yes
Front Panel Controls, (only applies to the Fibre Channel 16 model)	Managed through the display screen located only on the Fibre Channel SAN Switch 16 model	Yes	No	No

\*Most host bus adapters are not set up to initiate an in-band Fibre Channel IP connection. At least one switch must have an Ethernet connection.

## Licenses

Compaq StorageWorks Fibre Channel SAN Switches come pre-installed with the following licenses:

- Fabric OS
- Web Management Tools
- QuickLoop (except on the 8-EL and 16-EL models)
- Zoning
- Fabric Manager, (included with the StorageWorks SAN Switch Integrated/32 and StorageWorks SAN Switch Integrated/64 products)

Optional licenses for the Fibre Channel SAN Switches include:

- Remote Switch Services
- Extended Fabric, (check <http://www.compaq.com/storage> for availability)
- Multi-E\_Port support for Fibre Channel 8-EL model
- Fabric Watch, (see the *Fabric Watch Version 2.4.1 User Guide*, Part Number AA-RR79A-TE)

## Chapter 2

# Managing the Switch Using Network View

Network View is a management application that runs on the SAN Appliance. If installed in your network, Network View provides easy access to Fibre Channel SAN Switch management applications, including Web Management Tools. Additional Network View features include:

- Performance tracking of SAN devices and connections
- Distribution analysis on SAN devices
- Management of devices in zones
- Network map of SAN devices and connections
- Alert and notification functions for all devices on a SAN.

### Accessing Network View

Use these steps to access Network View from the SAN Appliance already running in your network.

**NOTE:** This section lists Network View procedures relative to Compaq StorageWorks Fibre Channel SAN Switch models 8, 8-EL, 16, 16-EL, Integrated/32 and Integrated/64 only. For more detailed information on Network View, refer to the *Network View Installation Guide*, Part Number PN AA-RP8AB-TE, (and Network View online Help once installed.)

1. Access your browser. Type the SAN Appliance IP address and port number.
2. The SANworks Management Appliance splash screen displays. Click anywhere inside the splash screen to view the login prompt.
3. Type your username and password at the Login. Click OK.

**NOTE:** The default username is administrator. The default password is administrator.

## 2-2 Fibre Channel SAN Switch Management Guide

4. The Open SAN Manager window displays, see [Figure 2-1](#).
  - a. Click the Applications folder.
  - b. Click the Network Utilities folder.
  - c. Click the Network View icon.
  - d. Click the Launch button.

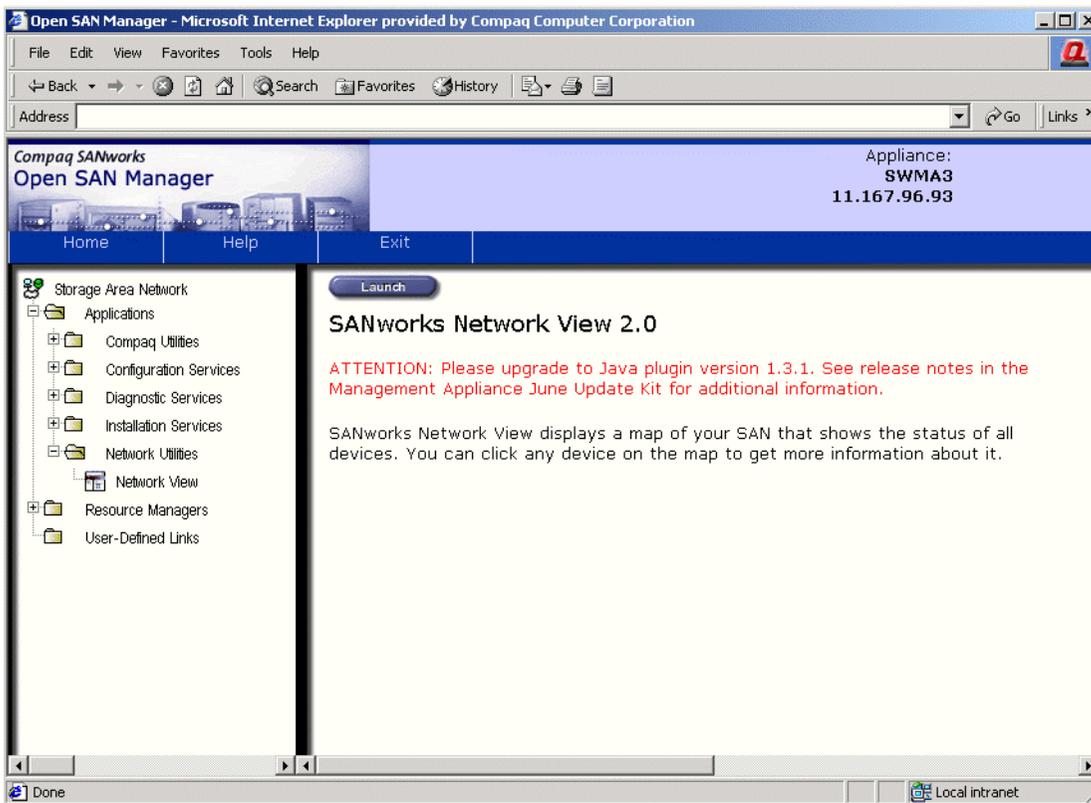


Figure 2-1: Open SAN Manager window

5. The SAN Topology screen displays, see [Figure 2-2](#). Use Network View to discover the appropriate Fibre Channel SAN switch, as follows.
  - a. At the Session Pane, click the Configure button, see [Figure 2-2](#).
  - b. Enter the range of switch TCP/IP addresses to be discovered on your SAN.
  - c. Click Add Range.

- d. Click on the active row. Type the range of TCP/IP addresses in the open row.
  - e. Set the **SMTP Server Information** to identify the mail server to use for sending email notification.
  - f. Set the **Device Discovery Interval** to configure the time interval at which you want Network View to discover new devices.
  - g. Click Start Discovery. The number of devices found appears in the Content pane.
6. The SAN Topology screen displays, showing the icons associated with the newly discovered devices.

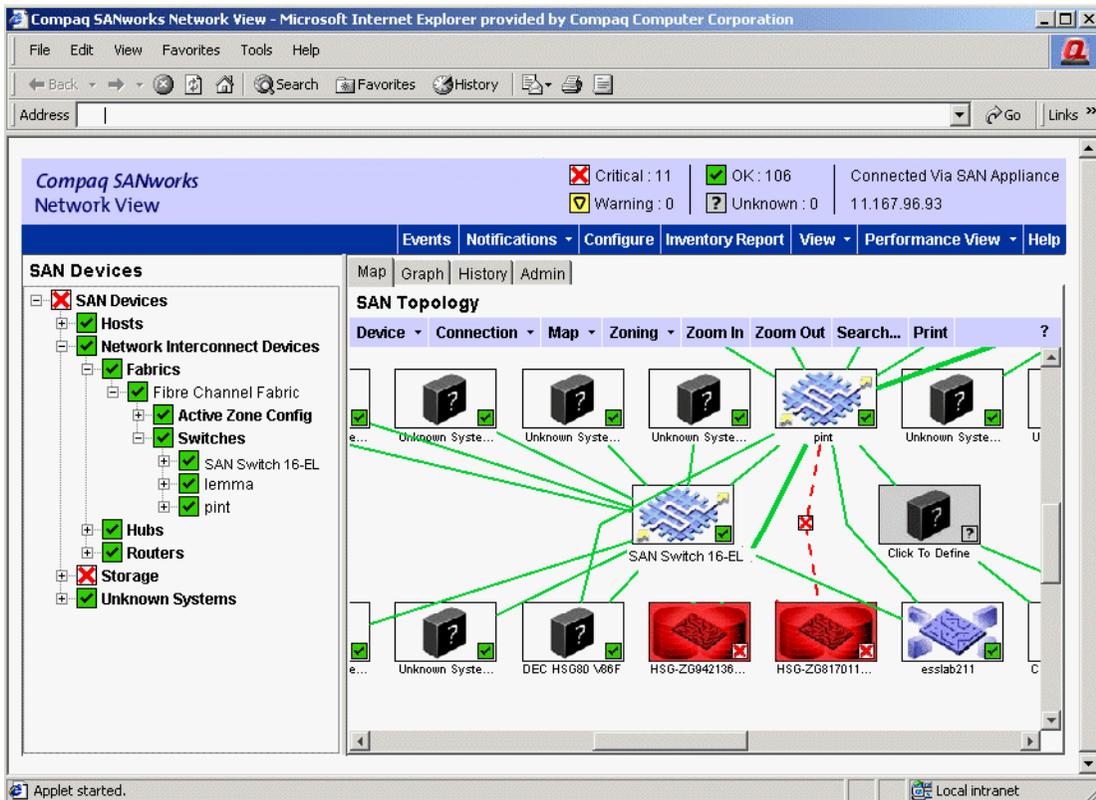


Figure 2-2: Network View, SAN Topology screen

7. To view the switch properties from Network View, right click the appropriate switch icon, and select Properties from the drop-down list. See Figure 2-3.

**NOTE:** The appearance and behavior of the window as shown in Figure 2-3 is based on the device. The properties that are known to Network View, such as display names and device types, are displayed. For each device, a different set of properties is displayed.

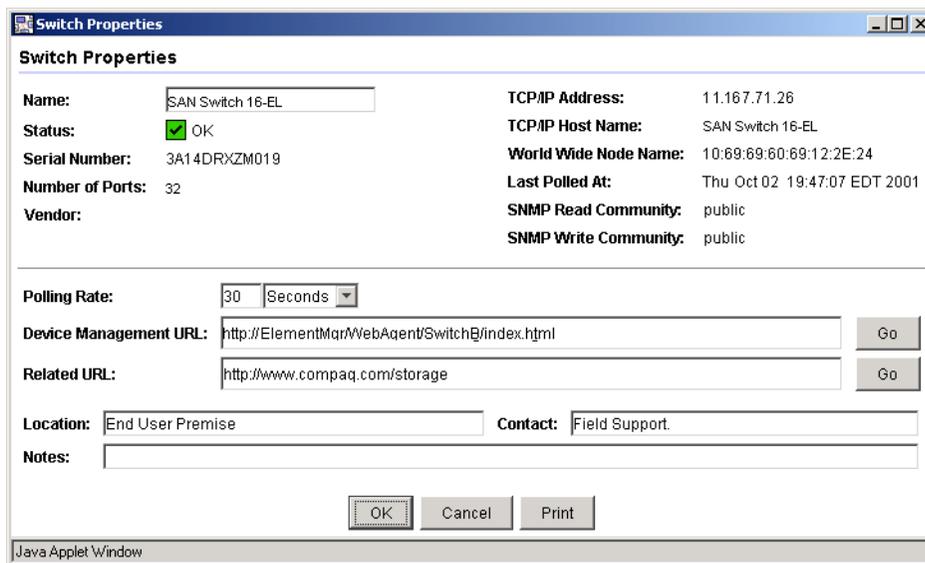


Figure 2-3: Switch Properties window

To access the web-based management application, refer to the next section, "Launching Web Management Tools from Network View."

## Launching Web Management Tools from Network View

Use these steps to access Web Management Tools from Network View.

---

**IMPORTANT:** Before launching Web Management Tools, you must first discover the switch. See step 5 in the previous section, "Accessing Network View."

---

1. At the SAN Topology screen, double-click the appropriate Fibre Channel switch icon, see Figure 2-4. Or, right click the icon and select Manage Device from the menu. The Login screen displays.

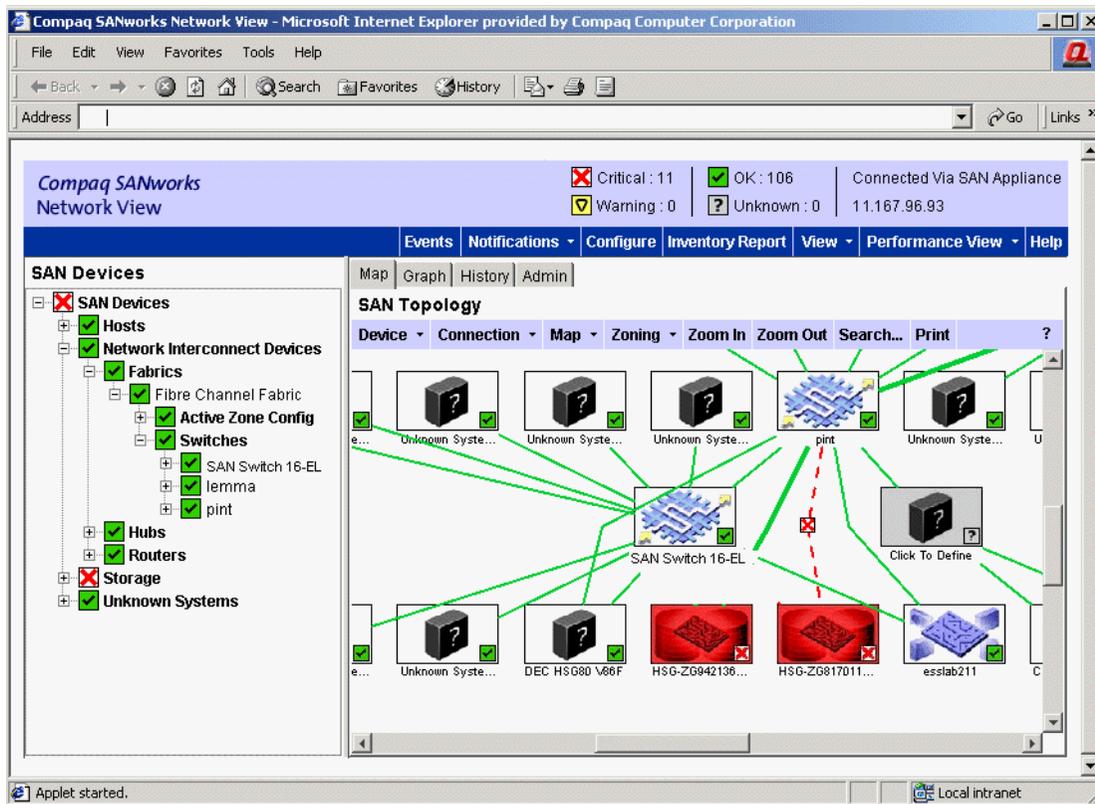


Figure 2-4: Network View, SAN Topology screen

2. Obtain the Web Management Tools username and password from your Network Administrator.
3. Type the username and password at the Login. The default username is Administrator. The default password is password.

- The Fabric View screen displays. Fabric View is the first view that displays when you connect to a switch through Web Management Tools.

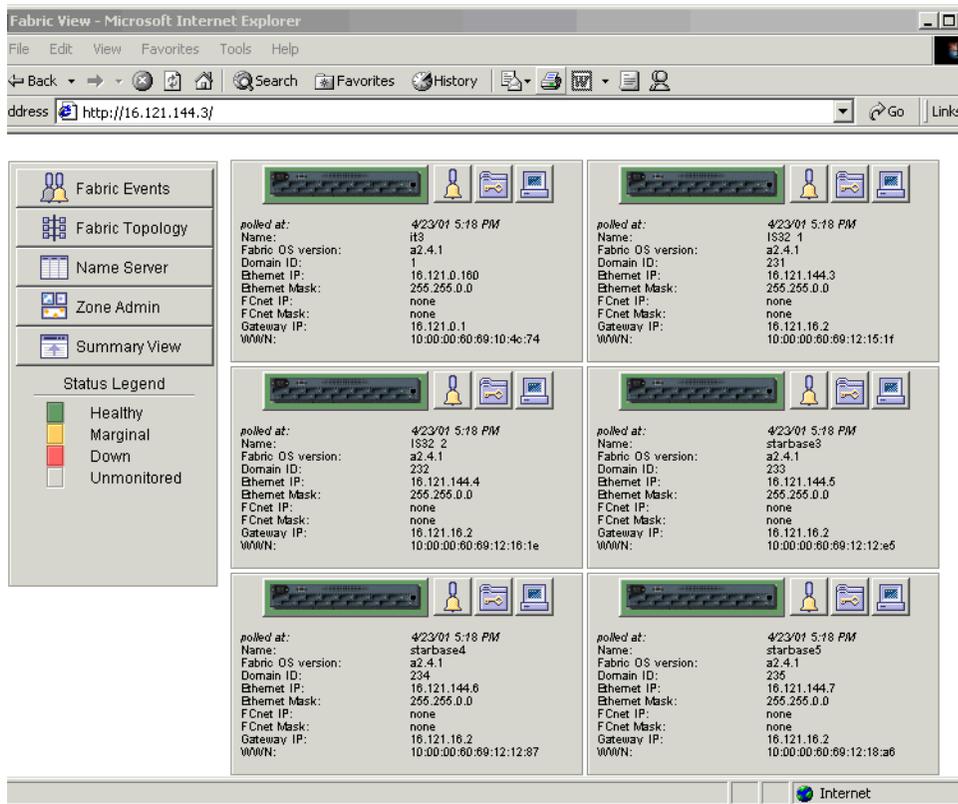


Figure 2-5: Fabric View screen in Web Management Tools

**NOTE:** Refer to Chapter 4, “Managing the Switch Using Web Management Tools,” for more detailed information.

# Chapter 3

## Managing the Switch Using SWCC

**NOTE:** SWCC supports 1Gbps SAN Switches only.

The version of SWCC included with the switch lets you manage and monitor SAN elements using either Web Management (WEBM) technology, or Microsoft Windows-based software.

For the Fibre Channel SAN Switch, both management methods are loaded during installation and accessed from the SWCC Navigation window. [Figure 3–1](#) shows the initial Navigation window, as it displays after starting SWCC immediately following installation.

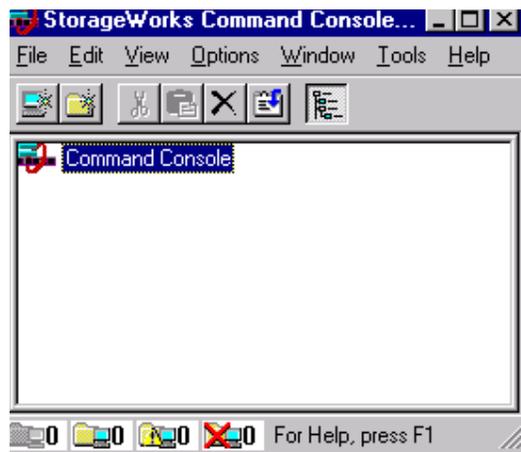


Figure 3–1: Navigation window

The Windows-based version supports many of the current Compaq StorageWorks products. The Web-based version supports Fibre Channel elements that use Compaq WEBM technology.

Compaq SWCC software lets you manage your fabric, Fibre Channel SAN switches, storage controllers, tape controllers and hubs from the Navigation window. When systems are added, they display as icons in the Navigation window.

## Finding Additional Information About SWCC

This chapter provides a high-level overview of SWCC for the Fibre Channel SAN Switch. For more information on how to install and configure SWCC, refer to the following sources:

- SWCC Release Notes (located in the SWCC folder on the CD included with the switch), include the following:
  - *Fcinter.txt* - Provides information relating to the Fibre Channel Interconnect Agent and Fibre Channel Interconnect Client (Web-based management).
  - *Readme.txt* - Provides information on software components and installation.
  - *Ccclient.txt* - Provides information relating to the Command Console Client, such as the Navigation window and tree.
- *Compaq StorageWorks Command Console for Hubs, Switches, and Tape Controller Getting Started Guide*: Included in the switch kit, this document provides SWCC setup requirements, installation instructions and troubleshooting information.
- Online Help is available for both the Windows-based and Web-based versions of SWCC.
- Compaq web site The specific web site for SWCC software and software support information is:

<http://www.compaq.com/products/storageworks/swcc/index.html>

**NOTE:** The previous path is subject to change.

## SWCC Installation Requirements

SWCC software runs on Microsoft Windows NT 4.0, Service Pack 4 or later, or Windows 2000 systems. SWCC requires a compatible network with TCP/IP and SNMP services installed on the host system. (See the *SWCC Getting Started Guide* for instruction on how to install TCP/IP and SNMP services). For the Web-based management support, SNMP services, a compatible Web browser and Sun Java Plugin 1.3.1 are required. Supported browsers are Explorer version 5.0 or later, or Netscape Communicator version 4.6 or later.

**NOTE:** SWCC does not support Dynamic Host Configuration Protocol (DHCP) or Windows Internet Name Service (WINS).

## Installing SWCC for the Fibre Channel SAN Switch

Use these steps to install SWCC.

1. Insert the CD into the CD-ROM drive. Navigate to the top-level SWCC directory and double-click *Setup.exe*.
2. Follow the prompts. When the SWCC Setup screen ([Figure 3-2](#)) displays, select all three radio buttons: SWCC Navigation Window, SAN Interconnect Devices, and SAN Interconnect Management if you want to install the clients and agent on the same host. If you want to install only the agent, click SAN Interconnect Management radio button in the Agent Applications pane.

**NOTE:** There are two clients and one agent, for example,

- Client = SWCC Navigation Window
- Client = SAN Interconnect Devices
- Agent = SAN Interconnect Management.

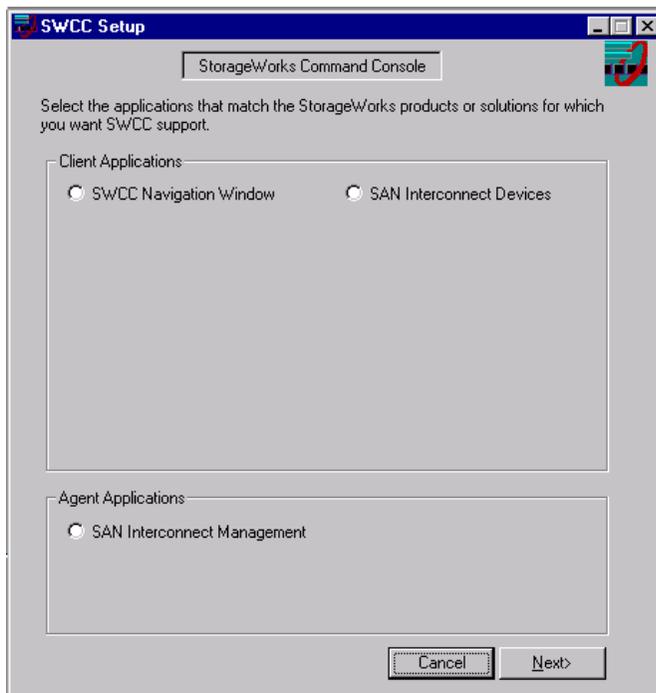


Figure 3-2: SWCC Setup screen

3. Select the appropriate options, then click Next. The installSHIELD Wizard proceeds with the installation.
4. The Maintenance Complete window displays. Click Finish.
5. The StorageWorks SAN Management Setup window displays with three options for the installation:
  - Modify (see [Step 6](#))
  - Repair (do not select this option when upgrading firmware, doing so prevents downloading the most current files)
  - Remove (see [Step 7](#))

---

**IMPORTANT:** Many files in the \fibre agent\hmmo\help folder from the 2.5 installation were not removed when Version 2.6 was installed. In order to install the latest files, you must first uninstall the Version 2.5 software before installing the newer kit. To ensure that you are loading the latest SWCC files, make sure to select the Remove option. Do not select the Repair option, as it is possible to retain obsolete files.

---

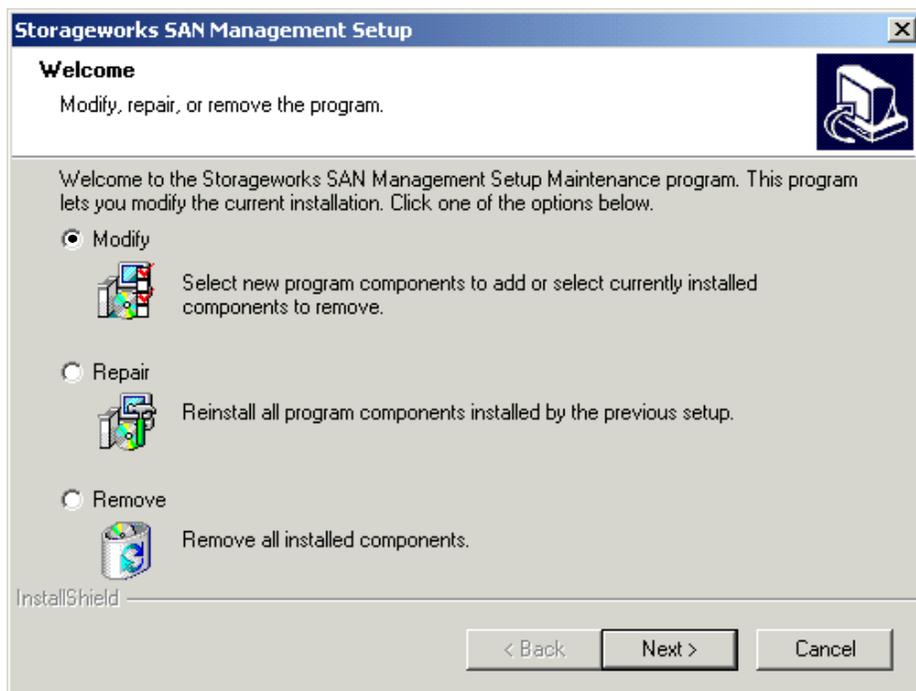


Figure 3-3: Modify, repair or remove the program

6. Modify is the default if there are no previous installations of SWCC. Select this option if you have existing Compaq management programs running. Only unique files will be added.
  - a. Select Modify and click Next. The Select Components window displays (Figure 3-4) with both Agent and Service selected by default.
  - b. Deselect Service if you want to run the Agent only.
 

**NOTE:** You can run the Agent without the Service. You cannot run the Service without the Agent.
  - c. Click Next and proceed with [Step 8](#).

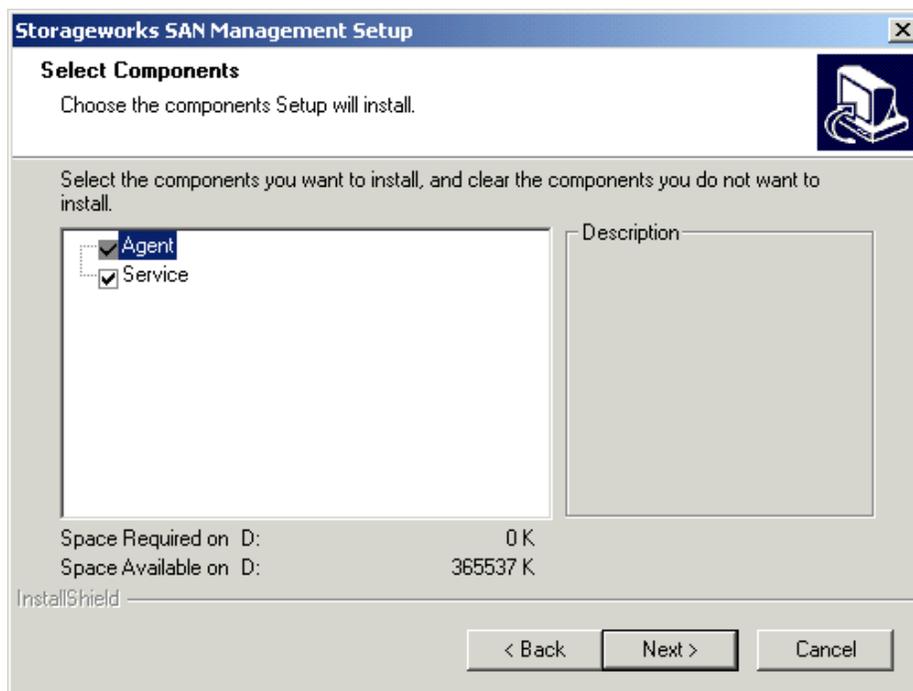


Figure 3-4: Select Components window

7. Select Remove to delete the program. You can also remove the program via the the Control Panel. See [Uninstalling SWCC, page 3-21](#). If you choose this option, and want to perform the installation process later, begin with [Step 1](#).
8. During the installation, SWCC starts the Command Console Fibre Agent Configuration Utility ([Figure 3-5](#)). The utility prompts you to set the polling interval.  
**NOTE:** Polling interval is the time between samples of the status of monitored fabric elements. Polling more frequently (shorter interval) will slow down the management workstation. Polling less frequently (longer interval) will elongate the time between status updates.
9. Enter a polling interval for the SAN Interconnect Management Agent to poll each element in the fabric. An element is a hub, switch, or tape controller. The default is five minutes. Enter an interval from 1 to 60 minutes.

**NOTE:** The Stop/Start button is a toggle. When Start is showing, the Agent State is stopped. Click Start to begin polling. The button will read Stop, and the Agent State will read Running (Figure 3-5). The default Agent State is Running, with the button showing Stop.

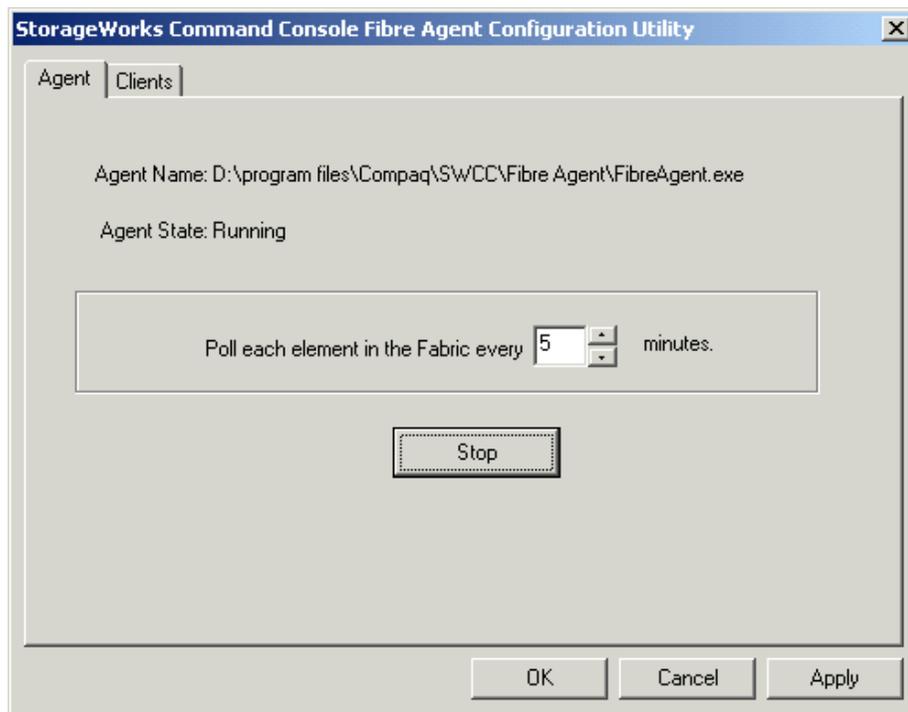


Figure 3-5: Agent Tab, Fibre Agent Configuration Utility - Stop/Start toggle

10. Click the Clients tab (Figure 3-6).

11. Enter the address or name of the host running the SAN Interconnect Devices client.

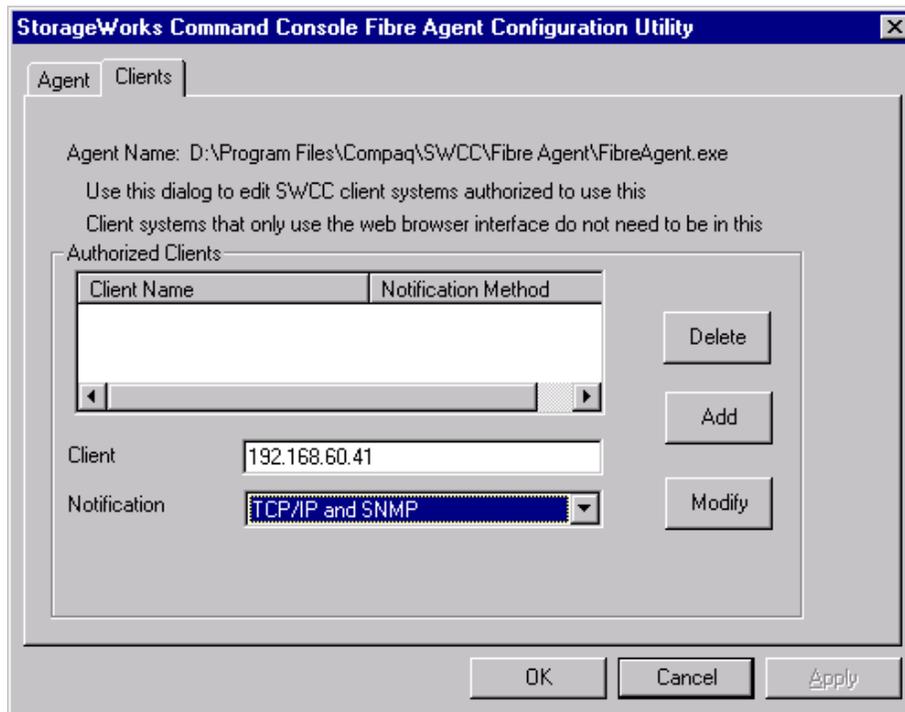


Figure 3-6: Fibre Agent Configuration Utility, Clients tab

12. From the drop-down menu, select one of the following appropriate notification schemes (see [Figure 3-7](#)),

- None
- TCP/IP
- SNMP, or
- TCP/IP and SNMP.

See [Table 3-1](#) for an explanation of the options.

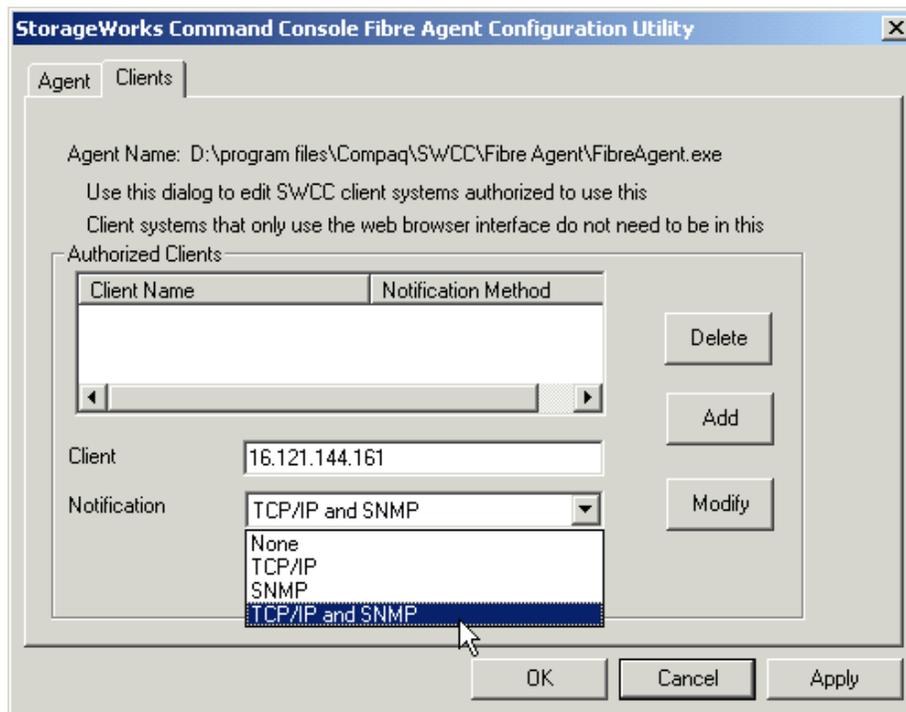


Figure 3-7: Notification drop-down

**Table 3-1: Client System Notification Options**

Options	SWCC Function
None	No notification sent
Transmission Control Protocol/Internet Protocol (TCP/IP)	<ul style="list-style-type: none"> <li>■ Automatically updates the Fabric window of subsystem changes</li> <li>■ Required for event logging and pager notification</li> <li>■ If you do not select this option, you must refresh the Fabric Window to obtain the latest status of a subsystem.</li> </ul>
SNMP	Requires you to use an SNMP-monitoring program to view SNMP traps.
TCP/IP and SNMP	Notifications sent via TCP/IP and SNMP.

**NOTE:** For a client system to receive updates from the agent, you must add the client name or IP address to the agent's list of client system entries. The agent will only send information to client system entries that are on the list.

13. Click Add to add the client system entry to the Client list. Repeat for each client you want to add to the list.

**NOTE:** To edit client information or the notification scheme, click Modify. To delete a client, select the client and click Delete. To add more clients later, click Start > Programs > StorageWorks > Fibre Agent Configure.

14. Click either OK or Apply to save your changes.

- Click OK to complete the installation and exit.
- Click Apply to keep the program running. The Start/Restart Agent dialog box displays (Figure 3-8).



Figure 3-8: Start/Restart Agent dialog box

15. Restart the Agent for changes to take effect.

## Adding a System

Put the most important client systems at the top of this list and the client systems that are connected less frequently to the network at the bottom. The Agent contacts client system entries from the top of the list downward.

1. From the Window 2000 or Windows NT Start menu, click Start > Programs > Command Console > StorageWorks Command Console to display the Navigation window (Figure 3-9).

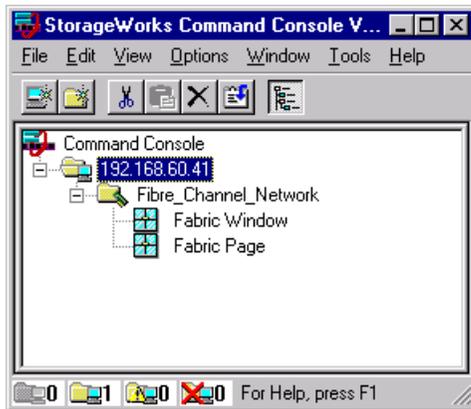


Figure 3-9: Navigation window

2. From the File menu select Add System. When the Add System dialog box displays, enter the host name or address in the text box (Figure 3-10).

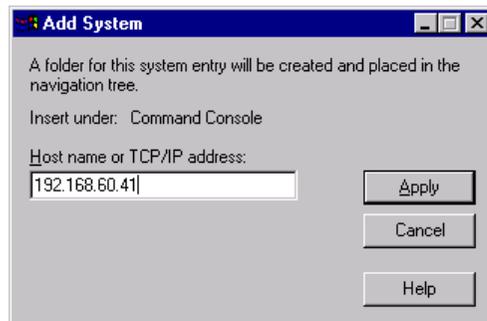


Figure 3-10: Add System dialog box

3. Click Apply. SWCC adds the system to the Navigation Window.
4. Expand the folder with the address; 192.168.60.41 (Figure 3-9) to show the Fibre Channel Network folder. There are two icons: Fabric Window and Fabric Page. Double-click the Fabric Window icon to follow the Windows-based software path, or the Fabric Page icon for the Web-based management path.

## Accessing Fabric and Switch Information

There are three ways to obtain fabric and switch information, as follows.

- [Viewing the Web-based Management Pages, page 3-12](#)
- [Accessing the SAN Interconnect Web-based Management Home Page, page 3-16](#)
- About Windows based Management, page 3-16

### About Web-based Management

Use this procedure to access SWCC Web-based management support. The path begins by double-clicking the Fabric Page icon, which displays a Web page. Fabrics and fabric elements are monitored and managed using a standard Web browser and single-click links. Online Help contains procedures for defining fabrics and elements using Web-based management.

#### Viewing the Web-based Management Pages

1. Double-click the Fabric Page icon from the Navigation Window as follows.



2. Log onto the Compaq Web-based Management page ([Figure 3-11](#)).

**NOTE:** The default password and username is administrator.

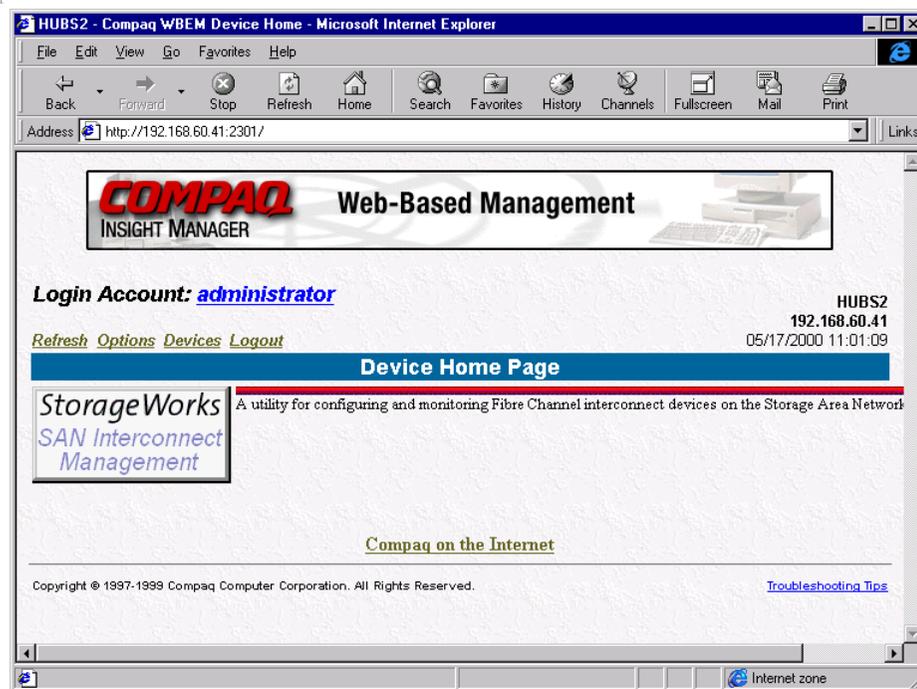


Figure 3-11: Web-based Management home page

4. If SWCC is installed on your workstation, proceed to [Step 6](#).
5. If you are a Client remotely accessing the Agent from a Web page, click the StorageWorks SAN Interconnect Management link, (the button on the left in [Figure 3-11](#)).

This link displays the SAN Interconnect Management page ([Figure 3-12](#)). The left frame lists the fabrics—demo is listed. The right frame lists the fabric elements, switch59 and switch47.

6. Enter the User Name and Password.
7. Click a switch link.

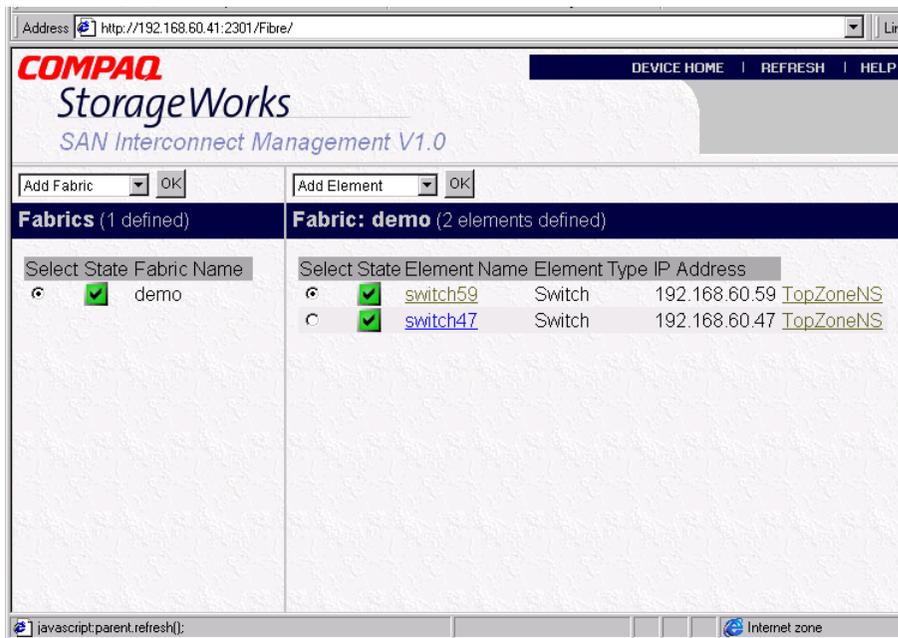


Figure 3-12: SAN Interconnect Management page

8. The SAN Interconnect Management Application page (see [Figure 3-12](#)) displays. Read the following sections for specific procedures.

### Accessing a Switch

Use these steps to access a switch.

1. On the SAN Interconnect Management Page, locate the underlined name of the switch. See [Figure 3-12](#).
2. Click the appropriate switch name.

### Selecting an Active Fabric

Use these steps to set the fabric you would like to manage.

1. Locate the name or IP address of the appropriate fabric. See [Figure 3-12](#).

2. Select the corresponding radio button to the left of the fabric.

### **Adding Fabrics**

Use these steps to add a fabric.

1. Click the arrow on the first pull down menu (on left) and select Add Fabric.
2. Click OK.
3. Follow the on-screen instructions to add more fabrics. This allows you to monitor and control more than one fabric of switches and hubs at a time.

**NOTE:** When adding a fabric, specify the IP address of the switch in the fabric that you are going to use to discover other switches. Enter this address as a fabric on the left and as an element on the right.

### **Adding Elements**

Use these steps to add elements (for example, switches and hubs).

1. Click the arrow on the second pull down menu (on right) and select Add Fabric.
2. Click OK.
3. Follow the on-screen instructions to add more fabrics. This allows you to monitor and control more than one fabric of switches and hubs at a time.

### **Deleting Elements**

Use these steps to delete or modify a fabric element.

1. Click the appropriate radio button on the right to select the element.
2. Click the down arrow on the right to select Modify or Delete.
3. Click OK.

### Accessing a Fabric View Page

The Fabric View Page is used to discover other switches in the fabric. Once you discover the switches that you want to manage via the Fabric View Page, write the IP addresses down. You will then need to add these switches as elements, (see “Adding Elements” listed previously).

Use these steps to display a Fabric View page.

1. On the SAN Interconnect Management page, click TopZoneNS, to the right of the switch’s IP address. See Figure 3-12.
2. The Fabric View displays. See Figure 3-13.

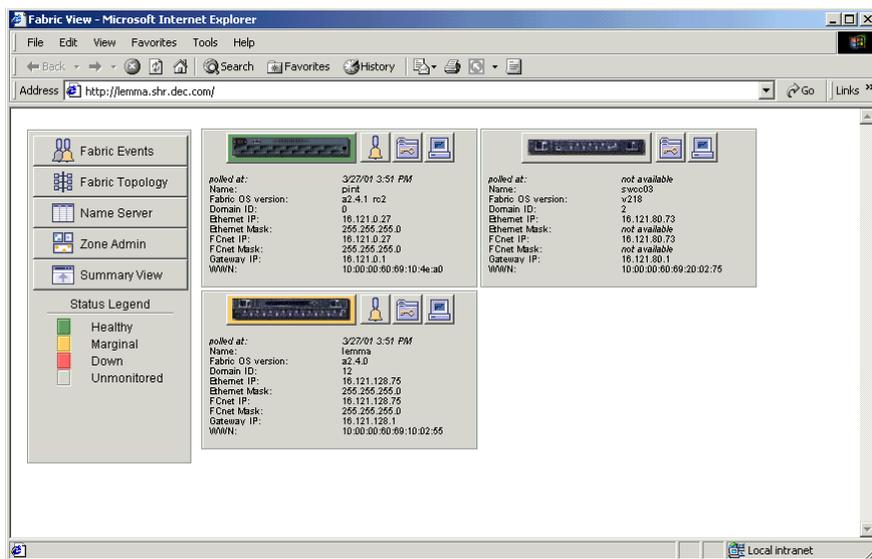


Figure 3-13: Fabric View

### Accessing the SAN Interconnect Web-based Management Home Page

Once you have installed SWCC Web-based support and a compatible browser, you can access the Compaq StorageWorks SAN Web-based Management page at:

<http://agentsystemname:2301>

**NOTE:** Be sure to specify :2301 in the URL.

## About Windows-based Management

The following is the general procedure to create a fabric and add fabric elements (for example, switches and hubs) using Windows-based management tools from SWCC. Fabric and element names are user-defined.

### Creating a Fabric and Adding Fabric Elements

**NOTE:** The Fabric Window provides a similar capability as the Insight WEB based Management with less security. You do not need to use both.

1. Double-click the Fabric Window icon, as follows (also see [Figure 3-9](#)).



The first time you double-click the icon, the Add Fabric dialog box displays.

2. Type a fabric name in the text box.
3. Click OK. SWCC creates the fabric and displays the Fabric Window ([Figure 3-14](#)). In this example, the fabric is named “demo” and the Status is “Good” because no switches are defined yet, and therefore, no error conditions have occurred.

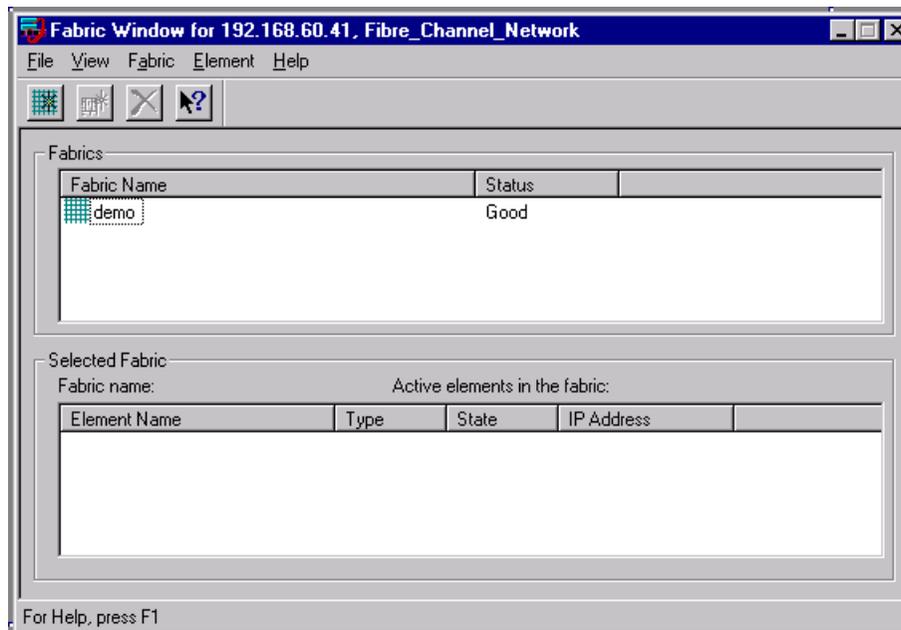


Figure 3-14: Fabric Window

4. Highlight the demo icon. Select Element > Add Element to display the demo: Add Element dialog box (Figure 3-15).
5. Type the TCP/IP address of the switch and the name.
6. Click OK.

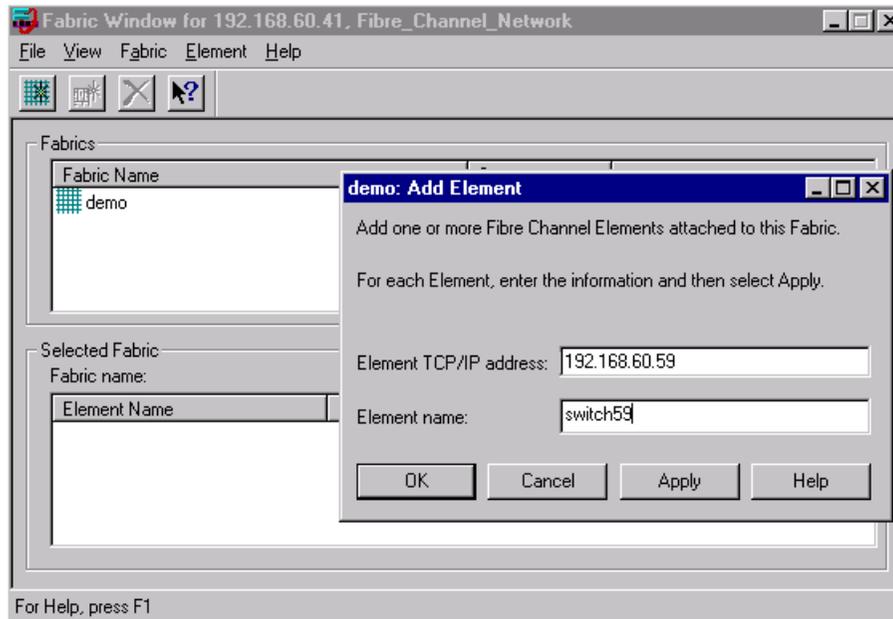


Figure 3-15: Add Element dialog box

Figure 3-16 shows the new fabric “demo” (in the top pane) and two switch elements (“switch59” and “switch47” in the bottom pane).

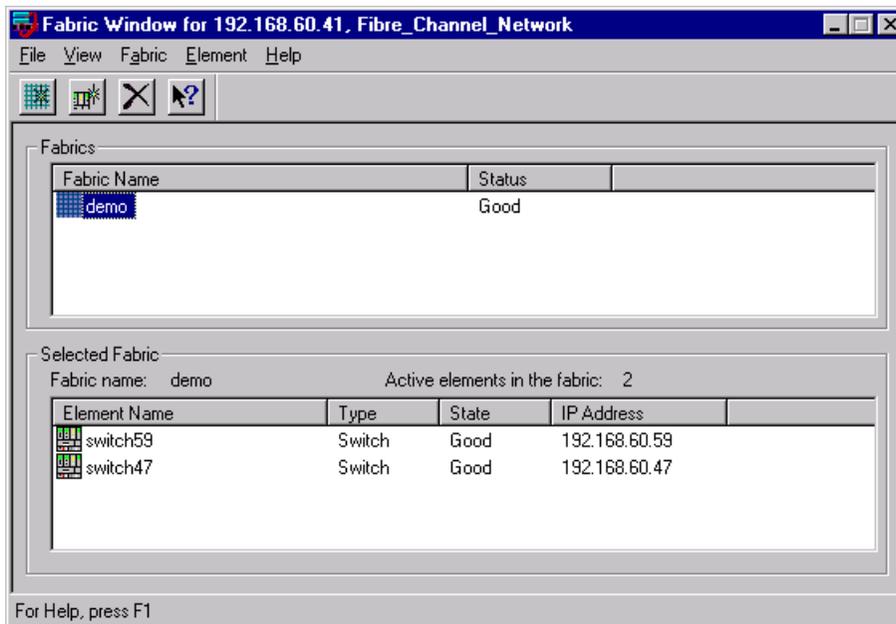


Figure 3-16: Fabric Window with switch elements added

7. To access switch management tools, double-click the appropriate switch icon.
8. To view all of the switches in the fabric, right-click the appropriate switch icon.
9. Select TopZoneNS (Figure 3-17) to access the Fabric View.

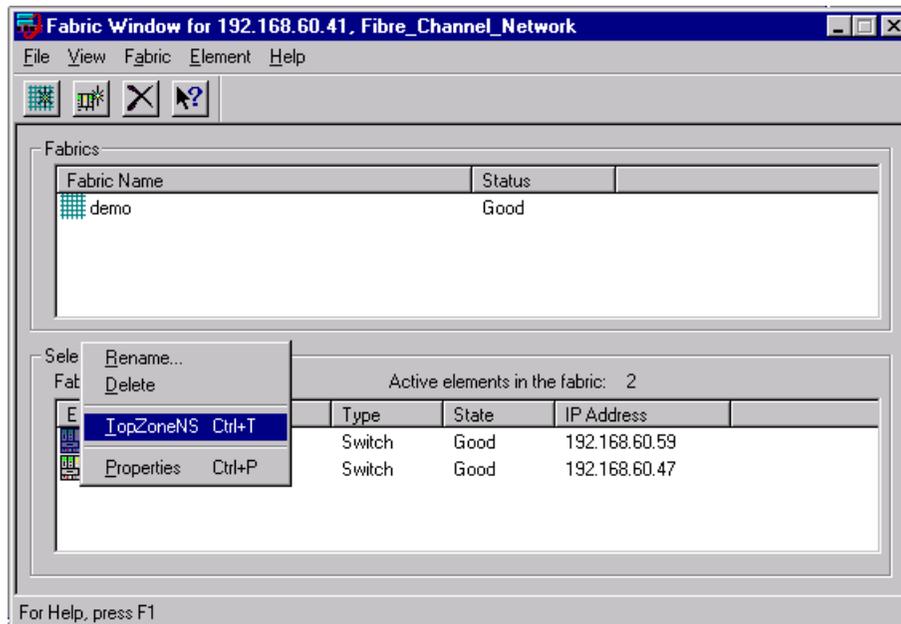


Figure 3-17: TopZoneNS selection

## Uninstalling SWCC

To uninstall SWCC click Start > Settings > Control Panel > Add/Remove Programs. The Add/Remove program window appears. Select Element Manager. Remove the program.

For more detailed information on SWCC, refer to the *Compaq StorageWorks Command Console for Hubs, Switches, and Tape Controller Getting Started Guide*, Part Number AA-RHDAD-TE.



# Chapter 4

## Managing the Switch Using Web Management Tools

Web Management Tools let you monitor status and manage performance of Fibre Channel SAN Switches over the Web. Web Management Tools display information and let you interact dynamically with your switches to make overall topology decisions and administrative changes.

This chapter covers the following topics:

- [Views Available in Web Management Tools, page 4-3](#)
- [Requirements, page 4-5](#)
- [Installation, page 4-6](#)
- [Launching Web Management Tools, page 4-10](#)

Web Management Tools provide a Graphical User Interface (GUI) that allows the administrator to monitor and manage all of the Fibre Channel SAN Switches in a fabric from a workstation.

Web Management Tools provide the following information and capabilities:

- Monitoring and managing the entire fabric, specifically,:
  - ❑ Switch status
  - ❑ Event logs
  - ❑ Zoning
  - ❑ Name Server Table
  - ❑ Secured management through the GUI or through a Telnet session
  - ❑ Switch beaconing for rapid identification in large fabric environments

## 4-2 Fibre Channel SAN Switch Management Guide

- Loop diagnostics and query and control of loop interfaces to aid in locating faulty devices
- Ability to name and zone QuickLoops
- Help functions including glossary help, online HTML help, and popup help for error conditions
- Out-of-band interface through a 10/100Base-T Ethernet connection
- In-band interface over a Fibre Channel link
- Fabric topology and routing information
- Four minutes of aggregate bandwidth throughput shown graphically, scaled dynamically.
- Monitoring and managing individual switches specifically,
  - Summary information about each switch
  - Access to event logs for individual switches
  - Switch configuration and administration
  - Ability to upgrade switch firmware
  - License key administration
  - Report capability for switch configuration information
  - Switch identification in the network
  - Real-time graphical switch status and statistics reports.
- Monitoring and managing individual ports specifically,
  - Real-time graphical port status and statistics reports
  - Information about Gigabit Interface Converter (GBIC) Serial IDs
  - Information about connected devices
  - Loop information
  - Port configuration control
  - Graphical representation of port performance.

## Views Available in Web Management Tools

Web Management Tools provide information about and access to the fabric through a series of separate windows, making it possible to view several aspects of the fabric at the same time. [Table 4-1](#) summarizes the views available in Web Management Tools.

<b>Table 4-1: Web Management Tools Views</b>	
<b>Initial Display Upon Launching Web Management Tools</b>	
Fabric View	<p>Includes a control panel that provides access to fabric-wide options, a panel for each switch in the fabric, plus a legend that explains the meaning of the background colors on the Switch icons.</p> <p>Each panel contains an icon that represents the switch or integrated fabric, in addition to icons for Switch Events and the Administrative and Telnet interfaces. The background color of the switch icon represents the status of that particular switch (as defined by the legend provided in the window). Fabric View also provides access to fabric-wide options such as zoning.</p> <p>Switch status is calculated approximately once per second; however the initial calculation does not occur until 30-60 seconds after the switch is started.</p> <p>For all conditions that are based on errors per time interval, any errors will cause the status to show faulty until the entire sample interval has passed.</p>
<b>Accessible from Fabric View</b>	
Fabric Events View	Displays the error log for the fabric, which is the combination of the error logs of all the switches in the fabric. Accessed by clicking the Fabric Events icon on the control panel.
Fabric Topology View	Displays physical configuration, including active domains, paths and routing information. Accessed by clicking the Fabric Topology icon on the control panel.
Name Server Table View	Displays the Name Server Table for the fabric. Use to view information about the devices attached to the fabric. Accessed by clicking the Name Server icon on the control panel.
Zone Administration View	Provides an interface to Zoning, including zone settings, zone aliases, QuickLoops, and zone configurations. Accessed by clicking the Zone Admin icon on the control panel.
Fabric Log	Provides a record of system events and error messages.
Summary View/ Detail View	Toggles between summarized and detailed versions of Fabric View.

**Table 4-1: Web Management Tools Views (Continued)**

Switch view	Displays information about individual switches, including a real-time view of switch status. Accessed by clicking a Switch icon on a switch panel. The Switch view is also the launch point for the Switch Events view, Telnet Interface, Fabric Watch view, Administrative Interface, Performance view, and Port Information view. It includes icons that display the status of the switch fans, temperature monitors, and beacon.
Switch Events View	Displays the error log for the switch. Accessed by clicking the Events icon on the switch panel. This view can also be accessed through Switch view (see <a href="#">Switch Events View, page 4-4</a> ).
Telnet Interface	Provides an interface for using Telnet commands for switch diagnostics, troubleshooting, and fabric management. Accessed by clicking the Telnet icon on the switch panel. This view can also be accessed through Switch view (see <a href="#">Telnet Interface, page 4-4</a> ).
Administrative Interface	Provides an interface for performing functions such as upgrading firmware versions or reconfiguring a switch. Accessed by clicking the Admin icon on the switch panel. This view can also be accessed through Switch view (see <a href="#">Administrative Interface, page 4-5</a> ).
<b>Accessible From Switch View</b>	
Port Information View	Displays statistics and status for the selected port, GBIC, or loop. Also provides options for managing loops. Accessed by clicking the icon for the relevant port in Switch view.
Power Supply Status	The Power Supply icons on the switch graphic indicate the number of power supplies present, and the LED on the power supply indicates the status of the power assemblies.
Switch Events View	Displays the error log for the switch. Accessed by clicking Events in Switch view. This view can also be accessed through Fabric View (see <a href="#">Fabric View, page 4-3</a> ).
Telnet Interface	Provides an interface for using Telnet commands for switch diagnostics, troubleshooting, and detailed fabric management. Accessed by clicking Telnet in Switch view. This view can also be accessed through Fabric View (see <a href="#">Fabric View, page 4-3</a> ).
Fabric Watch View (Optional, grayed out if not installed)	Monitors fabric elements and displays error and performance counter status, issuing an alert when conditions are out of acceptable ranges. Accessed by clicking Watch in Switch view.
Fan Icon	The color of this icon indicates the overall status of the fans (see the color legend in Fabric View).

**Table 4-1: Web Management Tools Views (Continued)**

Administrative Interface	Provides an interface for performing functions such as upgrading firmware versions or reconfiguring a switch. Accessed by clicking Admin in Switch view. This view can also be accessed through Fabric View.
Performance View	Graphically portrays real-time data throughput for each port and displays total switch bandwidth utilization. Accessed by clicking Perf in Switch view.
Beacon Icon	Click to turn the beacon, which is an indicator light on the front panel of the switch, on or off. Appearance of icon indicates whether beacon is lit.
Temperature Icon	The color of this icon indicates the overall temperature status (see the color legend in Fabric View).

## Requirements

For the correct installation and operation of Web Management Tools, the computer workstation and the switch must both meet the requirements listed in this section.

### Switch Requirements

Web Management Tools can be used to manage Compaq StorageWorks Fibre Channel switches that meet the following requirements:

- Fibre Channel SAN Switch models 8, 16, 8-EL, 16-EL, IS/32 and IS/64 (including the switch elements housed within the SAN Integrated Switch models).
- Firmware version 2.4.x or later.

### Workstation Requirements

The following items are required for the correct installation and operation of Web Management Tools on the computer workstation.

- One of the following operating systems,
  - Windows 95, 98, or 2000
  - Windows NT 4.0
  - Solaris 2.61 or later.
- Adequate RAM (required for Windows operating systems only):
  - 128 MB for fabrics of 21 switches or less

- 256 MB for fabrics containing more than 21 switches.
  - 5 MB of free disk space.
  - One of the following Web browsers:
    - Internet Explorer 4.01 or later
    - Netscape Communicator 4.51 or later.
- NOTE:** The browser must be configured to work with Web Management Tools. For information about how to do this, see [Configuring the Web Browser, page 4-6](#).
- The correct version of the Java Plug-in for the operating system:
    - Windows 95, 98, 2000, and NT require Java Plug-in version 1.3.1 or later
    - Sun Microsystems offers a tuned and supported version of Netscape Navigator and Java Plug-in Software for Solaris. Follow this link for more information and downloading: <http://www.sun.com/solaris/netscape>.

## Installation

Preparing to use Web Management Tools to manage your fabric requires the following steps, included in this section..

- Installing a Web Browser
- Configuring a Web Browser
- Installing the Java Plug-in on a Workstation.

### Installing a Web Browser

Install one of the following browsers, if not already installed.

- Internet Explorer 4.01 or later (available at <http://www.microsoft.com>).
- Netscape Communicator 4.51 or later (available at <http://www.netscape.com/>).

### Configuring the Web Browser

Specific browser settings are required for the correct operation of Web Management Tools with either Internet Explorer or Netscape Communicator.

## **Configuring Internet Explorer**

Correct operation of Web Management Tools with Internet Explorer requires clearing the Web browser cache after installation and specifying the appropriate settings for the browser refresh frequency and process model.

The browser cache must be cleared after the installation of the firmware. The browser may use local cache copies of jar files and/or image files to improve performance (depending on options selected in the browser), which can cause incorrect display.

Use these steps to remove cached files from Internet Explorer.

1. Select Internet Options from the View menu if using Internet Explorer 4.x, or from the Tools menu if using 5.x or 6.x.
2. Select the General tab.
3. In the Temporary Internet Files area, click Delete Files.
4. Click OK.
5. Exit and launch the browser again.

Browser pages must be refreshed at every visit to ensure the correct operation of the Switch Admin feature.

Use these steps to set the refresh frequency.

1. Select Internet Options from the View menu if using Internet Explorer 4.x, or from the Tools menu if using 5.x.
2. Select the General tab and click Settings (under Temporary Internet Files).
3. Under “Check for newer versions of stored pages” select “Every visit to the page.”

The correct Browser Process Model must be selected. To select the Browser Process Model (only required for Windows NT):

1. If using Internet Explorer 4.x, select View .> Internet Options. If using Internet Explorer 5.x, select Tools > Internet Options.
2. Select the Advanced tab and click to expand the Browsing category.
3. Under Browsing, select “Browse in a new process” if using Internet Explorer 4.x. Select “Launch browser windows in a separate process” if using Internet Explorer 5.x.

### **Configuring Netscape Communicator**

The Web browser cache must be cleared after the installation of the firmware. The browser may use local cache copies of jar files and/or image files to improve performance (depending on options selected in the browser), which can cause incorrect display. To remove cached files from Netscape Communicator:

1. Select Edit > Preferences.
2. Click Advanced in the left text box to expand it, then click Cache.
3. On the Cache panel, click Clear Memory Cache.
4. Click Clear Disk Cache.
5. Click OK.
6. Exit and launch the browser again.

### **Installing the Java Plug-in on the Workstation**

Java Plug-in software needs to be installed on your workstation to use Web Management Tools. The software eliminates troublesome differences between the two supported Web browsers: Netscape Navigator and Microsoft Internet Explorer. The Java Plug-in software allows java applets used in the Web Management Tools program to run using Sun's Java Runtime Environment (JRE), instead of the browser's default Java virtual machine. The JRE provides consistency and reliability when running applets. Java Plug-in works on other operating systems. For more information about Java Plug-in support for other operating systems, refer to the manual that came with your operating system. For more information on Java Plug-in, go to:

<http://java.sun.com/products/plugin/index.html>

---

**IMPORTANT:** The required version depends on the operating system (see [Workstation Requirements, page 4-5](#)).

---

### Checking the Version of the Java Plug-in

There are a number of ways to check the version of the Java Plug-in installed on Windows 95, 98, 2000 or NT, as follows.

1. Open the Add/Remove Programs list.
  - a. Go to the Start menu, choose Start > Settings > Control Panel > Add/Remove Programs.
  - b. Double-click the Add/Remove Programs folder.
  - c. Scroll down to the Java file. The version number will show at the end of the filename. For example:  

Java 2 Runtime Environment Standard Edition v1.2.2 or  
Java 2 Runtime Environment Standard Edition v1.3.0\_02
2. Determine whether the correct Java Plug-in version is installed, as follows.
  - a. If the correct version is installed, Web Management Tools is ready for use.
  - b. If an outdated version is currently installed, uninstall it using the Add/Remove Programs feature from your control panel, and follow these instructions, as applicable:
    - [Installing the Java Plug-in on Windows, page 4-9](#)
    - [Installing the Java Plug-in on Solaris, page 4-10](#)
  - c. If no Java Plug-in is installed, install the plug-in by following these instructions, as applicable:
    - [Installing the Java Plug-in on Windows, page 4-9](#)
    - [Installing the Java Plug-in on Solaris, page 4-10](#)

### Installing the Java Plug-in on Windows

Use these steps to install the Java Plug-in on Windows 95, 98, 2000, or NT.

1. Insert the Fibre Channel SAN Switch CD into your CD-ROM drive.
2. Go to DSGGB > Firmware.
3. Locate the Java Plug-in .exe file. Double-click the file.
4. Follow the instruction provided during the installation.

### Installing the Java Plug-in on Solaris

Use these steps to install the Java Plug-in on Solaris.

1. Obtain the Java Plug-in from the Internet at:  
<http://java.sun.com/products/plugin/index.html>.

**NOTE:** For Solaris users, Sun offers a tuned version of Netscape Communicator and the plug-in.

2. Follow the instructions to install the Java Plug-in for Solaris.
3. Open the `.cshrc` file and set the path to the Java Plug-in executable file. For example, the following could be added to the `.cshrc` file.

```
NPX_PLUG-IN_PATH=/opt/NSCPcom/plugin export NPX_PLUG-IN_PATH
```

## Launching Web Management Tools

Use these steps to launch Web Management Tools and manage the fabric over the Web.

1. Launch the Web Browser.
2. Enter the switch name or IP address in the Location/Address field. For example:  
`http://161.123.456.7/` or  
`http://sw3/`
3. Web Management Tools launches, displaying the default view, Fabric View.

**NOTE:** You can also launch Web Management Tools from SWCC. (Refer to the *Compaq StorageWorks Command Console for Hubs, Switches, and Tape Controllers Getting Started Guide* for more information).

## Using Web Management Tools

This section describes the views and interfaces available through Web Management Tools, which consist of the following.

- Fabric View
- Fabric Events View
- Fabric Topology View
- Name Server Table View
- Zone Administration View
- Switch View

- Switch Events View
- Port Information View
- Fabric Watch View
- Performance View
- Administrative Interface
- Telnet Interface

Switches can be accessed simultaneously from different connections and by different methods, such as Web Management Tools, SWCC, Telnet, SNMP, and from the front panel controls (for the SAN Switch 16 model only). To verify that modifications are correctly applied, ensure that the switch is modified from only one connection at a time.

## **Fabric View**

Fabric View is the first view that displays when you connect to a switch through Web Management tools. It provides access to specific information about the switches in the fabric through a panel representing each switch. It also provides a control panel containing additional options and a legend explaining the colors that are used to indicate status on the switch panels.

**NOTE:** Fabric View is also accessible from the Fabric Page icon in SWCC .

Every switch in the fabric is represented by a switch panel in Fabric View.

Use these steps to access Fabric View.

1. Launch the Web browser.
2. Enter the switch name or IP address in the Location/Address field. For example:  
`http://switch name or IP address/`

**NOTE:** This switch is assumed to exist in a local domain. Local domain refers to the switch IP address which you specify in the URL window.

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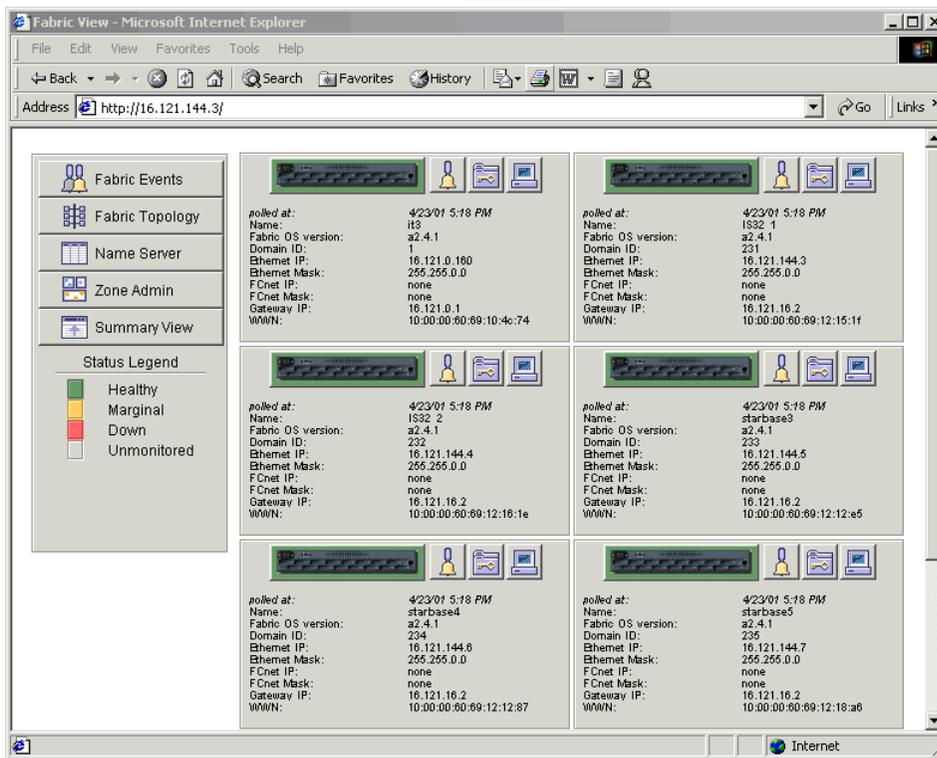
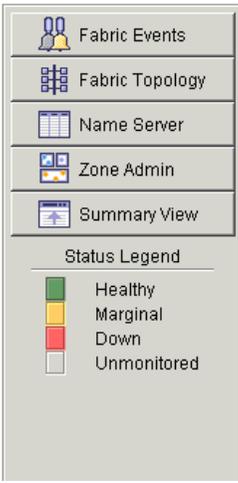
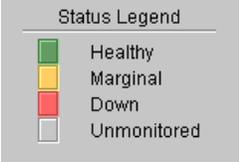
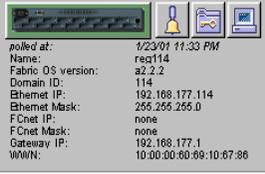


Figure 4-1: Fabric View

Table 4-2 describes the items visible in Fabric View.

Table 4-2: Fabric View Objects	
Object	Description
<b>Control Panel</b>	
	<p>The Control Panel provides access to a number of fabric-wide features and includes a legend for interpreting the background color of the switch icons.</p> <p>Control Panel components are described next in this Table.</p>
<p>Fabric Events button</p> 	<p>Click to open Fabric Events view. For information about this view, see <a href="#">Fabric Events View, page 4-16</a>.</p>
<p>Fabric Topology button</p> 	<p>Click to open Fabric Topology view. For information about this view, see <a href="#">Fabric Topology View, page 4-17</a>.</p>
<p>Name Server button</p> 	<p>Click to open Name Server Table view. For information about this view, see <a href="#">Name Server Table View, page 4-20</a>.</p>
<p>Zone Admin button</p> 	<p>Click to open Zone Administration view. Available only if a Zoning license is installed. For information about this view, see <a href="#">Zone Administration View, page 4-22</a>.</p>
<p>Summary/Detail View button</p> 	<p>Toggle to view Fabric View in either Summary or Detail format. The Summary format shows abbreviated switch panels (see <a href="#">Fabric View in summary format, page 4-15</a>). The default view is Detail.</p>

**Table 4-2: Fabric View Objects (Continued)**

Object	Description
<p>Status Legend</p> 	<p>Defines meaning of colors visible in the background of the switch icons. Each color indicates a different operational state.</p> <p>Green Healthy</p> <p>Yellow Marginal (mix of good and faulty readings)</p> <p>Red Down (more than two faulty readings)</p> <p>Gray Unknown or unmonitored</p> <p>If no data is available from a switch, the most recent background color remains displayed.</p> <p><b>NOTE:</b> For all status readings that are based on errors per time interval, any errors will cause the status to show faulty until the entire sample interval has passed.</p>
<b>Switch Panel</b>	
	<p>The Switch Panel represents an individual switch in the fabric. A Switch Panel displays for each individual switch in the fabric.</p>
<p>Individual Switch Icon</p> 	<p>Click to open Switch view for the switch. Each switch type is represented by a different icon. The background color around the icon indicates the status of the switch, as described above in the Status Legend. For information about this view, see <a href="#">Switch View</a>, page 4-32.</p>
<p>Events</p> 	<p>Click to open Switch Events view to display the Switch Events log (for information about this view, see <a href="#">Switch Events View</a>, page 4-36).</p>
<p>Admin</p> 	<p>Click to open Switch Administration view (for information about this view, see <a href="#">Administrative Interface</a>, page 4-55).</p>
<p>Telnet</p> 	<p>Click to launch the Telnet Interface for the switch (for information about this view, see <a href="#">Telnet Interface</a>, page 4-71).</p>

**Table 4-2: Fabric View Objects (Continued)**

Object	Description
polled at: (or unreachable since:)	Indicates time of the last status check. (If the switch is unavailable, this shows the time of the last successful status check.)
Name:	The name of the switch
Fabric OS version:	Version of Fabric OS installed on the switch
Domain ID:	A number that uniquely identifies the switch within the fabric
Ethernet IP:	Ethernet IP address
Ethernet Mask:	Ethernet subnetmask
FCnet IP:	Fibre Channel IP Address
FCnet Mask:	Fibre channel subnetmask
Gateway IP:	Gateway IP address
WWN:	Unique numeric identifier for the switch; assigned by manufacturer

Figure 4-2 shows the Fabric View in summary format.

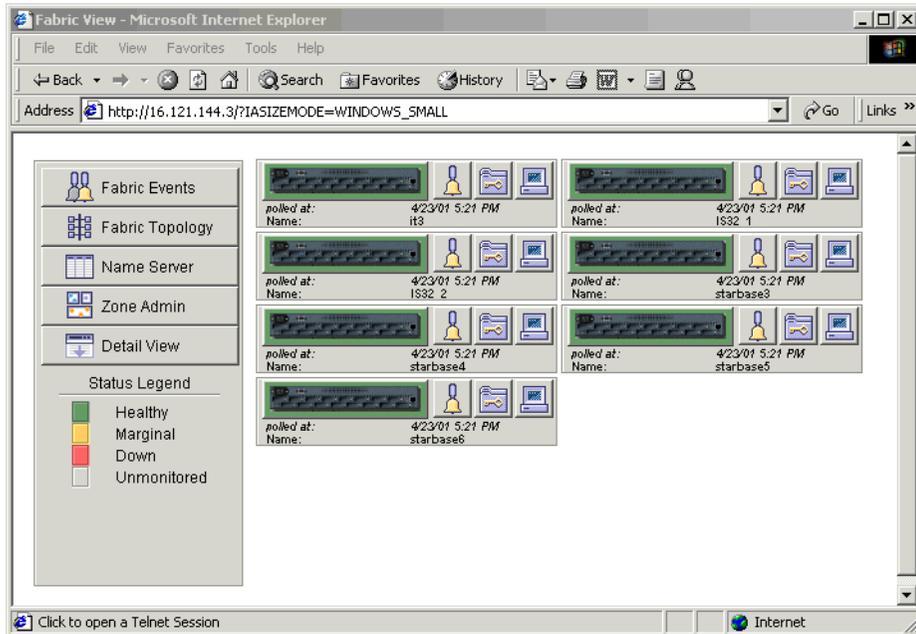


Figure 4-2: Fabric View in summary format

## Fabric Events View

Fabric Events View provides a log of events for all switches in the fabric.

Use these steps to access Fabric Events view.

1. Click the Fabric Events button in the Control Panel.
2. Fabric Events view displays, [Figure 4-3](#).

Switch	Num...	Time	Count	Level	Message
sqa14	31	Sep 28 13:19:19	1	4	0x10e6db10 (tThad) FW-CHANGED fabricFR000 (Fabric Reconfigure) val...
sqa14	30	Sep 28 13:09:36	1	4	0x10e6db10 (tThad) FW-CHANGED fabricFR000 (Fabric Reconfigure) val...
sqa14	29	Sep 28 13:09:27	1	4	0x10e6db10 (tThad) FW-CHANGED fabricGS004 (Fabric GBIC change 4) ...
sqa14	28	Sep 28 10:30:12	1	3	0x10e6db10 (tThad) FW-BELOW eportState006 (E Port State Changes 6) i...
sqa19	27	Sep 28 14:21:00	1	4	0x10e6d8e0 (tThad) FW-CHANGED fabricFR000 (Fabric Reconfigure) val...
sqa14	27	Sep 28 10:30:12	1	3	0x10e6db10 (tThad) FW-BELOW eportState003 (E Port State Changes 3) i...
sqa19	26	Sep 28 14:12:25	1	3	0x10e6d8e0 (tThad) FW-BELOW eportState000 (E Port State Changes 0) i...
sqa14	26	Sep 28 10:30:12	1	3	0x10e6db10 (tThad) FW-BELOW eportState000 (E Port State Changes 0) i...
sqa19	25	Sep 28 14:11:22	1	3	0x10e6d8e0 (tThad) FW-ABOVE eportState000 (E Port State Changes 0) i...
sqa14	25	Sep 28 10:30:11	1	3	0x10e6db10 (tThad) FW-BELOW eportCRCs006 (E Port Invalid CRCs 6) i...
sqa19	24	Sep 28 14:11:17	1	4	0x10e6d8e0 (tThad) FW-CHANGED fabricFR000 (Fabric Reconfigure) val...
sqa14	24	Sep 28 10:30:11	1	3	0x10e6db10 (tThad) FW-BELOW eportCRCs003 (E Port Invalid CRCs 3) i...
sqa19	23	Sep 28 14:11:17	1	4	0x10e6d8e0 (tThad) FW-CHANGED fabricED000 (Fabric E-port down) val...
sqa14	23	Sep 28 10:30:11	1	3	0x10e6db10 (tThad) FW-BELOW eportCRCs000 (E Port Invalid CRCs 0) i...
sqa19	22	Sep 28 11:31:48	1	3	0x10e6d8e0 (tThad) FW-BELOW eportState000 (E Port State Changes 0) i...
sqa14	22	Sep 28 10:30:11	1	3	0x10e6db10 (tThad) FW-BELOW eportWords006 (E Port Invalid Words 6) i...
sqa12	21	Sep 28 14:31:27	1	4	0x10e67240 (tThad) FW-CHANGED fabricFR000 (Fabric Reconfigure) val...
sqa19	21	Sep 28 11:31:42	1	3	0x10e6d8e0 (tThad) FW-BELOW eportLink000 (E Port Link Failures 0) is b...
sqa14	21	Sep 28 10:30:11	1	3	0x10e6db10 (tThad) FW-BELOW eportWords003 (E Port Invalid Words 3) i...
sqa12	20	Sep 28 14:21:44	1	4	0x10e67240 (tThad) FW-CHANGED fabricFR000 (Fabric Reconfigure) val...
sqa19	20	Sep 28 11:31:31	1	3	0x10e6d8e0 (tThad) FW-BELOW eportCRCs000 (E Port Invalid CRCs 0) i...
sqa14	20	Sep 28 10:30:11	1	3	0x10e6db10 (tThad) FW-BELOW eportSync006 (E Port Loss of Sync 6) is ...

Warning: Applet Window

Figure 4-3: Fabric Events view

**NOTE:** To sort the events by a particular column, click the column header. To resize a column, drag the column divider.

[Table 4-3](#) describes the columns in the Fabric Events view.

**Table 4-3: Fabric Events View Columns**

Column	Description
Switch	Name of switch
Num... (number)	Event number for affected switch
Time	Time of event
Count	Number of consecutive occurrences of same event

**Table 4-3: Fabric Events View Columns (Continued)**

Column	Description
Level	Severity level of event: 0      panic (switch restart) 1      critical 2      error 3      warning 4      information 5      debug
Message	Description of event

## Fabric Topology View

Fabric Topology view ([Figure 4-4](#)) summarizes the physical configuration of the fabric from the perspective of the local domain. The local domain is the domain of the switch entered as a URL in the Web browser.

This view includes information about the destination domains (which are all other domains in the fabric) and the paths between each destination domain and the local domain.

Use these steps to access the Fabric Topology view.

1. Click the Fabric Topology button in the Control Panel.
2. Fabric Topology view displays.

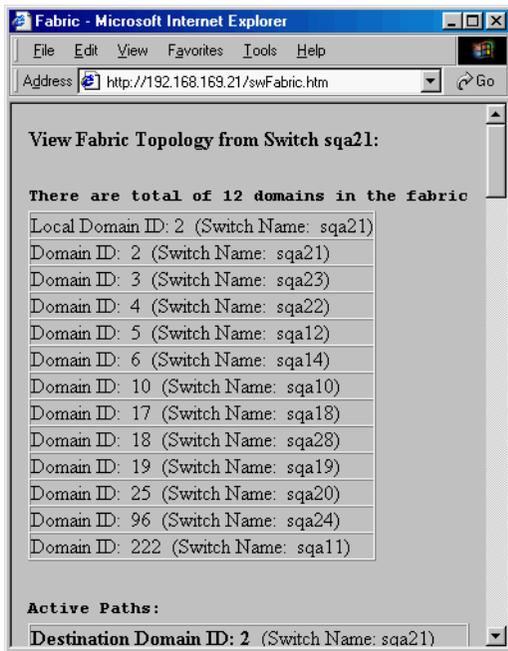


Figure 4-4: Fabric Topology view

Scroll the window down to display information about the individual paths between the local switch and each of the other switches in the fabric. See [Figure 4-5](#).

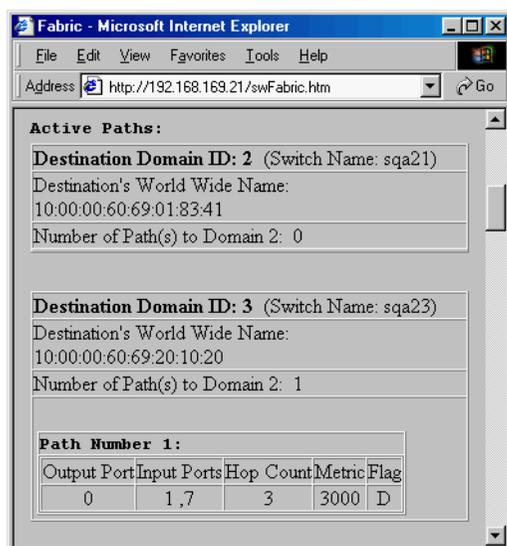


Figure 4-5: Fabric Topology view, scrolled down

Table 4-4 describes the fields in Fabric Topology view.

**Table 4-4: Fabric Topology View**

Field	Description
View Fabric Topology from Switch [switch name]:	Lists the switch in the domain that is assumed to be the local domain.
There are a total of [n] domains in the fabric.	Lists the number of domains in the fabric.
Local domain ID:	A number that uniquely identifies the local switch within the fabric, and the name of the switch.
Domain ID: (may be more than one)	A number that uniquely identifies the switch within the fabric, and the name of the switch.
Active Paths:	This line is followed by information about each destination domain, including information about each of the paths between that domain and the local domain.
Destination Domain ID:	The ID of the destination domain. The destination domain ID, destination's WWN, and number of paths to the local domain display for each destination domain in the fabric.
Destination's Worldwide Name (WWN):	Shows the WWN of the destination domain.

**Table 4-4: Fabric Topology View (Continued)**

Field	Description
Number of Paths:	Shows the number of active paths between the destination domain and the local domain.
Path Number:	Shows the number assigned to the specific path. The path number, output and input ports, hop count, metrics and flag (described in the following rows) display for each destination domain path.
Output Ports	Shows the number of output ports on the path between the destination domain and the local domain.
Input Ports	Shows the number of input ports on the path between the destination domain and the local domain.
Hop Count	Shows the number of hops (interswitch links) between the local domain and the destination domain.
Metric	Lists numeric values for traffic flow along the path.
Flag	Shows the routing type assigned to this path. D signifies dynamic and S signifies Static.

## Name Server Table View

The Name Server Table view (see [Figure 4-6](#)) provides the name server entries listed in the Simple Name Server database. This view includes all name server entries for the fabric, not only those related to the local domain. Each row in the table represents a different device.

To access Name Server Table view from Fabric View:

1. Click the Name Server button in the Control Panel.
2. Name Server Table view displays.

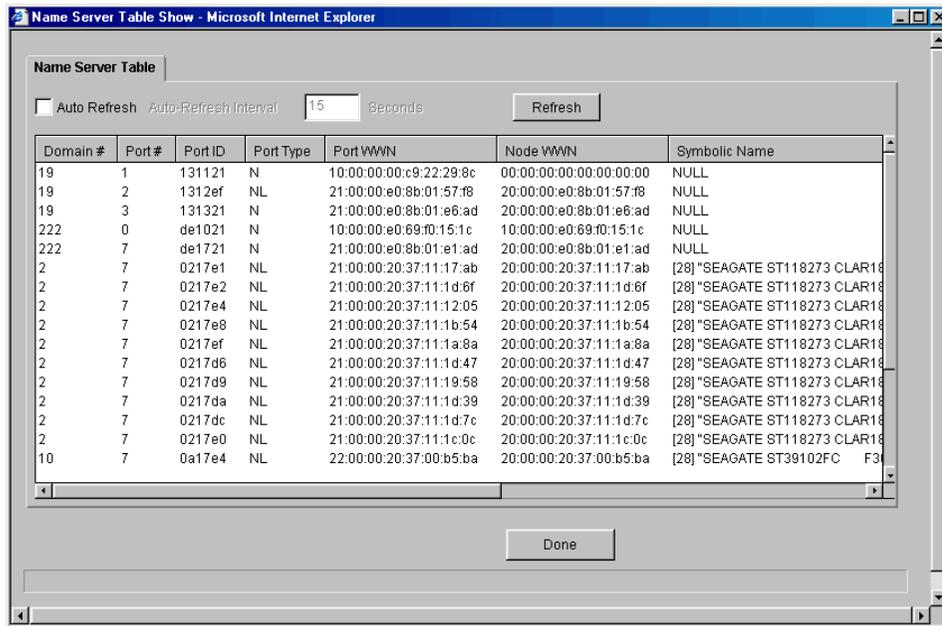


Figure 4-6: Name Server Table view

**NOTE:** To sort the events by a particular column, click the column header. To resize a column, drag the column divider.

Table 4-5 describes the fields in the Name Server Table.

Field	Description
Auto Refresh	Check to enable Auto Refresh or uncheck to disable.
Auto Refresh Interval	If Auto Refresh is checked, enter the number of seconds for the refresh interval.
Refresh	Click to refresh the window immediately.
Done	Click to close the window.

The Name Server Table also includes the following columns (see [Table 4-6](#)).

**Table 4-6: Name Server Table Columns**

Column	Description
Domain #	Shows the domain ID of the switch to which the device is connected.
Port #	Shows the number of the switch port to which the device is connected.
Port ID	Shows the port ID of the device (24-bit hexadecimal value).
Port Type	Shows the port type of the device (N for fabric direct attached port or NL for fabric direct attached loop port).
Port WWN	Shows the WWN assigned to the device port.
Node WWN	Shows the WWN worldwide name of the device node.
Symbolic Name	The symbolic name of the device assigned through the SCSI INQUIRY command.
FC4 Types	Shows the Fibre Channel FC4 layer types supported by the device, such as IP or FCP.
COS	Shows the Fibre Channel classes of service supported by the device.
Fabric Port Name	Shows the name of the fabric port in use by the device.
Port IP Address	Lists the IP address of the fabric port.
Hard Address	Shows the hard address of the fabric port.
Member of Zones	Lists the zones to which this device belongs. This column does not update when the table is refreshed. To view updated zoning information, close and reopen the Name Server Table.

## Zone Administration View

Zone Administration view provides access to all the zoning functions, and can only be accessed using an administrative account. This view is not updated once it is launched; if a switch or device is added or removed from the network, it is necessary to save the changes and relaunch the Zone Administration view for the changes to take effect. For more information about using Zoning, see “Understanding and Using Zoning,” Chapter 7.

To access Zone Administration view from Fabric View:

1. Click the Zone Admin button in the Control Panel.
2. Zone Administration view displays (see [Figure 4-7](#)).

The following Zone Administration view tabs are described in this section.

- Alias Tab
- Zone Tab
- QuickLoop Tab
- Fabric Assist Tab
- Config Tab

### Alias Tab

Use the Alias tab to create and manage aliases for devices in the fabric. See [Figure 4-7](#).

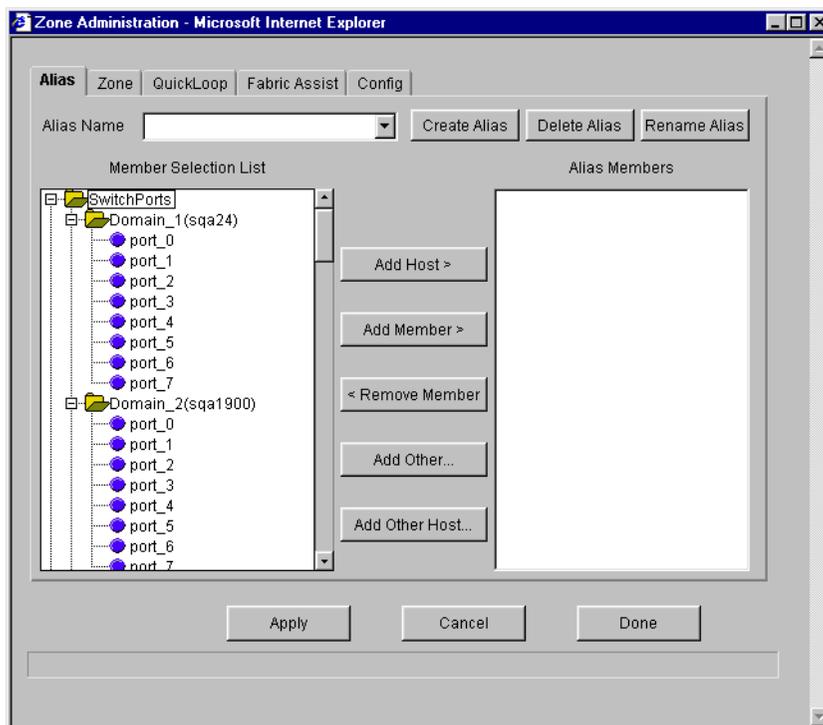


Figure 4-7: Alias tab in Zone Administration view

Alias tab fields are described in [Table 4-7](#).

**Table 4-7: Alias Tab**

Field	Description
Alias Name	To modify an existing alias, select an alias name.
Create Alias	Click to create a new alias. A dialog displays in which you can enter the name of the new alias. All names must be unique and contain no spaces.
Delete Alias	Click to delete the alias selected in the Alias Name field. Deleting an alias automatically removes it from all zones.
Rename Alias	Click to rename the alias selected in the Alias Name field. A dialog displays in which you can edit the alias name. Renaming an alias automatically renames it in all zones.
Member Selection List	A list of potential alias members, including switches, ports, WWNs, QuickLoop arbitrated loop physical addresses (AL_PAs), and Fabric Assists.
Add Member	Click to add the item selected in the Member Selection List to the Alias Members list. You can add individual ports or an entire switch. If a switch is added, all ports on the switch are added. To add a device WWN, select either a node WWN (folder icon) or port WWN (blue circle icon) from the WWN sub-tree.
Remove Member	Click to remove the selected member from the [Alias name] Members list.
Add Other	Click to add a WWN, switch port, QuickLoop AL_PA, or Fabric Assist that is not available in the Member Selection List.
Alias Members	The member list of the alias selected in the Alias Name field. The name of this list depends on the name of the selected alias. If no alias is selected, the name displays as "null Members."
Apply	Click to apply all changes made since Zone Administration view was opened, including changes made on other tabs in the view. You cannot undo changes once applied. Also, saves the Zoning information in Flash memory.
Cancel	Click to cancel all changes made since changes were last applied, and to exit Zone Administration view. You cannot undo changes once applied.
Done	Click to apply all changes made since Zone Administration view was opened and to exit Zone Administration view.

## Zone Tab

Use the Zone tab to create and manage zones. See [Figure 4-8](#).

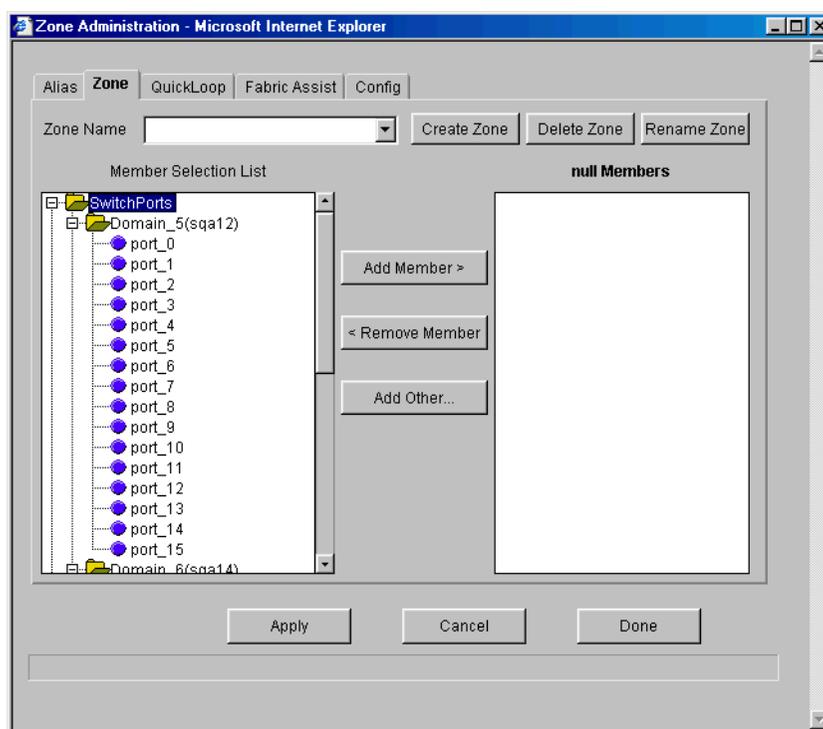


Figure 4-8: Zone tab in Zone Administration view

Zone tab fields are described in [Table 4-8](#).

**Table 4-8: Zone Tab**

Field	Description
Zone Name	To modify an existing zone, select a zone from the dropdown list, accessed by clicking the arrow at the right of the Zone Name entry field.
Create Zone	Click to create a new zone. A dialog displays in which you can enter the name of the new zone. All names must be unique and contain no spaces.
Delete Zone	Click to delete the zone selected in the Zone Name field. Deleting a zone automatically removes it from all zone configurations.

**Table 4-8: Zone Tab (Continued)**

Field	Description
Rename Zone	Click to edit the name of the zone selected in the Zone Name field. A dialog displays in which you can edit the name of the zone.
Member Selection List	A list of potential zone members, including switches, ports, WWNs, aliases, QuickLoop AL_PAs, and Fabric Assists.
Add Member	Click to add the member selected in the Member Selection List to the Zone Members list. If an entire switch is selected, all ports on the switch are added to the zone. You can also select individual ports. To add a device WWN, select either a node WWN (folder icon) or port WWN (blue circle icon) from the WWNs sub-tree. To add an alias to the zone, select it from the Aliases sub-tree (the alias must already exist).
Remove Member	Click to remove the selected member from the [Zone name] Members list.
Add Other	Click to add a WWN, switch, port, or QuickLoop AL_PA that is not listed in the Member Selection List.
Members	The members of the zone selected in the Zone Name field. The name of this list depends on the name of the selected zone. If no zone is selected, the name displays as "null Members."
Apply	Click to apply all changes made since Zone Administration view was opened, including changes made on other tabs in the view. You cannot undo changes once applied. Apply also saves the Zoning information in Flash memory.
Cancel	Click to cancel all changes since the changes were last applied and to exit Zone Administration. Changes cannot be cancelled once they are applied.
Done	Click to apply all changes made since Zone Administration view was opened and to exit Zone Administration view.

### QuickLoop Tab

Use this tab to create and manage QuickLoops in conjunction with Zoning.

**NOTE:** The QuickLoop license is not supported on the Fibre Channel SAN Switch models 8-EL and 16-EL.

For information on managing the QuickLoop feature separately from zoning, see [Loop Tab, page 4-44](#).

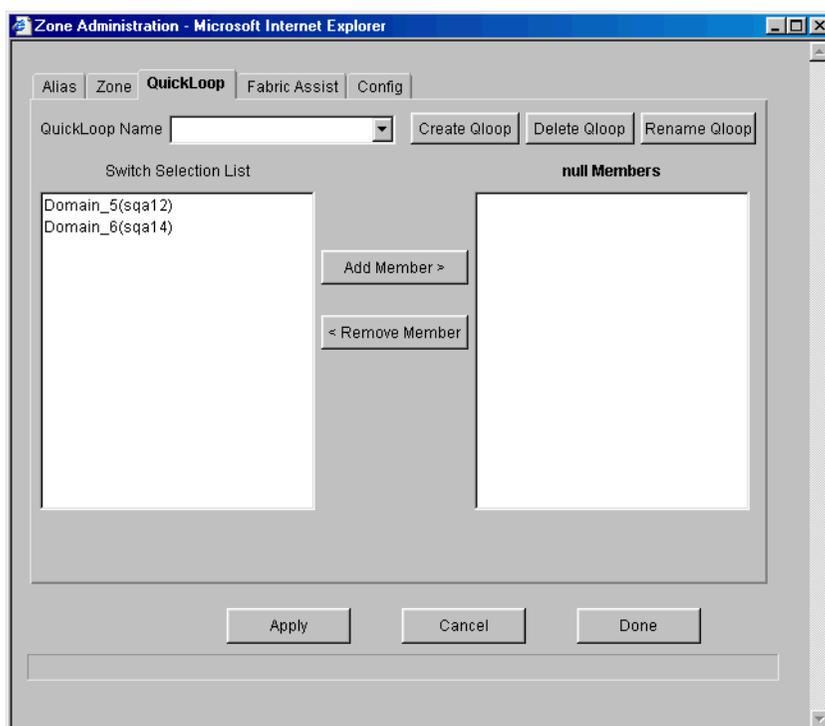


Figure 4-9: QuickLoop tab in Zone Administration view

QuickLoop tab fields are described in [Table 4-9](#).

**Table 4-9: QuickLoop Tab**

Field	Description
QuickLoop Name	To modify an existing QuickLoop, select a QuickLoop name.
Create Qloop	Click to create a new QuickLoop. A dialog displays in which you can enter the name of the new QuickLoop. All names must be unique and contain no spaces.
Delete Qloop	Click to delete the QuickLoop selected in the QuickLoop Name field. Deleting a QuickLoop automatically removes it from all aliases, zones, and zone configurations, including the associated AL_PAs.
Rename Qloop	Click to edit the name of the QuickLoop selected in the QuickLoop Name field. A dialog displays in which you can edit the name of the QuickLoop.
Switch Selection List	A list of the switches available to add to the QuickLoop.

**Table 4-9: QuickLoop Tab (Continued)**

Field	Description
Add Member	Click to add the switch selected in the Switch Selection List to the QuickLoop Members list.
Remove Member	Click to remove the selected member from the [QuickLoop name] Members list.
[QuickLoop name] Members	A list of the members of the QuickLoop currently selected in the QuickLoop Name field. The name of this list depends on the name of the selected QuickLoop. If no QuickLoop is selected, the name displays as "null Members".
Apply	Click to apply all changes made since Zone Administration view was opened, including changes made on other tabs in the view. Changes cannot be cancelled once they are applied. Apply also saves the Zoning information in Flash memory.
Cancel	Click to cancel all changes since the changes were last applied and to exit Zone Administration. Changes cannot be cancelled once they are applied.
Done	Click to apply all changes made since Zone Administration view was opened and to exit Zone Administration view.

### Fabric Assist Tab

Fabric Assist is used to allow private hosts to access public devices in the fabric. Use the Fabric Assist tab to create and manage Fabric Assists (see [Figure 4-10](#)).

---

**IMPORTANT:** You must obtain a QuickLoop license in order to use the Fabric Assist feature.

---

A Fabric Assist is a collection of one private host and up to 125 public devices that one host is allowed to access. The collection is sometimes called a Fabric Assist Zone. The private host addresses the public devices using private loop addressing (8 bit addresses). The 8 bit addresses are translated by the switch to public addresses (20 bit addresses). This allows private loop hosts to access up to 125 public devices anywhere in the fabric.

If one host is on a loop; any private device on that loop, that you want the host to access, will reduce the number of public devices that the host is able to access. The number of public devices is reduced from 125 by the number of devices that you want the public host to access on the same loop as the host.

Example: If there are 5 storage devices on the same loop as the private host, then the host will only be able to access 120 public devices in the fabric.

**NOTE:** Fabric Assist mode requires that all switches in the fabric be updated to Fabric OS version 2.4.x or later.

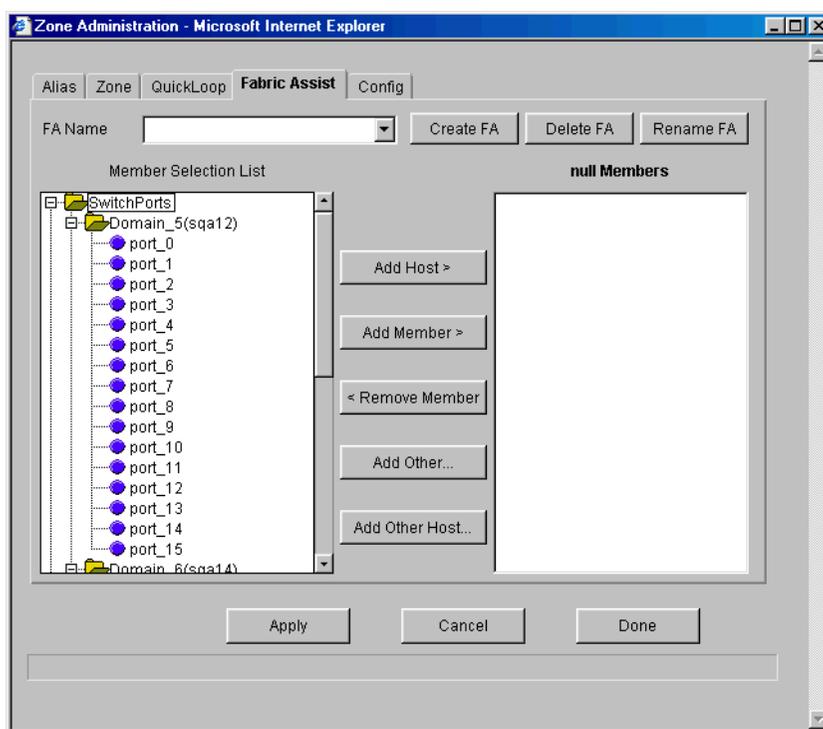


Figure 4-10: Fabric Assist tab in Zone Administration view

Fabric Assist tab fields are described in [Table 4-10](#).

**Table 4-10: Fabric Assist Tab**

Field	Description
FA Name	To modify an existing Fabric Assist, select a Fabric Assist name from the drop-down list.
Create FA	Click to create a new Fabric Assist. A dialog displays in which you can enter the name of the new Fabric Assist. All names must be unique and contain no spaces.

**Table 4-10: Fabric Assist Tab (Continued)**

Field	Description
Delete FA	Click to delete the Fabric Assist selected in the FA Name field. Deleting a Fabric Assist automatically removes it from all aliases, zones, and zone configurations, including the associated AL_PAs.
Rename FA	Click to edit the name of the Fabric Assist selected in the FA Name field.
Member Selection List	A list of members available to add to the Fabric Assist.
Add Host	Click to add the selected item as a host to the [Fabric Assist name] Members list. Only a domain port or a WWN can be added as a host.
Add Member	Click to add the member selected in the Member Selection List to the [Fabric Assist name] Members list.
Remove Member	Click to remove the selected member from the [Fabric Assist name] Members list.
Add Other	Click to add the member selected in the Member Selection List to the [Fabric Assist name] Members list. Click to add an unlisted domain port or WWN.
Add Other Host	Click to add a host to the [Fabric Assist name] Members list. Click to add an unlisted domain port or WWN. Click to add an unlisted domain port or WWN as a host.
[Fabric Assist name] Members	A list of the members that belong to the Fabric Assist currently selected in the FA Name field. The name of this list depends on the name of the Fabric Assist selected. If no Fabric Assist is selected, the name displays as "null Members".
Apply	Click to apply all changes made since Zone Administration view was opened, including changes made on other tabs in the view. Changes cannot be cancelled once they are applied.
Cancel	Click to cancel all changes since the changes were last applied and to exit Zone Administration. Changes cannot be cancelled once they are applied.
Done	Click to apply all changes made since Zone Administration view was opened and to exit Zone Administration view.

## Config Tab

Use the Config tab to create and manage zone configurations. See [Figure 4-11](#).

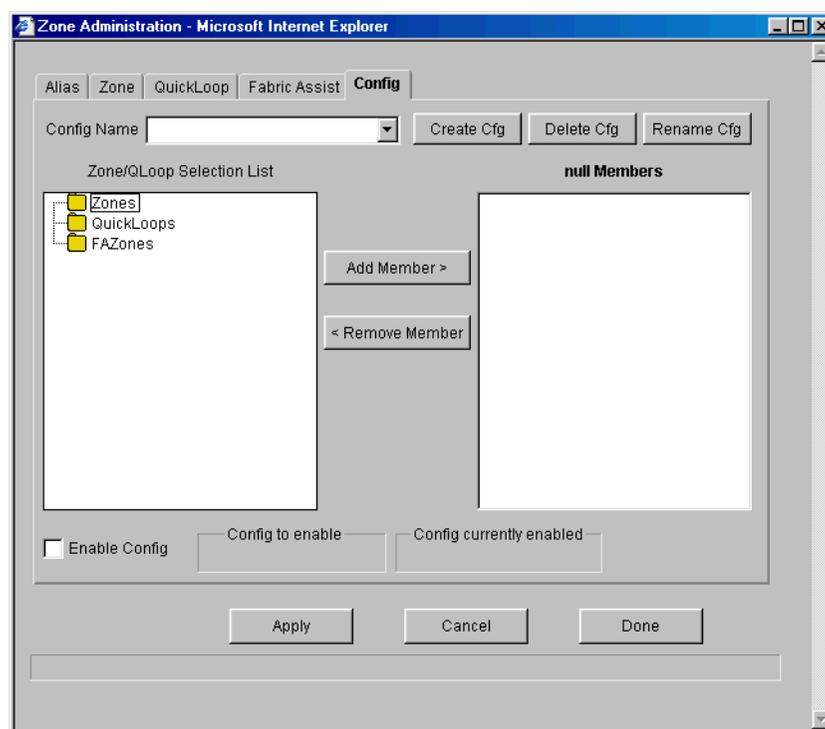


Figure 4-11: Config tab in Zone Administration view

Config tab fields are described in [Table 4-11](#).

**Table 4-11: Config Tab**

Field	Description
Config Name	To modify an existing configuration, select a configuration name.
Create Cfg	Click to create a new configuration. A dialog displays in which you can enter the name of the new configuration. All names must be unique and contain no spaces.
Delete Cfg	Click to delete the configuration selected in the Config Name field.
Rename Cfg	Click to edit the name of the configuration selected in the Config Name field.

**Table 4-11: Config Tab (Continued)**

Field	Description
Zone/QLoop Selection List	A list of the zones and QuickLoops available to add to the configuration.
Add Member	Click to add the switch selected in the Zone/QLoop Selection List to the Configuration Members list.
Remove Member	Click to remove the selected member from the [Configuration name] Members list.
[Configuration name] Members	The members of the configuration selected in the Config Name field. The name of this list depends on the selection. Only one configuration can be enabled at a time; if none are enabled, zoning is not active in the fabric.
Enable Config	Check to enable the configuration selected in the Config Name field, or uncheck to disable it.
Config to enable	Displays the name of the configuration that is currently selected for enabling. This configuration can be enabled by clicking Apply.
Config currently enabled	Displays the name of the currently enabled configuration. Only one configuration can be enabled at a time.
Apply	Click to apply all changes made since Zone Administration view was opened, including changes made on other tabs in the view. Changes cannot be cancelled once they are applied.
Cancel	Click to cancel all changes since they were last applied and to exit Zone Administration view. Changes cannot be cancelled once applied.
Done	Click to apply all changes made since Zone Administration view was opened and to exit Zone Administration view.

## Switch View

Switch view displays when you click a Switch icon in Fabric View. This view provides information about the overall status of the switch and the status of the individual elements in the switch. The information displayed is as close as possible to a real-time view of switch status. If the switch is not functioning properly, a message explains the problem detected.

**NOTE:** Switch status is calculated approximately once per second; however the initial calculation does not occur until 30 to 60 seconds after the switch is started.

To access Switch view from Fabric View:

1. Find the relevant Switch Panel and click the Switch icon in the panel.

2. The Switch view displays (see [Figure 4-12](#)).

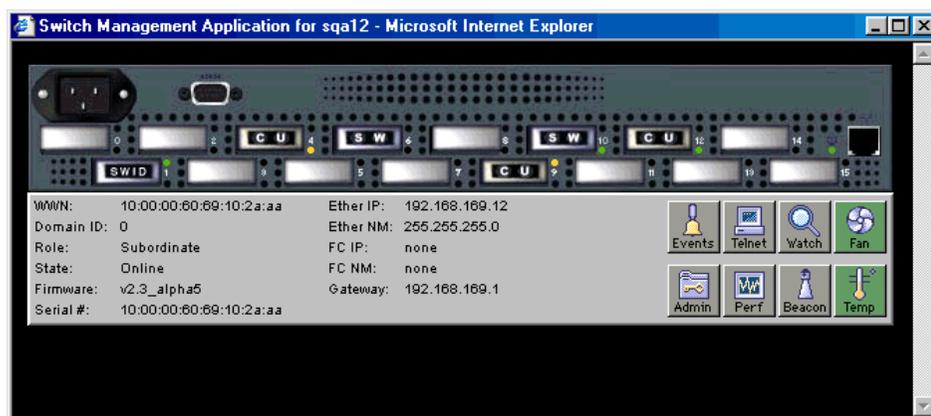
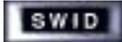


Figure 4-12: Switch view

Information available in Switch view is described in [Table 4-12](#).

**Table 4-12: Switch View**

Field	Description
Port icons 	The letters in the Port icon indicate the GBIC type, as follows: blank      No GBIC present SW          Short wave GBIC LW          Long wave GBIC SWID        Short wave serial ID GBIC LWID        Long wave serial ID GBIC A yellow outline around a port icon indicates port failure. For detailed port information, click the Port icon to see Port Information view.
Port numbers (on the right of each port)	The number assigned to a port.

**Table 4-12: Switch View (Continued)**

Field	Description
LED Status Indicators (round light next to each port)	The color indicates the status of the port. No light                      No device attached Steady yellow                Receiving light, but not online; check cable connections Slowly flashing yellow      Disabled (diagnostics or portDisable command) Rapidly flashing yellow      Error, fault with port Steady green                  Online (connected with device by cable) Slowly flashing green        Online but segmented (loopback cable or incompatible switch) Rapidly flashing green        Internal loopback (diagnostic) Flickering green              Online and transmitting/receiving frames
Power supply 	Removable power assemblies are updated to show presence/absence and status of each: Green            Power supply present and operational Red X            Power supply present but not operational Cover plate    Power supply absent or not fully plugged in
WWN	Unique numeric identifier for each switch; assigned by manufacturer.
Domain ID	Number that uniquely identifies the switch in a fabric.
Role	Indicates the current role of the switch. Principal        The principal switch as defined by FC_SW protocol Subordinate    Enabled but not the principal switch Disabled        Disabled
State	Indicates the current state of the switch, which may be online, offline, testing, or faulty.
Firmware	Fabric OS version
Serial #	The serial number of the switch being viewed
Ether IP	Ethernet IP address
Ether NM	Ethernet netmask value
FC IP	Fibre Channel IP address
FC NM	Fibre Channel netmask value
Gateway	IP address of default gateway. Must be properly set to access switch from other networks.

**Table 4-12: Switch View (Continued)**

Field	Description
<p>Events</p> 	<p>Click to access Switch Events view.</p>
<p>Telnet</p> 	<p>Click to launch a Telnet session.</p>
<p>Fabric Watch</p> 	<p>Click to access Fabric Watch.</p>
<p>Fan</p> 	<p>The background color of the button indicates the overall status of the fans:</p> <p>Green Healthy</p> <p>Yellow Marginal (mix of good and faulty readings)</p> <p>Red Down (more than two faulty readings)</p> <p>Gray Unknown or unmonitored</p>
<p>Admin</p> 	<p>Click to display the Administrative Interface where you can perform switch management functions.</p>
<p>Perf</p> 	<p>Click to display the Performance view where you can monitor switch performance.</p>
<p>Beacon</p>  	<p>Click to turn on the beaconing function. If on, this icon shows beams of light. The beaconing function helps to physically locate a switch by sending a signal to the specified switch, resulting in an LED light pattern flashing from side to side on the switch.</p>
<p>Temp</p> 	<p>The background color of the button indicates the overall temperature status:</p> <p>Green Healthy</p> <p>Yellow Marginal (less than two faulty readings)</p> <p>Red Down (more than two faulty readings)</p> <p>Gray Unknown or unmonitored</p>

## Switch Events View

Switch Events view displays a log of events for the selected switch.

To access Switch Events view from Fabric View:

1. Find the relevant Switch Panel and click the Switch icon in that panel. Switch view displays.
2. From the Switch view, click the Events icon. Switch Events view displays (see [Figure 4-13](#)).

Switch	Num...	Time	Count	Level	Message
sqa12	21	Sep 28 14:31:27	1	4	0x10e67240 (TThad) FW-CHANGED fabricFR000 (Fabric Reconfigu...
sqa12	20	Sep 28 14:21:44	1	4	0x10e67240 (TThad) FW-CHANGED fabricFR000 (Fabric Reconfigu...
sqa12	19	Sep 28 14:21:44	1	4	0x10e67240 (TThad) FW-CHANGED fabricED000 (Fabric E-port do...
sqa12	18	Sep 28 11:42:20	1	3	0x10e67240 (TThad) FW-BELOW eportState010 (E Port State Chan...
sqa12	17	Sep 28 11:42:20	1	3	0x10e67240 (TThad) FW-BELOW eportState004 (E Port State Chan...
sqa12	16	Sep 28 11:42:20	1	3	0x10e67240 (TThad) FW-BELOW eportState001 (E Port State Chan...
sqa12	15	Sep 28 11:42:20	1	3	0x10e67240 (TThad) FW-BELOW eportLink010 (E Port Link Failures...
sqa12	14	Sep 28 11:42:20	1	3	0x10e67240 (TThad) FW-BELOW eportLink004 (E Port Link Failures...
sqa12	13	Sep 28 11:42:20	1	3	0x10e67240 (TThad) FW-BELOW eportLink001 (E Port Link Failures...
sqa12	12	Sep 28 11:41:17	1	3	0x10e67240 (TThad) FW-ABOVE eportState010 (E Port State Chang...
sqa12	11	Sep 28 11:41:17	1	3	0x10e67240 (TThad) FW-ABOVE eportState004 (E Port State Chang...
sqa12	10	Sep 28 11:41:17	1	3	0x10e67240 (TThad) FW-ABOVE eportState001 (E Port State Chang...
sqa12	9	Sep 28 11:41:17	1	3	0x10e67240 (TThad) FW-ABOVE eportLink010 (E Port Link Failures ...
sqa12	8	Sep 28 11:41:17	1	3	0x10e67240 (TThad) FW-ABOVE eportLink004 (E Port Link Failures ...
sqa12	7	Sep 28 11:41:17	1	3	0x10e67240 (TThad) FW-ABOVE eportLink001 (E Port Link Failures ...
sqa12	6	Sep 28 11:41:17	1	4	0x10e67240 (TThad) FW-CHANGED fabricFL000 (Fabric Fabric logi...
sqa12	5	Sep 28 11:41:17	1	4	0x10e67240 (TThad) FW-CHANGED fabricZC000 (Fabric Zoning ch...

Figure 4-13: Switch Events view

**NOTE:** To sort the events by a particular column, click the column header. To resize a column, drag the column divider.

Switch Events view columns are described in [Table 4-13](#).

**Table 4-13: Switch Events View**

Switch	Name of switch
Number	Event number
Time	Time of event
Count	Number of back-to-back occurrences of same event

**Table 4-13: Switch Events View (Continued)**

Level	Severity level of event: 0=panic (switch restarts) 1=critical 2=error 3=warning 4=information 5=debug
Message	Description of event.

## Port Information View

Port Information view displays statistics for the selected port. This information is automatically updated when the view is opened, and is also refreshed periodically while the view remains open.

To access the Port Information view from Fabric View:

1. Find the relevant Switch Panel and click the Switch icon in the panel. Switch view displays.
2. From Switch view, click a Port icon (i.e., SW, SWID, LW). Port Information view displays (see [Figure 4-14](#)).

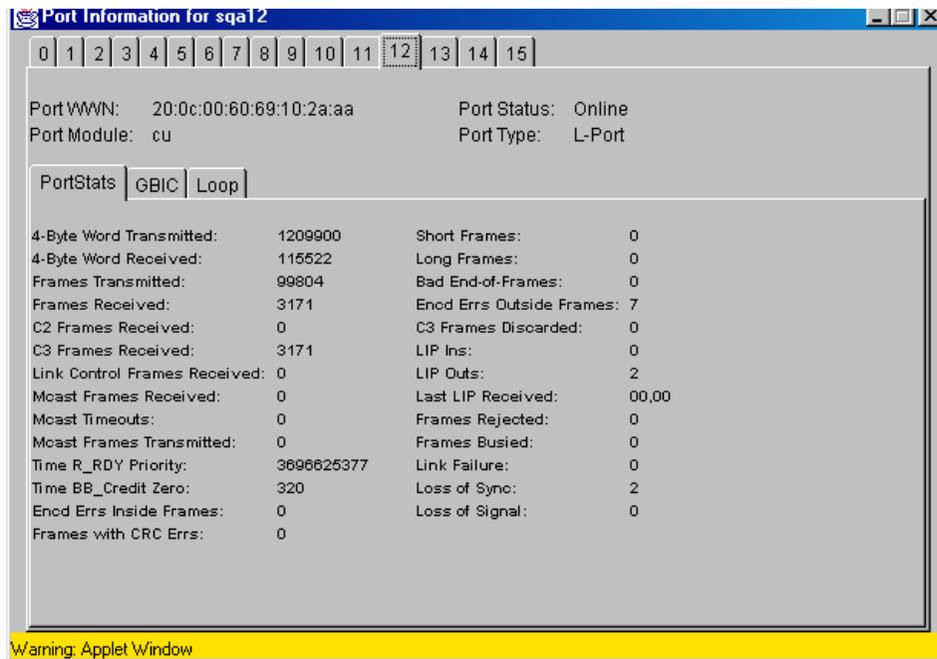


Figure 4-14: Port Information view

3. Click on the numbered tabs at the top of the window to specify the port for which you want to view information.

The following Port Information tabs are described in this section.

- [PortStats Tab](#)
- [GBIC Tab](#)
- [Loop Tab](#)

Table 4-14 describes the fields that are visible in the Port Information view regardless of which tab is selected.

<b>Table 4-14: Port Information View</b>	
<b>Field</b>	<b>Description</b>
Port WWN	WWN assigned to this port.
Port Module	The GBIC type, as follows: -- No GBIC present SW Short wave GBIC LW Long wave GBIC SWID Short wave serial ID GBIC LWID Long wave serial ID GBIC
Port Status	Indicates the current operating status of the port. No_Module No GBIC module is in this port. No_Light Cable disconnected or other end is turned off. No_Sync Cable is plugged in but other end is not enabled. In_Sync Connection is working offline. Laser_Flt Module signaling a laser fault (defective GBIC). Port_Flt Port is marked faulty (defective GBIC, cable, or device). Diag_Flt Port failed diagnostics. Online Port is up and running. Lock_Ref Port is locking to reference signal.
<p><b>NOTE:</b> Removing a cable from an E_Port temporarily generates errors, causing the status to show as faulty. The status returns to healthy when the sample interval has passed (the default interval is 1 minute).</p>	
Port Type	The type of port. E_Port Switch link port G_Port Generic port U_Port Universal port F_Port Fabric port FL_Port Fabric loop port L_Port Loop port

### PortStats Tab

The PortStats tab provides information about transmission speed, reception speed, and the volume of traffic through the selected port.

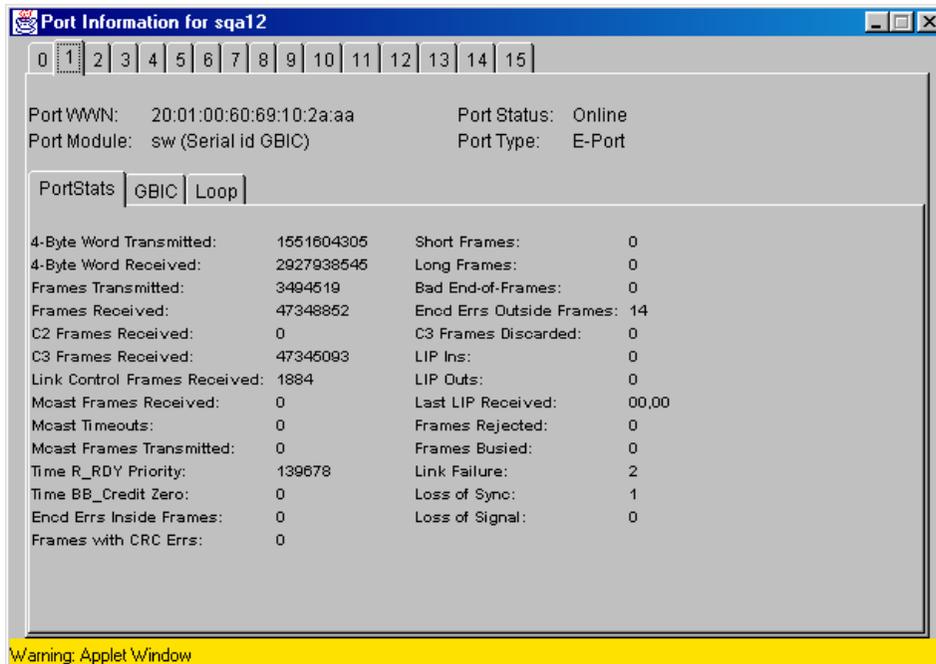


Figure 4-15: PortStats tab in Port Information view

The PortStats tab fields are described in [Table 4-15](#).

**Table 4-15: PortStats Tab**

Field	Description
4-Byte Word Transmitted	Number of four-byte words transmitted
4-Byte Word Received	Number of four-byte words received
Frames Transmitted	Number of frames transmitted
Frames Received	Number of frames received
C2 Frames Received	Number of class 2 frames received
C3 Frames Received	Number of class 3 frames received
Link Control Frames Received	Number of link control frames received

**Table 4-15: PortStats Tab (Continued)**

Field	Description
Mcast Frames Received	Number of multicast frames received
Mcast Time-outs	Number of multicast timeouts
Mcast Frames Transmitted	Number of multicast frames transmitted
Time R_RDY Priority	Number of times R_RDY has priority over frames to be sent
Time BB_Credit Zero	Number of times BB_Credit went to zero
Encd Errs Inside Frames	Number of encoding errors inside frames
Frames with CRC Errs	Number of frames with CRC errors
Short Frames	Number of frames shorter than minimum
Long Frames	Number of frames longer than maximum
Bad End-of-Frames	Number of frames with faulty end-of-frames
Encd Errs Outside Frames	Number of frames with encoding errors outside frames
C3 Frames Discarded	Number of class 3 frames discarded
LIP Ins	Number of LIPs received
LIP Outs	Number of times loop initialized by FL_Port
Last LIP Received	Last LIP received: AL_PD, AL_PS
Frames Rejected	Number of F_RJTs sent
Frames Busied	Number of F_BSYs sent
Link Failure	Number of times NOS received/sent
Loss of Sync	Number of times loss of sync occurred
Loss of Signal	Number of times loss of signal occurred

### GBIC Tab

**NOTE:** The information on this tab is only available for ports that contain GBICs.

This GBIC tab provides information about the GBIC installed in the selected port (see [Figure 4-16](#)). The information displayed depends on the type of GBIC installed. Possible GBIC types are listed next.

- Standard GBIC—Module type (short wave, long wave, etc.).
- Serial ID GBIC—Module type, plus extended information about capabilities, interfaces, and manufacturer.
- Smart Finisar GBIC—All of the above information, plus GBIC active status.

If the port does not contain a GBIC, the following message displays.

Not a serial ID GBIC. No GBIC info available.

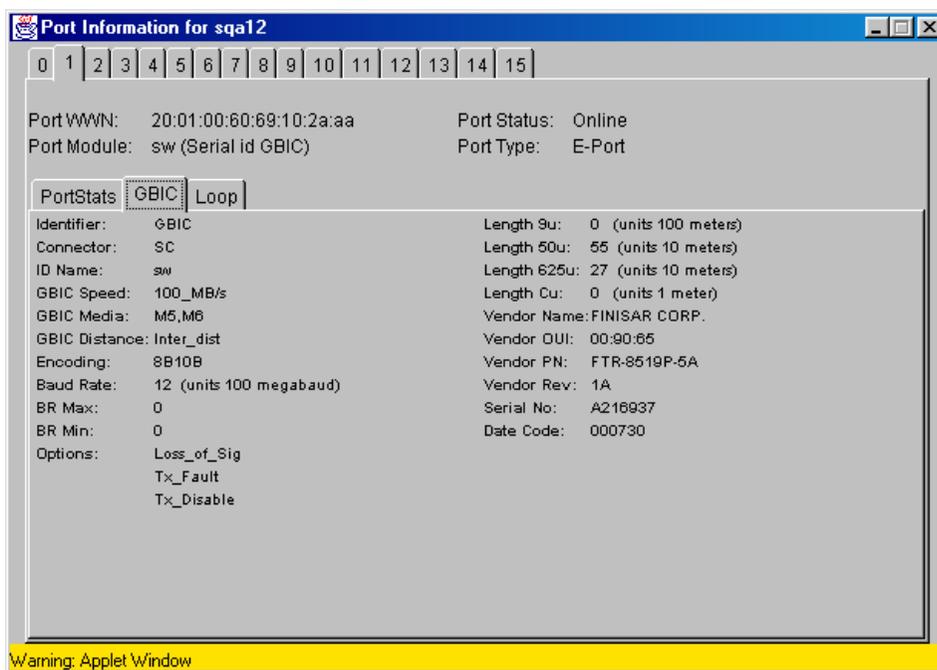


Figure 4-16: GBIC tab in Port Information view

The GBIC tab fields are described in [Table 4-16](#).

<b>Field</b>	<b>Description</b>
Identifier	Indicates the type of serial transceiver, which can be GBIC or on-board.
Connector	Indicates the external connector type, which can be one of the following: <ul style="list-style-type: none"> <li>■ SC</li> <li>■ Style-1 Copper</li> <li>■ Style-2 Copper</li> <li>■ BNC/TNC</li> <li>■ Coaxial</li> </ul>

**Table 4-16: GBIC Tab (Continued)**

Field	Description
ID Name	Indicates the GBIC module type, as follows. -- No GBIC present sw Short wave GBIC lw Long wave GBIC swid Short wave serial ID GBIC lwid Long wave serial ID GBIC
GBIC Speed	Indicates the GBIC speed, which can be 100, 200, or 400 MB/sec.
GBIC Media	Indicates the transmission media, as follows. SM single mode M5 multimode, 50u M6 multi-mode, 62.5u TV video coax MI miniature coax TP shielded twisted pair TW twin axial pair
GBIC Distance	Indicates the length of the Fibre Channel link, which can be long distance, intermediate distance, or short distance.
Encoding	Indicates the serial encoding mechanism, which can be 8B10B, 4B5B, NRZ, or Manchester.
Baud Rate	Nominal baud rate in units of 100 Megabyte.
BR Max	Upper limit at which GBIC meets its specifications (in units of 1 percent above nominal baud rate).
BR Min	Lower limit at which GBIC meets its specifications (in units of 1 percent below nominal baud rate).
Options	May indicate any of the following: ■ Loss of Signal ■ Loss of Signal Inverted ■ Transmission Fault ■ Transmission Disable
Length 9u	Indicates the length of link using single mode fibre.
Length 50u	Length of link using 50um multi-mode fibre
Length 625u	Length of link using 62.5um multi-mode fibre

**Table 4-16: GBIC Tab (Continued)**

Field	Description
Vendor Name	Name of vendor
Vendor OUI	Unique identifier for vendor
Vendor P/N	Vendor part number
Vendor Rev	Vendor revision number
Serial No.	Vendor serial number
Date Code	Vendor date code
<b>NOTE:</b> Smart GBIC Data (following rows) displays only if a smart GBIC is present):	
Temperature	Module temperature (in Centigrade)
Rx Power	Received optical power in micro Watts
Tx Power	Transmitted optical power in micro Watts (longwave only)
Current	Laser diode drive current in mAmps

### Loop Tab

**NOTE:** The information on the Loop tab is available only for those ports that are loop-enabled.

The Loop tab (see [Figure 4-17](#)) provides information about any loop on the port, including the following:

- Loop statistics
- Local AL\_PA statistics
- QuickLoop looplet statistics (if a QuickLoop license is available and the port is a member of the QuickLoop)
- QuickLoop statistics (if a QuickLoop license is available and the port is a member of the QuickLoop)

If the port is not a loop-enabled port, the following information displays:

Not an L\_Port. No loop info available.

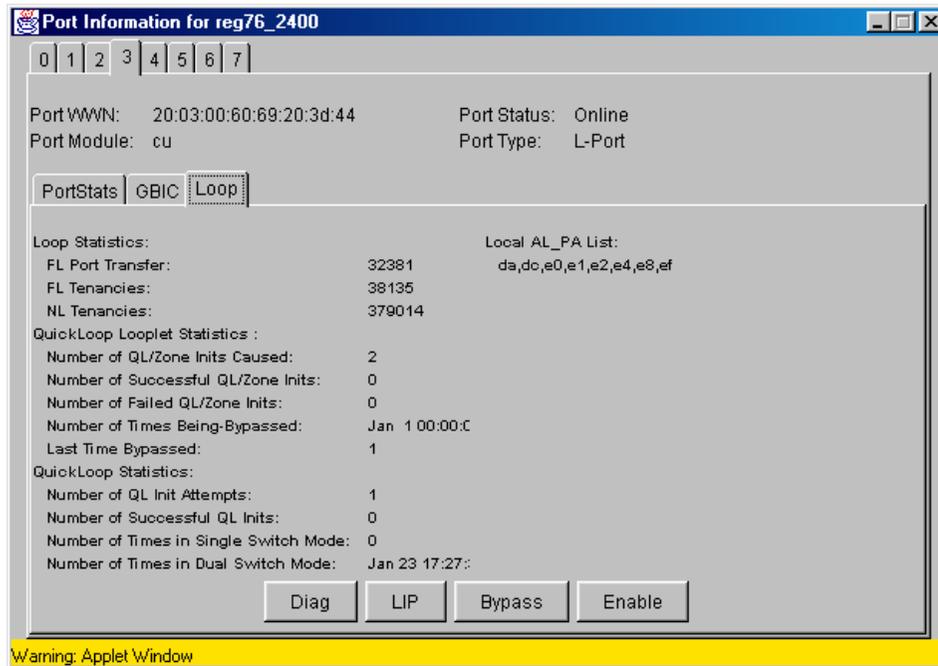


Figure 4-17: Loop tab in Port Information view

The Loop tab fields are described in [Table 4-17](#).

**Table 4-17: Loop Tab**

Field	Description
FL Port Transfer	Displays number of times FL_Port used transfer state.
FL Tenancies	Displays the number of times FL_Port opens loop tenancy.
NL Tenancies	Displays the number of times NL_Port opens loop tenancy.
Number of QL/Zone Inits Caused	Displays number of times looplet has caused QuickLoop to be initialized.
Number of Successful QL/Zones Inits	Displays number of times looplet has successfully initialized.
Number of Failed QL/Zone Inits	Displays number of times looplet failed to successfully initialize.
Number of Times Being Bypassed	Displays number of times looplet was not included as part of QuickLoop.

**Table 4-17: Loop Tab (Continued)**

Field	Description
Last Time bypassed	Displays time that looplet was last bypassed.
Local AL_PA List	Displays list of AL_PAs associated with devices connected to loop.
Number of QL Init Attempts	Displays number of times QuickLoop attempted initialization.
Number of Successful QL Inits	Displays number of time QuickLoop successfully initialized.
Number of Times in Single Switch Mode	Displays number of times switch reverted to single switch mode.
Number of Times in Dual Switch Mode	Displays number of times switch operated in dual switch mode.
Time of Last QL Init	Displays time of latest QuickLoop initialization.
Switch, Port Caused the Last Init	Displays number of switch, port that caused the latest initialization.
Diag	Click to open the Loop Diagnostics dialog box, which enables you to run loop diagnostics (requires password). For more information, see <a href="#">Loop Diagnostics Dialog Box, page 4-46</a> .
LIP	Click to open the LIP dialog box, which enables you to initialize the loop (requires password). For more information, see <a href="#">LIP Dialog Box, page 4-47</a> .
Bypass	Click to open the Bypass dialog box, which enables you to bypass a specified looplet (requires password). For more information, see <a href="#">Bypass Dialog Box, page 4-48</a> .
Enable	Click to open the Enable dialog box, which enables you to enable an AL_PA on a specified looplet (requires password). For more information, see <a href="#">Enable Dialog Box, page 4-48</a> .

### Loop Diagnostics Dialog Box

This dialog appears when you click DIAG on the Loop tab in Port Information view. Use the Loop Diagnostics option to identify faulty devices on a loop. See [Figure 4-18](#).

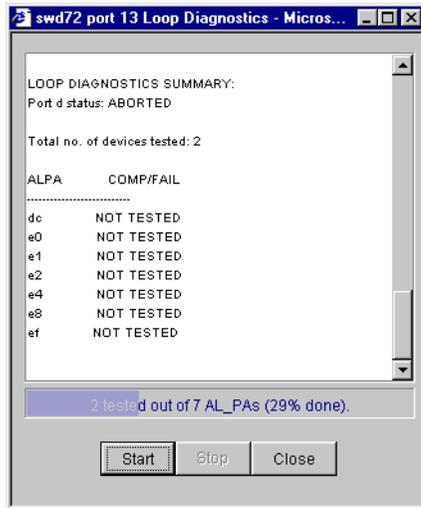


Figure 4-18: Loop Diagnostics dialog box

Table 4-18 describes the fields in the Loop Diagnostics dialog box.

**Table 4-18: Loop Diagnostics Dialog Box**

Field	Description
Start	Click to start the Loop Diagnostics on the specified port.
Stop	Click to stop (abort) Loop Diagnostics on the specified port.
Close	Click to close the Loop Diagnostics function.

### LIP Dialog Box

Use the Loop Initialization Process (LIP) option to initialize a loop port. To access this option, click LIP on the Loop tab in Port Information view. The LIP dialog box displays.



Figure 4-19: LIP dialog box

Table 4-19 describes the fields in the LIP dialog box.

Table 4-19: LIP Dialog Box	
Field	Description
Apply	Click to initialize a loop port.
Close	Click to close the LIP dialog box.

### Bypass Dialog Box

Use the Bypass option to bypass an AL\_PA (device) on the loop port. To access this option, click Bypass on the Loop tab in Port Information view.

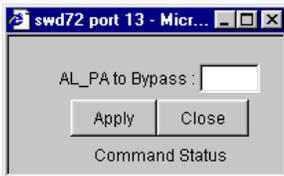


Figure 4-20: Bypass dialog box

Table 4-20 describes the fields in the Bypass dialog box.

**NOTE:** Some loop ports will respond to the bypass command and some will ignore it. Only faulty loop ports should be bypassed.

Table 4-20: Bypass Dialog Box	
Field	Description
AL_PA to Bypass	Specify the AL_PA number to bypass.
Apply	Click to bypass an AL_PA on the loop port (must be a valid AL_PA).
Close	Click to close the Bypass dialog box.

**NOTE:** Do not bypass the last AL\_PA on the loop, as this will put it into a loopback state, requiring a restart to return it to an L\_Port state.

### Enable Dialog Box

Use the Enable option to enable an AL\_PA on the loop port that was previously bypassed. To access this option, click Enable on the Loop tab in Port Information view.



Figure 4-21: Enable dialog box

Table 4-21 describes the fields in the Enable dialog box:

<b>Field</b>	<b>Description</b>
AL_PA to Enable	Specify AL_PA to be enabled. Entering off will enable all the AL_PAs in the loop.
Apply	Click to enable the AL_PA (must be a valid AL_PA).
Close	Click to close Enable an AL_PA window.

## Fabric Watch View

Use the Fabric Watch view to monitor fabric elements for potential problem conditions. For detailed information about Fabric Watch, see the *Fabric Watch Version 2.4.1 User Guide*, Part Number AA-RR79A-TE.

**NOTE:** Fabric Watch View is only available if you have purchased the optional Fabric Watch software, and have the appropriate license installed.

To access Fabric Watch view from Fabric View:

1. Find the relevant Switch panel and click the Switch icon in the panel. Switch view displays.
2. From Switch view, click the Fabric Watch icon. Fabric Watch view displays (see [Figure 4-22](#)).

An organizational tree appears at the left of the view, showing all the Fabric Watch classes regardless of which tab is selected. Classes represent the different aspects of the fabric that can be monitored and configured in Fabric Watch. Fabric Watch classes include:

- Environment
- GBIC
- Port
- E-Port
- F/FL Optical Port
- Fabric

To expand or contract the folders in the Fabric Watch tree, double-click the folder (Switch folder or Fabric folder)

Fabric Watch view contains the following tabs:

- Alarm Notifications Tab
- Configure Thresholds Tab
- Current Settings Tab

The general steps used to manage a class within your fabric include.

1. Select a class from the tree. For example, the Environment class is selected in [Figure 4-22](#).
2. Review the Alarm Notifications tab.
3. Select the Configure Thresholds tab to make changes.
4. Check current settings in the Current Settings tab.

### **Alarm Notifications Tab**

Use the Alarm Notifications tab to view Fabric Watch notifications. You can either accept the default notifications or select the Configure Thresholds tab and specify the alarm notifications you want to customize.

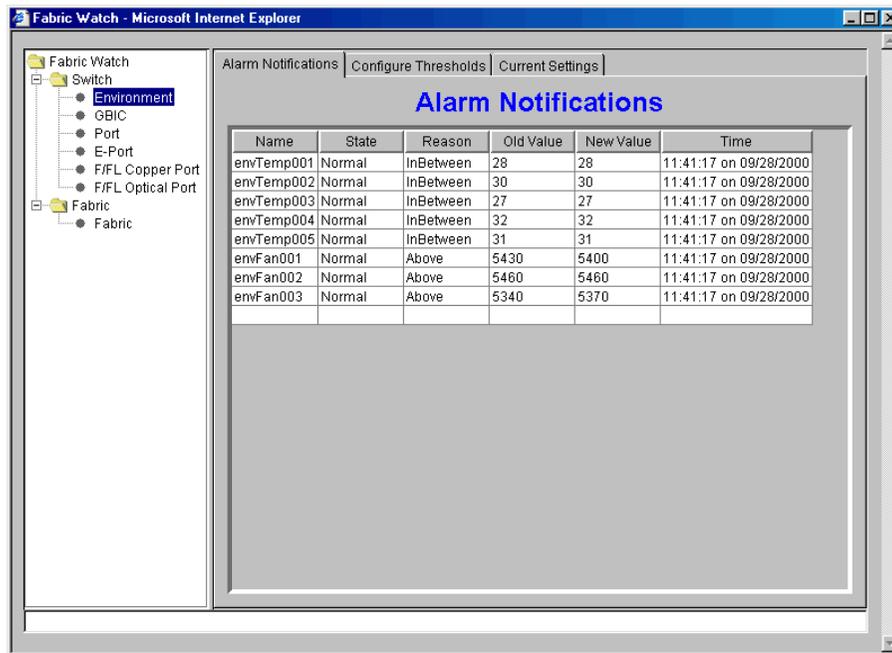


Figure 4-22: Alarm Notifications tab for Environmental class

### Configure Thresholds Tab

Use the Configure Thresholds tab to view and configure Fabric Watch thresholds for the Fabric Watch class currently selected in the organizational tree (see [Figure 4-23](#)).

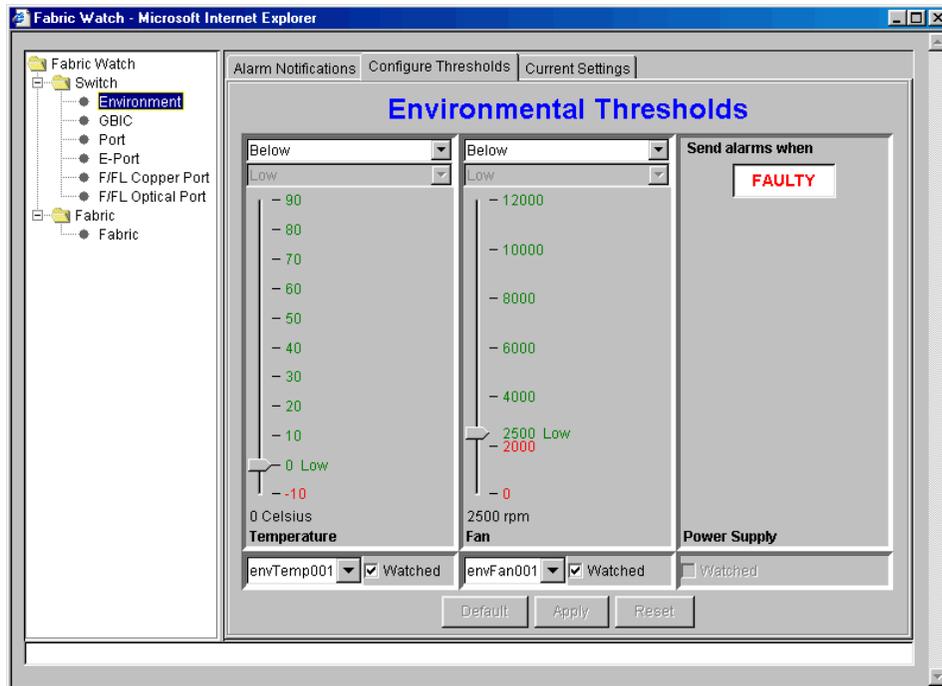


Figure 4-23: Configure Thresholds tab for Environment class

The information displayed on the Configure Thresholds tab is specific to the class selected in the organizational tree.

When you change information in the Configure Thresholds tab, the Alarm Delivery Mechanism dialog box ([Figure 4-24](#)) will display after you select Apply.

**NOTE:** If you select Default, settings are returned to factory defaults. If you select Reset, settings are returned to the last saved settings.



Figure 4-24: Alarm Delivery Mechanisms dialog box

### Current Settings Tab

Use the Current Settings tab to view the current Fabric Watch threshold parameters for the class selected in the Fabric Watch tree.

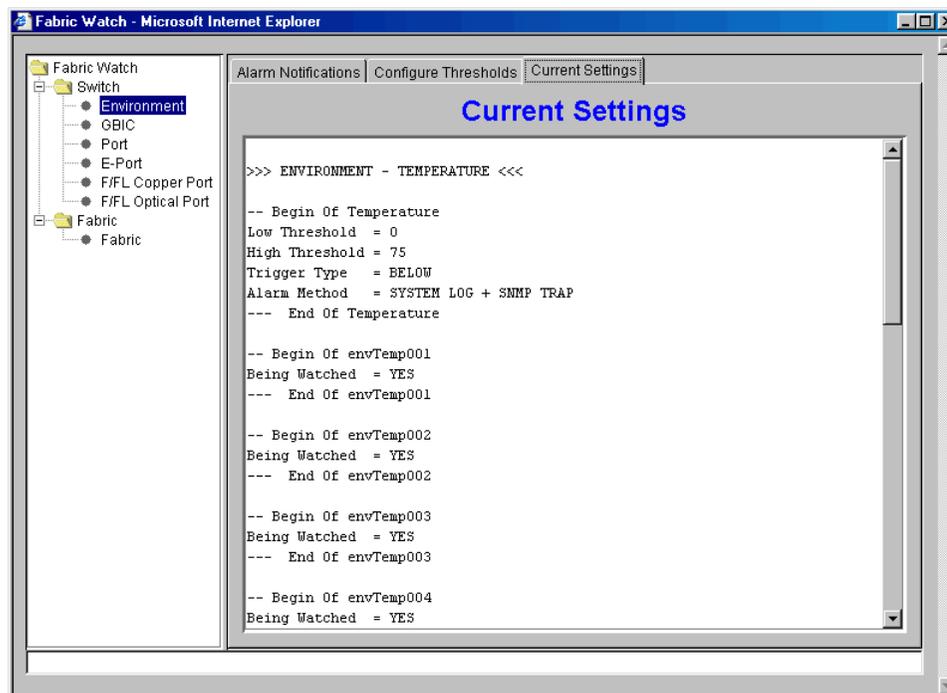


Figure 4-25: Current Settings tab for Environmental class

**NOTE:** For each class, select all three tabs to monitor and configure thresholds.

## Performance View

The Performance view graphically displays throughput (megabytes per second) for each port, and for the entire switch.

- Port throughput is the number of bytes received at a port plus the number of bytes transmitted.
- Switch throughput is the sum of the throughput for all the ports.

To access the Performance view from Fabric View:

1. Find the relevant Switch panel and click the Switch icon in the panel. Switch view displays.
2. From Switch view, click the Performance icon. Performance view displays (see [Figure 4-26](#)).

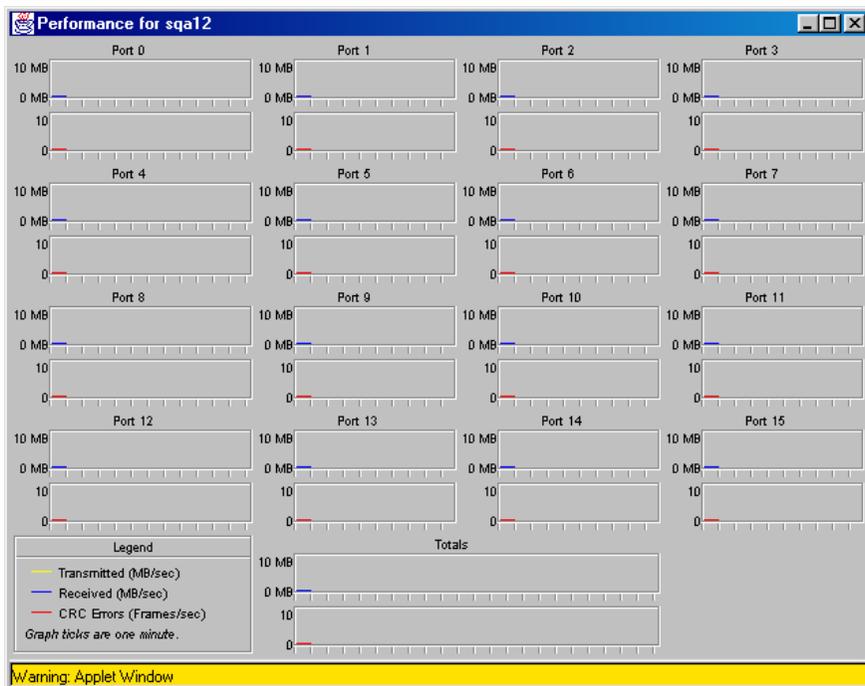


Figure 4-26: Performance view

In addition to the port graphs, a graph for the entire switch is provided at the bottom of the window. Resizing the window changes the size and shape of all the individual graphs.

In both the port and switch graphs, the horizontal axis represents elapsed time and the vertical axis represents throughput. Each port graph contains up to 60 seconds of performance data, and the switch graph at the bottom of the view can contain up to four minutes of data.

## Administrative Interface

The Administrative Interface provides access to the administrative functions through the following tabs, listed next. Descriptions of the Administrative tabs follow this section.

- [Switch Admin Tab](#)
- [User Admin Tab](#)
- [Firmware Upgrade Tab](#)
- [Reboot Switch Tab](#)
- [SNMP Admin Tab](#)
- [License Admin Tab](#)
- [Remote Switch Tab \(Optional Software\)](#)
- [QuickLoop Admin Tab](#)
- [Config Admin Tab](#)
- [Extended Fabric Tab \(Optional Software\)](#)

**NOTE:** The Administrative Interface requires administrative privileges.

Once an administrative login is entered, administrative privileges remain available from that workstation until the Web browser is exited.

Use these steps to access the Administrative Interface.

1. Find the relevant Switch Panel and click the Admin icon on the switch panel.
2. The Enter Network Password dialog box displays (see [Figure 4-27](#)).

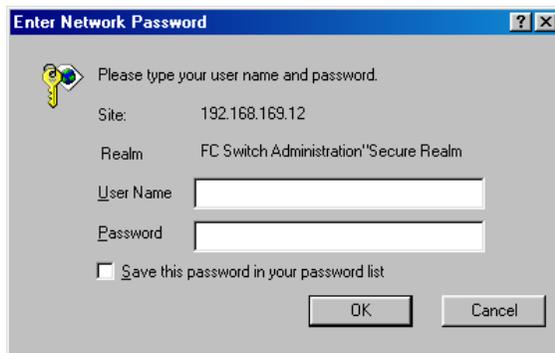


Figure 4-27: Enter Network Password dialog box

3. Enter your user name and password. The log on account must have administrative privileges.
4. Click OK. The Administrative Interface displays, with the Switch Admin tab selected by default.

### Switch Admin Tab

Use the Switch Admin tab to change IP information, enable/disable a switch, change the domain, change the switch name, see which ports are enabled, and enable/disable individual ports.

**NOTE:** The software licenses installed will determine what tabs will be displayed.

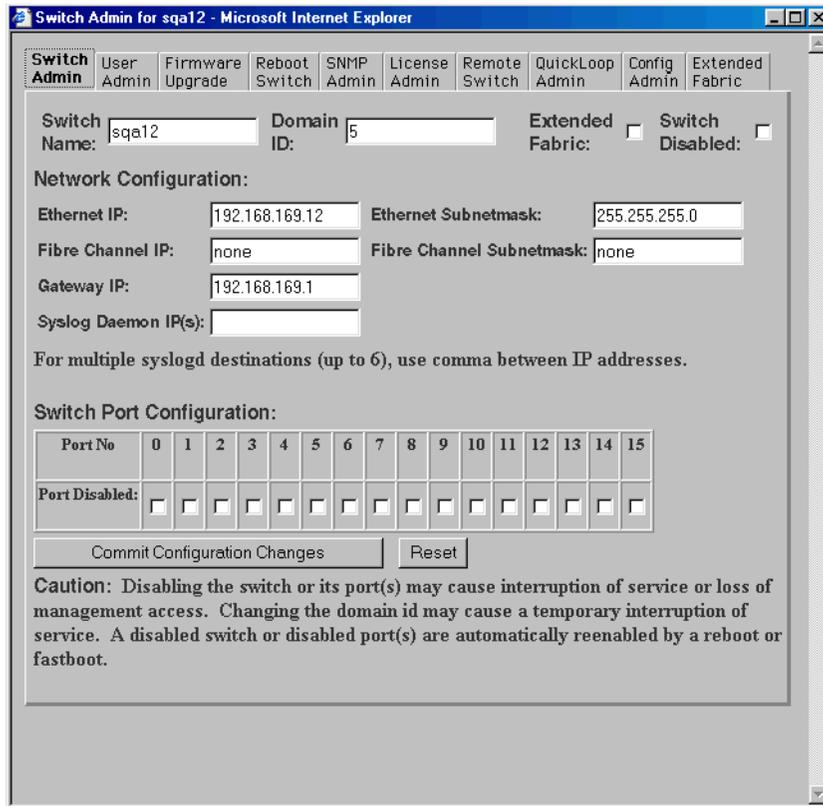


Figure 4-28: Switch Admin tab

The Switch Admin tab fields are described in [Table 4-22](#).

**Table 4-22: Switch Admin Tab**

Field	Description
Switch Name	Displays or sets the switch name. To change name, enter new name in this field.
Domain ID	Displays or sets switch domain ID. Domain IDs must be unique within a fabric. To change a domain ID, enter a new domain ID in this field. Use a number from 1 to 239 for normal operating mode (FCSW compatible) and a number from 0 to 31 for VC encoded address format mode.
Extended Fabric	Enables additional Buffer-to-Buffer (BB) Credits for improved performance of long distance links. The number of extra BB Credits credits is determined by the settings on the Extended Fabrics tab. The longer the distance the more BB credits.
<b>NOTE:</b> When employing Extended Fabric, each switch must be configured to support long distance. Each switch must have the Extended Fabric license installed. This is an optional license.	
Switch Disabled	Check to disable the switch, or uncheck to enable the switch.
Ethernet IP	Displays or sets IP address for Ethernet connection to switch.
Ethernet Subnetmask	Displays or sets Ethernet subnetmask. Default value is none. Contact network administrator for value to enter. If changed, restart browser.
Fibre Channel IP	Displays or sets Fibre Channel IP address.
Fibre Channel Subnetmask	Displays or sets Fibre Channel subnetmask. If changed, restart browser.
Gateway IP	Displays or sets gateway IP address. Contact network administrator for IP address. If changed, restart browser.
Syslog Daemon IP	Displays or sets the destination station IP address to which events are sent, using syslog protocol to host. Maximum of six IP addresses (contact network administrator for IP address). If messages are not to be sent, enter none or leave blank. Enter multiple addresses as a list, for example: 192.168.64.35, 192.168.62.36.  On UNIX systems, a syslogd (System Log Daemon) would receive the forwarded events and log them into a well-known file. Use "man syslogd" on a UNIX system to learn about options of how to handle events which have been forwarded by the switch to the syslogd software running on the host.
Port No	The number assigned to the port.
Port Disabled	If the box is checked, the port is disabled. To enable the port, uncheck the box.

**Table 4-22: Switch Admin Tab (Continued)**

Field	Description
Commit Configuration Changes	Click to apply changes made.
Reset	Click to reset all fields to values present when Switch Administration was launched.

### User Admin Tab

Use the User Admin tab to rename accounts or change password. See [Figure 4-29](#).

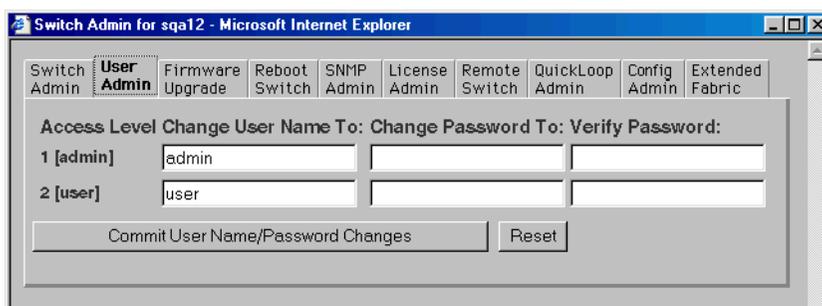


Figure 4-29: User Admin tab

The User Admin tab fields are described in [Table 4-23](#).

**NOTE:** User can only change the user password not the admin password. An administrator logged in as admin can change both the user and the admin password.

**Table 4-23: User Admin Tab**

Field	Description
Access Level	Access level required (admin or user)
Change User Name To	Enter new user name.
Change Password To	Enter new password.
Verify Password	Re-enter password to verify.
Commit User Name/Password Changes	Click to apply changes made.
Reset	Click to reset all fields to values set at last submission.

## Firmware Upgrade Tab

Use the Firmware Upgrade tab to download firmware upgrades. See [Figure 4-30](#).

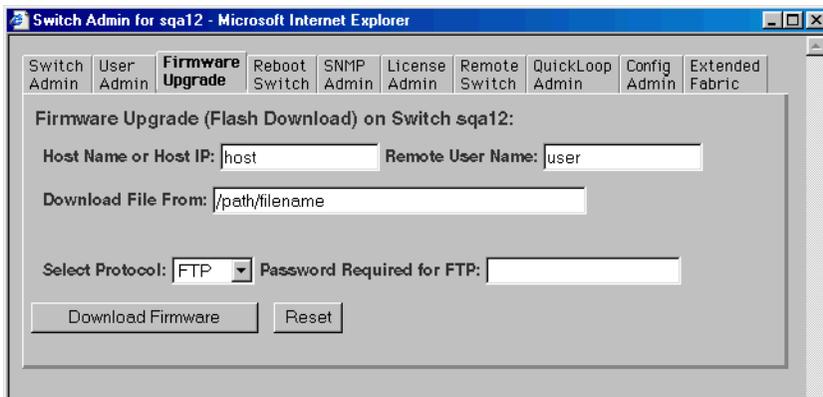


Figure 4-30: Firmware Upgrade tab

The Firmware Upgrade tab fields are described in [Table 4-24](#).

**Table 4-24: Firmware Upgrade Tab**

Field	Description
Host Name or Host IP:	Displays or sets host name or host IP address.
Remote User Name:	Displays or sets remote user name.
Download File From:	Enter fully qualified path name for firmware download.
Select Protocol:	Select the protocol for the download.
Password Required for FTP:	Enter a password if FTP was selected as the protocol.
Download Firmware	Click to download firmware.
Reset	Resets all fields to values present when Firmware Upgrade was launched.

### Reboot Switch Tab

Use the Reboot Switch tab to restart or fastboot the switch or to disable POST (Power On Self Test) for future restarts. See [Figure 4-31](#).

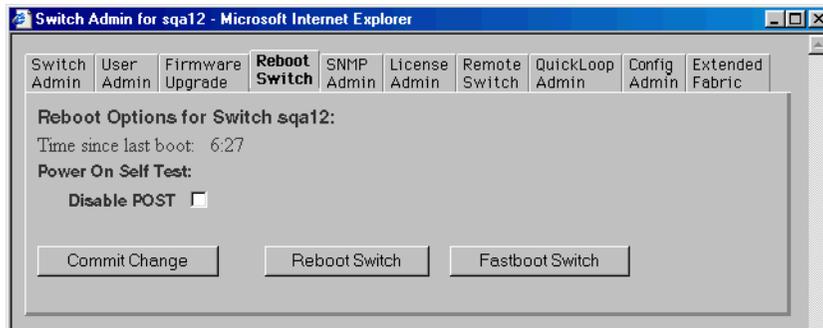


Figure 4-31: Reboot Switch Tab

The Reboot Switch tab fields are described in [Table 4-25](#).

**Table 4-25: Reboot Switch Tab**

Field	Description
Disable POST	Check to disable POST for future restarts, or uncheck to enable POST.
Commit Change	Click to save settings.
Reboot Switch	Click to restart the switch.
Fastboot Switch	Click to perform a fast restart. A fastboot bypasses POST. (It is the same as a restart with POST disabled.)

### SNMP Admin Tab

Use the SNMP Admin tab to set SNMP options. See [Figure 4-32](#).

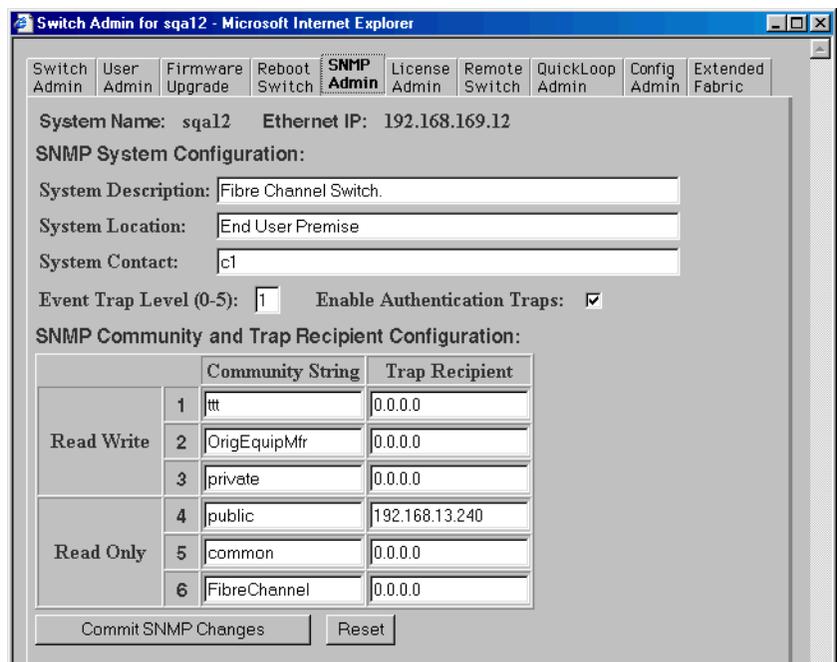


Figure 4-32: SNMP Admin tab

The SNMP Admin tab fields are described in [Table 4-26](#).

**Table 4-26: SNMP Admin Tab**

Field	Description
System Description	Displays or sets system description. Default is Fibre Channel Switch.
System Location	Displays or sets location of switch. Default is End User Premise.
System Contact	Displays or sets contact information for switch. Default is Field Support.
Event Trap Level	Sets severity level of switch events that prompt SNMP traps. Default is 0.
Enable Authentication Traps	Select checkbox to enable authentication traps; deselect checkbox to disable (recommended).
Read Write Community String	Displays or sets up to three strings that work with the SNMP set command.

**Table 4-26: SNMP Admin Tab (Continued)**

Field	Description
Read Only Community String	Displays or sets up to three strings that work with the SNMP get or get-next command.
Read Write and Read Only Trap Recipients	Displays or sets recipients for traps (usually IP address of SNMP management station).
Commit SNMP Changes	Click to apply changes made.
Reset	Click to reset all fields to values present when SNMP Administration was launched.
<b>NOTE:</b> To disable the community string or trap recipient fields, leave empty.	

### License Admin Tab

Use the License Admin tab to view a list of installed license keys and features or to add or remove licenses. See [Figure 4-33](#).

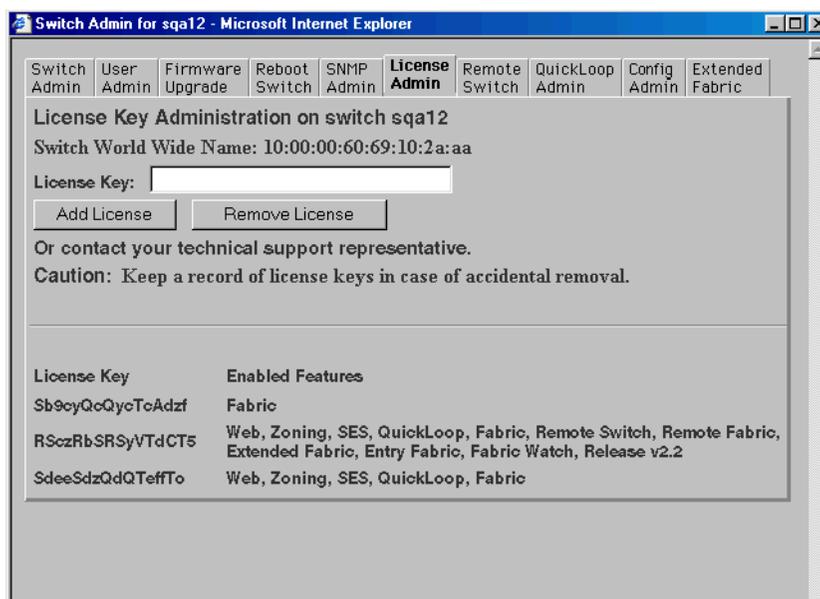


Figure 4-33: License Admin tab

The License Admin tab fields are described in [Table 4-27](#).

Table 4-27: License Admin Tab	
Field	Description
License Key	Enter license key to be added or removed.
Add License	Click to add specified license.
Remove License	Click to remove specified license.
Text Box	A list of the licenses installed on the switch.

### Remote Switch Tab (Optional Software)

**NOTE:** This tab is only available for switches that have the Remote Switch license installed. The Remote Switch feature can only be implemented in a fabric that contains exactly two switches.

Use the Remote Switch feature to configure a pair of switches to operate over an extended Wide Area Network (WAN) interface. This enables the switches to communicate across an Asynchronous Transfer Mode (ATM) network by using a compatible Fibre Channel-to-ATM gateway. The Remote Switch feature requires an active Remote Switch license on *both* switches. For detailed information on the Remote Switch feature, see the *Compaq StorageWorks Extended Fabrics Version 2.4.1 Guide*, Part Number AA-RR7DA-TE.

Use the Remote Switch tab to enable or disable the Remote Switch feature on the selected switch. See [Figure 4-34](#).

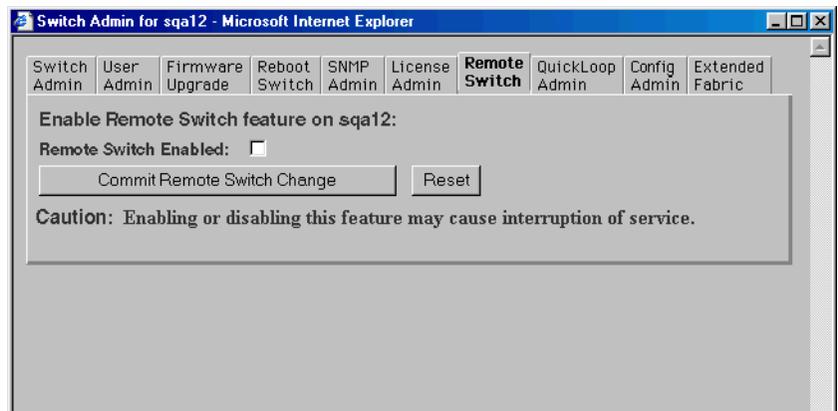


Figure 4-34: Remote Switch tab

The Remote Switch tab fields are described in [Table 4-28](#).

**Table 4-28: Remote Switch Tab**

Field	Description
Remote Switch Enabled	Check to enable the Remote Switch feature, or uncheck to disable it.
Commit Remote Switch Change	Click to apply changes made.
Reset	Click to reset all fields to values present when Remote Switch was launched.

### QuickLoop Admin Tab

**NOTE:** For information specific to QuickLoop to be available, the QuickLoop switch must be the local domain.

Use the QuickLoop Admin tab to manage QuickLoop functionality, such as modifying a QuickLoop or setting up a partner switch. See [Figure 4-35](#).

For additional QuickLoop and Zoning information, see the “Zone Administration View” section in this chapter.

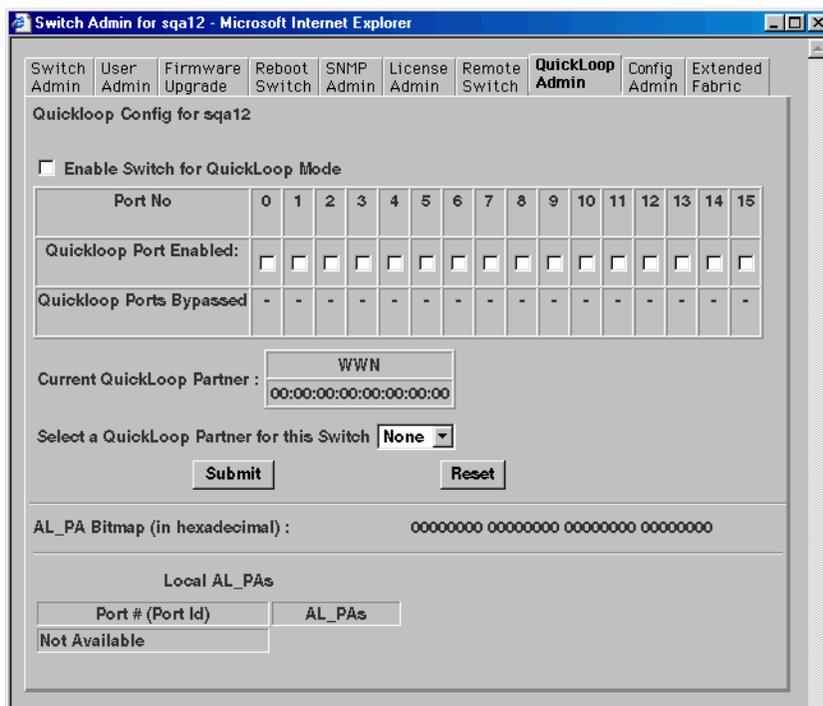


Figure 4-35: QuickLoop Admin tab

The QuickLoop Admin tab fields are described in [Table 4-29](#).

**Table 4-29: QuickLoop Admin Tab**

Field	Description
Enable Switch for QuickLoop Mode	Check to enable all the ports on the switch for QuickLoop, or uncheck to disable all the ports on the switch for QuickLoop.
Port No	The number assigned to a port.
QuickLoop Port Enabled	Check to enable the port for QuickLoop, or uncheck to disable the port for QuickLoop.
QuickLoop Ports Bypassed	If checked, indicates a port is currently bypassed.
Current QuickLoop Partner	Displays the current partner switch WWN, domain ID, and switch name of a dual-switch QuickLoop.
Select a QuickLoop Partner for this Switch	Select a switch from the list of switch names currently in the fabric as the partner switch of a dual-switch QuickLoop.
Submit	Click to apply changes made.

**Table 4-29: QuickLoop Admin Tab (Continued)**

Field	Description
Reset	Click to reset all fields to values present when QuickLoop Administration was launched.
AL_PA Bitmap (in hexadecimal)	Displays the AL_PA bitmap at the end of a QuickLoop initialization.
Local AL_PAs	Lists the AL_PAs of devices connected to the local switch.
Remote AL_PAs	Lists the AL_PAs of devices connected to the remote switch in a dual-switch QuickLoop. This information only displays if a partner is configured.

### Config Admin Tab

Use the Config Admin tab to upload the switch configuration file for archiving, or to download a new configuration file from the host. See [Figure 4-36](#).

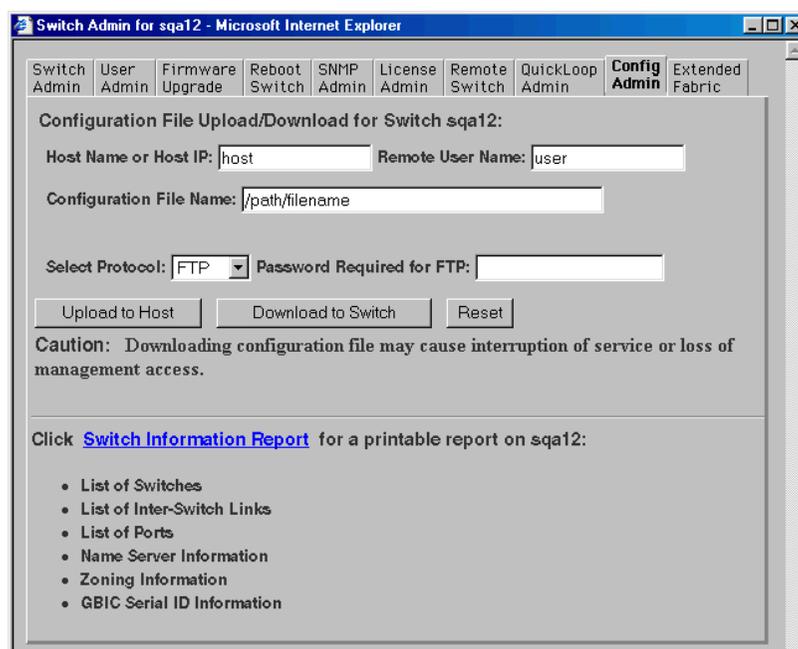


Figure 4-36: Config Admin tab

The Config Admin tab fields are described in [Table 4-30](#).

**Table 4-30: Config Admin Tab**

Field	Description
Host Name or Host IP	Specify the host name or host IP address from which to load the firmware.
Remote User Name	Specify the remote user name on the host.
Configuration File Name	Specify the name of the configuration file to be uploaded or downloaded.
Select Protocol	Specify FTP or RSHD protocols to be used for the down load or upload.
Password Required for FTP	Specify a password for the user, if one is required by the host.
Upload to Host	Click to retrieve configuration file from the switch.
Download to Switch	Click to send configuration file to the switch.
Reset	Click to reset all fields to values present when Configuration Administration was launched.
Switch information Report	Click to open a browser window displaying a status report for the switch. Information can be printed or saved to file.

### ***Switch Information Report***

The Switch Information Report can be generated by clicking the corresponding link on the Config Admin tab in the Switch Admin window. It provides information about all the switches, interswitch links, and ports in the fabric. See [Figure 4-37](#).

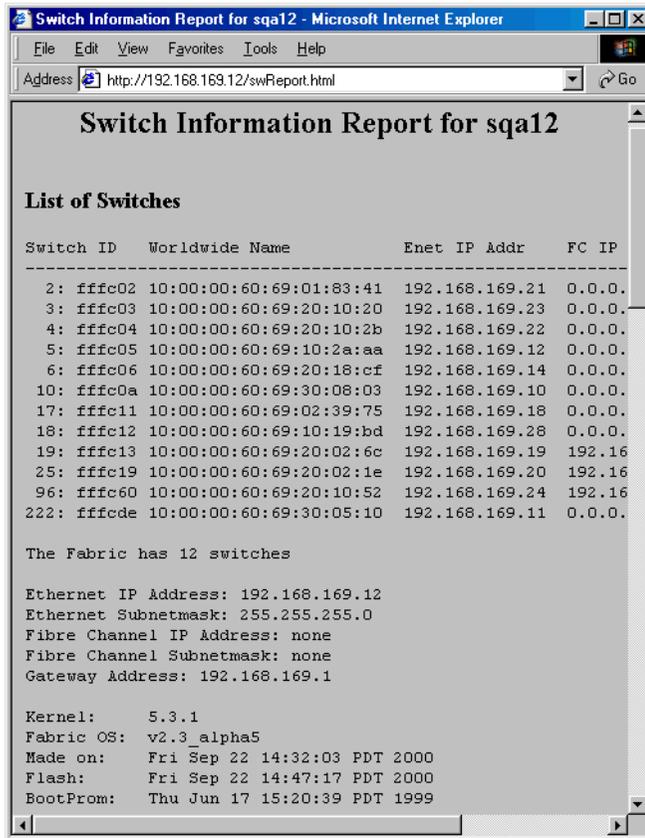


Figure 4-37: Switch Information Report

### Extended Fabric Tab (Optional Software)

**NOTE:** This tab is only available for switches that have the Extended Fabric license installed.

The Extended Fabric feature enables you to configure ports for a long distance link of up to 100 kilometers. For detailed information on this feature, see the *Compaq StorageWorks Extended Fabrics User Guide*, Part Number AA-RR7DA-TE.

Use the Extended Fabric tab to specify which ports you want configured for a specific distance, and at what level. See [Figure 4-38](#).

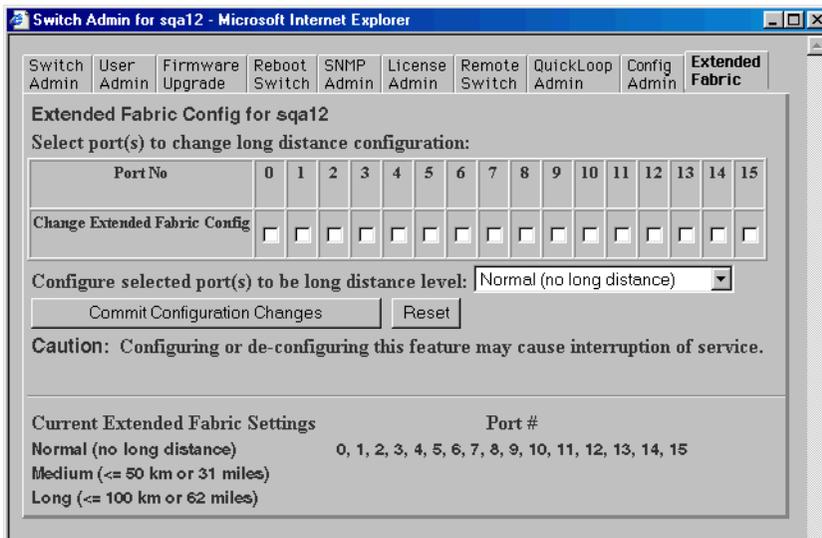


Figure 4-38: Extended Fabric tab

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**IMPORTANT:** Configuration changes will not take effect unless you have previously selected the Extended Fabric checkbox from the Switch Admin tab (Figure 4-28).

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The Extended Fabric tab fields are described in Table 4-31.

**Table 4-31: Extended Fabric Tab**

Field	Description
Port No	The number assigned to a port.
Change Extended Fabric Configuration	Check to designate the ports for which you want to change the long distance configuration. All ports that are checked when the Commit Configuration Changes button is pushed are changed to the value selected from the long distance level dropdown list. Boxes not checked are not changed.

**Table 4-31: Extended Fabric Tab (Continued)**

Field	Description
Configure selected port(s) to be long distance level	Select the long distance level to be supported for the selected ports. Three levels are available: <ul style="list-style-type: none"> <li>■ Normal (no long distance): Reconfigures port as a regular switch port. The number of buffers reserved for the port supports links up to 10 km (16 buffer credits).</li> <li>■ Medium: Level one long distance, less than or equal to 50 kilometers. A total of 27 full size frame buffers are reserved for the port.</li> <li>■ Long: Level two long distance, less than or equal to 100 kilometers. A total of 60 full size frame buffers are reserved for the port.</li> </ul>
Commit Configuration Changes	Click to apply configuration for Extended Fabric. Does not clear the values that are already committed to the switch. To set all the ports to normal you have to check all the ports, select the normal (no long distance) and then click Commit Configuration Changes.  After a commit, it is necessary to select another tab and then select the long distance tab in order to restart the Java script for that page.
Reset	Click to reset all fields to values present when Extended Fabric was launched.
Current Extended Fabric Settings	Displays current settings by port number.

## Telnet Interface

Each switch can only have one active Telnet session at a time.

**NOTE:** The Telnet Interface requires administrative privileges. Once an administrative login is entered, administrative privileges remain available from that workstation until the session is closed and the Web browser is exited.

Use these steps to access the Telnet interface.

1. Find the relevant Switch Panel and click the Telnet icon on the Switch panel.
2. If a Telnet session is already active, the following message displays.



Figure 4-39: "Telnet Session is in Use..." message

- a. If this message displays and you want to abort the active session, click Abort Session. Otherwise, click Cancel.
  - b. If there is no active session or an active session has been aborted, the Enter Network Password dialog box appears.
3. Enter your user name and password (the account must have administrative privileges).
  4. Specify whether you want the password saved (not recommended).
  5. Click OK.

The Telnet interface displays.

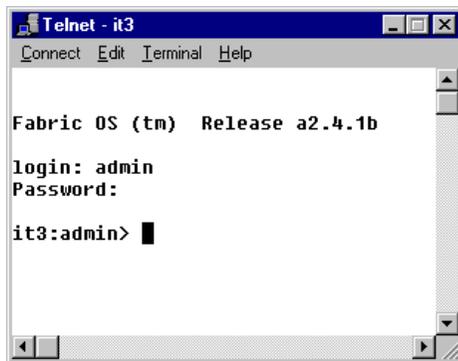


Figure 4-40: Telnet interface

# Chapter 5

## Managing the Switch Using SNMP, Telnet, or a Single Ethernet Port

This chapter covers the following topics:

- [Managing the Switch Using SNMP, page 5-2](#)
  - ❑ [SNMP Model, page 5-2](#)
  - ❑ [Management Information Base, page 5-3](#)
  - ❑ [SNMP Transports, page 5-4](#)
  - ❑ [MIB-II Support, page 5-4](#)
  - ❑ [Fabric Element MIB Support, page 5-5](#)
  - ❑ [Specific MIBs, page 5-5](#)
  - ❑ [Generic Traps, page 5-5](#)
  - ❑ [Enterprise-Specific Traps, page 5-6](#)
  - ❑ [Agent Configuration, page 5-7](#)
  - ❑ [Tools for Managing with SNMP, page 5-8](#)
- [Managing the Switch Using Telnet, page 5-10](#)
  - ❑ [Default Usernames and Security Levels, page 5-10](#)
  - ❑ [Changing Passwords, page 5-11](#)
  - ❑ [Initiating a Telnet Session, page 5-11](#)
  - ❑ [Telnet Commands, page 5-12](#)
- [Managing the Switch through a Single Ethernet Port, page 5-13](#)

- [Syslog Daemon, page 5-15](#)
  - [Introduction, page 5-15](#)
  - [Syslogd Support, page 5-15](#)
  - [Error Message Format, page 5-16](#)
  - [Message Classification, page 5-17](#)
  - [Switch Configuration, page 5-18](#)
  - [Syslogd Configuration, page 5-18](#)

## Managing the Switch Using SNMP

The switch's resident SNMP agent allows remote switch management through IP over Ethernet and Fibre Channel interfaces. This section provides an overview of the key concepts in switch management based on SNMP.

### SNMP Model

Within the SNMP model, a manageable network consists of one or more manager systems (or network management stations) and a collection of agent systems (or network elements).

- A manager system runs a management application, such as SWCC, that monitors and controls the network elements.
- An agent is a network device, such as a Fibre Channel switch, a managed hub, or a bridge, that has an agent responsible for carrying out operations requested by the manager. Therefore, an agent is the interface to a managed device.

The manager communicates with an agent by using SNMP. The switch agent supports SNMP version 1 (SNMPv1) and Community-based SNMP version 2 (SNMPv2C). SNMP allows the following management activities:

- A manager can retrieve management information from an agent. There are three operations for this activity:
  - SNMP-GET
  - SNMP-NEXT
  - SNMP-BULKGET (SNMPv2C)
- A manager can change management information on the agent. This operation is called SNMP-SET.

- An agent can send information to the manager without being explicitly polled for it. This operation is called a trap in SNMPv1 and a notification in SNMPv2C. Traps or notifications alert the manager to events that occur on the agent system.

**NOTE:** The term trap is used throughout this document.

## Management Information Base

The information on an agent is known as the Management Information Base (MIB). It is a collection of configuration and status information. A specific type or class of management information is known as a MIB object or MIB variable. For example, the MIB variable `sysDescr` describes an agent system. The existence of a particular value for a MIB object in the agent system is known as a MIB object instance, or simply an instance. Some MIB objects have only a single instance for a given agent system. For example, the system description and the instance are denoted as `sysDescr.0`. Other MIB objects have multiple instances. For example, the operational status of each Fibre Channel port on a switch and a particular instance can be denoted as `swFCPortOperStatus.5`.

MIB objects are organized in a hierarchical tree structure. Each branch in the tree has a unique name and numeric identifier. Intermediate branches of the tree serve as a way to group related MIB objects together and the leaves of the tree represent the MIB objects. Figure 4-1 illustrates the tree structure.

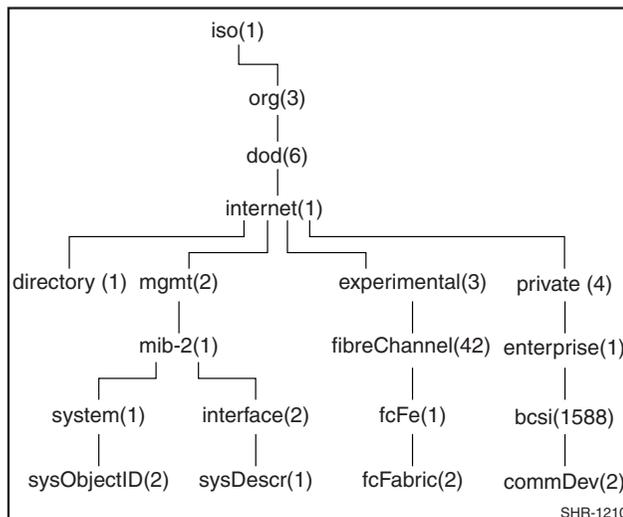


Figure 5-1: MIB tree

## 5-4 Fibre Channel SAN Switch Management Guide

A MIB object is identified by its position in the tree. A full object identifier consists of the identifier of each branch along the path through the tree. For example, the object `sysObjectID` has the full identifier of 1.3.6.1.2.1.1.2. For readability, the notation `{system 1}` can be used.

The switch's agent supports the following.

- SNMPv1 and SNMPv2c
- Command line utilities to provide access to and configuration of the agent
- MIB-II system group, interface group, and SNMP group
- Fabric element MIB
- Vendor-specific MIBs
- Standard generic traps
- Enterprise-specific traps

## SNMP Transports

The SNMP agent residing on the embedded processor supports UDP/IP over the Ethernet interface or any FC-IP interface. This transport provides an immediate plug-and-play support for the switch after the IP address has been assigned.

## MIB-II Support

Eleven groups of objects are specified in MIB-II. The SAN Switch SNMP agent supports three of these groups. The three supported groups include:

- System group (object ID is `{iso, org, dod, internet, mgmt, mib-2, 1}`)
- Interfaces group (object ID is `{iso, org, dod, internet, mgmt, mib-2, 2}`)
- SNMP group (object ID is `{iso, org, dod, internet, mgmt, mib-2, 11}`)

The following variables can be modified by using the SNMP set command, given an appropriate community with read-write access.

- `SysDescr`—The system description; the default value is set as Fibre Channel Switch.
- `SysObjectID`—The system object identifier vendor's authoritative identification (1.3.6.1.4.1.1588.2.1.1.1).
- `SysUpTime`—The time since the agent was last initialized.

- **SysContact**—The identification and contact information for this system. By default, this is set as Field Support.
- **SysLocation**—The node's physical location. The default setting is End User Premise.

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

## **Fabric Element MIB Support**

Five object groups are defined for fabric element MIB support:

- Configuration group
- Operation group
- Error group
- Accounting group
- Capability group.

The SNMP agent supports all groups.

## **Specific MIBs**

Five groups of MIBs are defined for fabric support:

- Switch System group
- Fabric group
- SNMP Agent Configuration group
- Fibre Channel Port group
- Name Server group.

## **Generic Traps**

Setting up the switch's SNMP connection to an existing managed network lets the network system administrator receive the following generic traps.

- **coldStart**—Indicates that the agent has reinitialized itself such that the agent's configuration can be altered. This also indicates that the switch has started.

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- linkDown—Indicates an IP interface (Ethernet, loopback, or embedded N\_Port) has gone down and is not available.
- linkUp—Indicates an IP interface (Ethernet, loopback, or embedded N\_Port) has become available.  
**NOTE:** The linkUp and linkDown traps are not associated with removing or adding an Ethernet cable. This is strictly a driver indication that the interface is configured, operational, and available, and does not necessarily mean that the physical network cable is affected.
- authenticationFailure—Indicates that the agent received a protocol message that is not properly authenticated. This trap is disabled by default, but it can be enabled with the command `agtcfgSet`.

### Enterprise-Specific Traps

The fabric supports four enterprise-specific traps. These include:

- swFault—Indicates that the diagnostics detected a fault in the switch.
- swSensorScn—Indicates that the operational state in an environment sensor, such as a fan, the temperature, or a power supply has changed.
- swFCPortScn—Indicates that the operational state in a Fibre Channel port has changed.  
**NOTE:** SNMP `swFCPortScn` traps are generated whenever a GBIC is inserted and removed, even though the state remains offline.
- swEventTrap—Indicates a firmware event has been written to the switch event log.

Trap parameters can be configured with the SNMPv1 SET command with an appropriate community. These parameters can also be configured through a Telnet connection with the `agtcfgSet` command.

## Agent Configuration

The agent parameters that can be configured include the following.

- SNMPv1 communities (up to six)

- Trap recipients (one per community)

**NOTE:** You must restart the switch for changes in the SNMPv1 communities or trap recipient parameters to take effect.

- sysName

- sysContact

- sysLocation

**NOTE:** The sysName, sysContact, and sysLocation parameters can be configured by the SNMPv1 SET command with an appropriate community. These parameters can also be configured using a Telnet connection and the agtcfgSet command.

- authenticationFailure

- swTrapEnable

- swEventTrapLevel

**NOTE:** The swEventTrapLevel parameter is a trap that specifies the severity level in conjunction with the security level of an event. When an event occurs, if its severity level is at or below the set value, the trap is sent to configured recipients. For example, if the trap value is set to 3 (warnings), traps will be sent for 3, 2 (errors), and 1 (criticals). By default, the event trap value is set to 3.

Possible trap values include:

0-None

1-Critical

2-Error

3-Warning

4-Informational

5-Debug

- authTrapsEnabled: (true, t, false, f) By default, the parameter is set to t.

- SNMP community and trap recipients configuration:

**NOTE:** SNMP community and trap recipients configuration parameters contain the IP address of the trap recipients that have been configured to process the traps. The SWCC Agent will write this address during setup.

Agent parameters can be changed through SNMP or through Telnet with the `agtcfgSet` command.

**NOTE:** Changes to SNMP parameters are not displayed in SNMP until the switch is restarted. This is because SNMP runs from cache while the active settings run from the flash ROM.

## Tools for Managing with SNMP

The SWCC software provides an easy way to set up and manage the switch. The SNMP MIBs are integrated into the SWCC software. Refer to the *Compaq StorageWorks Command Console (SWCC) for Hubs, Switches, and Tape Controllers* documentation included on the software CD for more information.

You can set up trap definitions with a number of tools, including SWCC, Compaq Insight Manager, HP OpenView, and others. To use a tool other than the SWCC, refer to the documentation provided with the tool.

### CNMS SNMP Setup

Complete the following steps to incorporate the Fibre Channel standard MIB and the Compaq-specific MIB into an SNMP management station:

1. Install Compaq Network Management System (CNMS) on your computer.
2. Log in to your computer.
3. Double-click the CNMS icon.

When the User Settings wizard displays:

1. Choose Normal and click Next.
2. Choose Default Polling and click Next.
3. Change the default (write) community string to private and click Next.
4. Leave the email choices at their default values and click Next.
5. Leave the Web choices at their default values and click Next.
6. Leave the wizard choices at their default values and click Next.
7. Choose Yes for `manageable devices automatically discovered` and click Next.
8. Enter the gateway router IP address (provided by your network administrator).
9. Leave the other `community strings for read` at their default values and click Next.

10. Leave the `automatic layout settings` at their default values and click Next.
11. At the next window, click `Begin Discovery Now`. This completes the User Settings wizard entries.

To configure the agent for the switch:

1. Go to the Tools pull-down menu and click `Create Custom Device`. You will be prompted for a Device Type Name.
2. Enter a name, such as “FC Switch,” and click Next. You will be prompted for an icon.
3. Click `none selected`, choose an icon, and click Next.
4. Skip the batch file prompt. You will be prompted for the type of MIB this device supports.
5. From the list, select `RFC1213-MIB` and click Next.
6. The next window asks for the SysObject ID. This is the string of numbers that defines the object ID for SNMP. Enter `1.3.6.1.4.1.1588.2.1.1.1` and click Next.
7. The next window prompts for a Physical Port. Enter a name for the Ethernet port, such as “Ethernet Mgmt Port.” Click `Add Port` and choose Ethernet as the protocol.
8. At the next window, click `Finish`. A message displays stating that you successfully created a custom device type.
9. Exit the program and restart Compaq CNMS for the device type to take effect.
10. When the program starts, the User Settings wizard displays. Click `Cancel`. The FC Switch icon displays in the networking devices area. This is the custom device type you created.
11. Drag the icon with your mouse and drop it into the window labeled `Main`. A picture of the FC Switch displays in the `Main` window.
12. A description of the switch displays. Enter a name and the IP address for your switch. Click `OK`.
13. Place the cursor on the switch and click the right mouse button. From the menu, choose `SNMP Statistics`, then `System Information`.
14. A new window displays the information about the switch as configured through the Telnet command `agtCfgSet`. The values that display are the default settings. Change them if necessary. After you change the values, verify they are set on the switch through Telnet using the `agtCfgShow` command or through SNMP.
15. Go back to the `SNMP Statistics` window and choose `Protocols` for a list of supported protocols.
16. Go back to `SNMP Statistics` and choose `MIB Browser`. A window displays with three items in a tree. Choose `Parse MIBS`.
17. Click `OK`, then choose `Browse MIB` to parse from the next window.

18. Choose *sw.mib* to compile the MIB. Exit the Parse MIB window, then exit the MIB Browser window.

**NOTE:** `swTrapEnable` must be set to 1 and `swEventTrap` level must be set correctly.

### Version 2.4.1 Firmware Includes Improved API

This firmware version supports a new Applications Programming Interface (API) that allows management programs to manage the switch using:

- XML headers or definitions utilizing TCP/IP.
- Fabric Access, providing a critical set of functions required by applications to integrate within SAN environments. These functions include:
  - ❑ Discovery—Applications can quickly discover the fabric topology (switches, ports, and routes) and devices within the SAN.
  - ❑ Zoning—Fabric Access provides full access to Comapq zone management facilities. A transaction model with rollback manages multi-application access to safeguard against concurrent access.
  - ❑ Switch and Port Management—Fabric Access provides application control of individual switches and ports. Applications have access to Switch, Ports, Port Statistics (PortStats), and Port Errors (PortErrors) objects for in-depth information of critical SAN information.
  - ❑ Device Management—Fabric Access provides access to Node and Device Objects that provide information about the end-points within the SAN.
  - ❑ Route Management—Fabric Access provides access to route control information to assist users in discovering and managing routes within the fabric.

## Managing the Switch Using Telnet

To make a successful Telnet connection to a switch, you need the switch name or IP address, a username, a password, and an Ethernet connection.

**NOTE:** The switch must have an IP address. To assign an IP address, refer to the installation and hardware guide that came with your switch.

### Default Usernames and Security Levels

Each username has an associated security level, with username 3 having the least number of privileges and username 1 having the most (see [Table 5-1](#)).

**Table 5-1: Default Usernames**

Default Username	Description
User (username 3)	Gives users access to commands that do not change a switch state. This level is recommended for monitoring switch activity.
Admin (username 2)	Gives users access to all commands in the Help menu. Most switch administration is performed at this level.
Root (username 1)	Gives users access to an extensive command set that can significantly alter system performance. Root commands are beyond the scope of this manual. Consult Compaq customer service before using root commands.

The system administrator can assign user names other than those listed; however, users at the same security level have the same privileges regardless of the user name assigned.



**CAUTION:** Limit root access to users responsible for maintaining and modifying the fabric. Commands available to a root user, if used inappropriately, can cause the switch to stop functioning or to function abnormally. Root commands should only be used at the request of Compaq customer service.

## Changing Passwords

The initial default password for all usernames is password. Use these steps to change user passwords.

1. Log in as admin.
2. Issue the Telnet command passwd.

Each username (admin and user) is displayed in sequence, letting you modify each password and name.

3. To replace the existing password, enter a new password or name.

## Initiating a Telnet Session

Initiate a Telnet session between a workstation and a switch, through an Ethernet connection, by establishing a network connection between the host system and the switch's Ethernet RJ-45 connector.

Use these steps to initiate a Telnet session.

1. Launch Telnet from a workstation connected to the network.  
**NOTE:** For Windows 95/Windows 98/ Windows NT, select Run from the Start menu. Type Telnet, then click OK.
2. From Telnet, connect to the switch using the switch's IP address.  
**NOTE:** For Windows 95/Windows 98/Windows 2000/Windows NT, select Remote System from the Connect menu on the Telnet window. Enter the IP address of the switch in the Host Name box.
3. Press Enter to display the login prompt. At the prompt, enter admin.
4. At the password prompt, enter the password.
5. When the prompt switchName:userName> displays, enter a Telnet command.

## Telnet Commands

Information and examples on managing and monitoring the switch through Telnet are provided in [Appendix A](#) of this guide. The following command types are covered:

- [QuickLoop-Specific Telnet Commands, page A-2](#)
  - [QuickLoop Management Commands, page A-2](#)
  - [QuickLoop Zoning Commands, page A-8](#)
  - [QuickLoop Fabric Assist Mode Commands, page A-11](#)
- [Fabric Operating System and QuickLoop Telnet Commands, page A-17](#)
  - [General Commands, page A-17](#)
  - [Diagnostic Commands, page A-93](#)
  - [Routing Commands, page A-112](#)
  - [License Commands, page A-129](#)
- [Zone-Specific Telnet Commands, page A-130](#)
  - [Zone Alias Commands, page A-131](#)
  - [Zone Configuration Commands, page A-133](#)
  - [Zone Commands, page A-136](#)
  - [Configuration Management Commands, page A-139](#)
  - [QuickLoop Zoning Commands, page A-140](#)
- [Fabric Watch Telnet Commands, page A-140](#)
- [Management Server Telnet Commands, page A-146](#)
- [Grouping Telnet Commands, page A-151](#)

## Managing the Switch through a Single Ethernet Port

Multiple StorageWorks Fibre Channel switches can be managed through a single IP connection to one of the switches using Telnet services, Web Management Tools, or SNMP commands. Each switch supports a 10BaseT or 10/100BaseT Ethernet connection, which is the general link for IP services. A second IP connection, the Fibre Channel IP or in-band support, is also available for managing a switch.

Most host bus adapters are not set up to initiate an in-band Fibre Channel IP connection. At least one switch must have an Ethernet connection. From that entry point you can manage the remaining switches in the fabric using in-band IP services. The management workstation runs a Web browser, a Telnet session, or SNMP to address the switch that has an Ethernet connection. Therefore, the management workstation and the Ethernet IP address of the switch must be in the same subnet. In addition, the management station must have either a static route to the Fibre Channel IP subnet, or the switch must be the default gateway for the management workstation. This allows the management station to direct IP to or through the switch.

### Requirements

The switches not connected to the Ethernet connection must have:

- The same default gateway value as the switch that is connected to the Ethernet connection.
- FC IP addresses in a different subnet from the Ethernet IP addresses of the management station.
- FC IP addresses in the same subnet as the FC IP address of the switch that is connected to the Ethernet connection.

Following is an example and description of managing the Fabric through a single Ethernet port (see [Figure 5-2](#)).

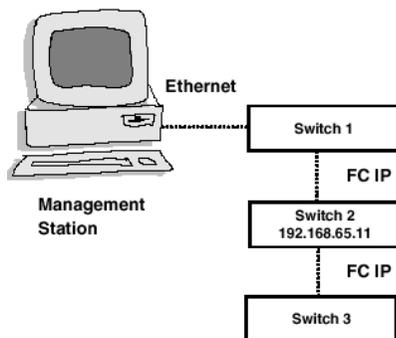


Figure 5-2: Single-port management of switches

To access switch 2 from a browser on the management station, you must enter:  
<http://192.168.65.11>.

The management station detects that the address is not on the same subnet as the management station so it forwards it to its gateway address (IP address of switch 1). Switch 1 forwards it to switch 2 over the Fibre Channel.

In the opposite direction, switch 2 detects that the address where the web pages are to be sent are not on the same subnet as switch 2 so it sends the pages to its gateway address, FC IP address of switch 1 which forwards them to the management station.

**Table 5-2: Example IP Address Settings**

	Management Station	Switch 1	Switch 2	Switch 3
Ethernet IP Address	192.168.1.09	192.168.1.10	204.1.1.11 Not Connected	204.1.1.12 Not Connected
FC IP Address	192.168.65.09	192.168.65.10	192.168.65.11	192.168.65.12
Default Gateway	192.168.1.10	any	192.168.65.10	192.168.65.10

## Syslog Daemon

A UNIX-style syslog daemon (syslogd) reads system events, forwards system messages to users, and writes the events to log files according to the system configuration.

### Introduction

Syslogd categorizes events by facility and severity. Refer to the manual pages on your UNIX system for a list of facilities and severity levels.

The log process documents errors and system events on the local machine and sends the information to a user or system administrator. The daemon is constantly running and ready to receive messages from system processes. The events are logged according to the statements in the configuration file.

In addition, syslogd can receive messages from a remote machine. Syslogd listens to UDP port 514 for system events. A remote machine does not have to be running UNIX to forward messages to syslogd, but it must follow the basic syslog message format standard.

An example entry in a syslogd log file is:

```
Jul 18 12:48:00 sendmail[9558]: NOQUEUE: SYSERR(uucp):  
/etc/mail/sendmail.cf: line 0: cannot open: No such file or directory
```

The first two items are the event's date and time (as known by the machine on which syslogd is running) and the name of the machine that issued the error. This would be the local machine if the message is generated by a task running on the same machine as syslogd, or a remote machine if the message was received on UDP port 514. The first two items are always present while other entries are message-specific.

**NOTE:** The log file can be located on a different machine and remotely mounted. A local error is an error that occurs where syslogd is running, not on the machine where the error log physically resides.

Syslogd applications for Windows NT and Windows 95 are available at no charge on several FTP servers on the Internet.

### Syslogd Support

Switch firmware maintains an internal log of all error messages. The log is implemented as a circular buffer with a storage capability of 30 errors. After 30 errors have been logged, the next error message overwrites the oldest message at the beginning of the buffer.

The switch can be configured to send internal error messages to syslog by sending a UDP packet to port 514 on the syslogd machine. This allows storage of switch errors on a syslogd-capable machine and avoids the limitations of the circular buffer.

Syslogd provides system error support by means of a single log file and can notify a system administrator in real time of error events. The daemon also provides dial home capability.

## **Error Message Format**

Each logged error message sends the following information.

- Error number (1 for the first error after start, increased by increments of one with each new error)
- The error message, exactly as it is stored in the error log (and printed by the `errShow` command)

The error number helps identify the error and determine when a switch restarted. For example, if a log of error number N from the switch is followed by a log of error number 0, then the switch restarted between the two errors.

The error message includes the switch that reported the error and the following event information:

- ID of the task that generated the error
- Name of the task that generated the error
- Date and time when the error occurred, as seen by the switch. This can be different from the first item in the log file, which is the time of the error as seen by the syslogd machine. These two time values are different if the clocks in the switch and in the syslogd machine are not synchronized.
- Error identifier consisting of a module name, a dash, and an error name
- Error severity
- Optional informational part
- Optional stack trace

Example:

Syslogd running on switch sw9 is sending log events to the UNIX machine called example. The following is an example of a no memory error generated by the shell. This is a severity 1 (LOG\_CRITICAL) error. Syslogd is configured to store the errors in the `/var/adm/silkworm` file similar to the following.

```
example% egrep sw9 /var/adm/silkworm
Jul 11 16:48:25 sw9 1 0x103d8620 (tShell): Jul 11 16:48:19
    Jul 11 16:48:25 sw9Error SYS-NOMEM, 1, No memory
    Jul 11 16:48:25 sw9 Traceback:
    Jul 11 16:48:25 sw9 _tl+0x40 (0x103a2030)
    Jul 11 16:48:25 sw9 _yystart+0x95c (0x1017128c)
    Jul 11 16:48:25 sw9 _yyparse+0x694 (0x10172dc4)
    Jul 11 16:48:25 sw9 _execute+0xdc (0x1014c06c)
    Jul 11 16:48:25 sw9 _shellTask+0x964 (0x1003aea4)
    Jul 11 16:48:25 sw9 _shellTask+0x198 (0x1003a6d8)
    Jul 11 16:48:25 sw9 _vxTaskEntry+0x10 (0x10114d14)
    Jul 11 16:48:25 sw9
```

## Message Classification

Syslogd messages are classified according to facility and priority (severity code), which lets a system administrator take different actions for different errors. The action taken, based on the message's facility and priority, is defined in the syslog configuration file. Example configurations are provided in a following section.

The switch uses the facility local7 for all error messages sent to the syslogd.

UNIX provides eight priorities and the switch provides four severity codes [code LOG\_PANIC (0) causes a restart and is not sent to the syslogd]. The mapping between the switch's severity codes and UNIX syslogd priorities is provided in the following table.

**Table 5-3: Syslog Message Classification**

Switch	UNIX
LOG_CRITICAL (1)	Alert
LOG_ERROR (2)	Err
LOG_WARNING (3)	Warning
LOG_DEBUG (4)	Debug

## Switch Configuration

To start the syslogd, type the following command:

```
syslogdip <IP address of the syslogd machine>
```

The syslogdip command with no parameter prints the IP address of the current target syslogd machine. An IP address of 0.0.0.0 disables the forwarding of error messages to syslogd. In this case, error messages are logged internally to the switch, but the messages are not forwarded to the syslogd. See [Figure 5-3](#) for syslog examples.

<p>Enable and verify syslogd support:</p> <pre>syslogdip "10.0.0.1" syslogdip syslog daemon's address: 10.0.0.1</pre> <p>Disable syslogd support:</p> <pre>syslogdip "0.0.0.0" syslogdip syslog daemon's address: 0.0.0.0</pre>
---

Figure 5-3: sysLog examples

## Syslogd Configuration

The syslog configuration provides the syslogd with instructions for handling different messages. The following are example entries in a syslog configuration file (*/etc/syslog.conf*) that show the switch error messages that are stored in different files. Refer to the syslog manual pages on your UNIX system for the full documentation of the

syslog configuration file. The following entry in */etc/syslog.conf* causes all messages from the switch that have a priority warning or higher (switch severity LOG\_WARNING or higher) to be stored in the file */var/adm/silkworm*.

```
local7.warning /var/adm/silkworm
```

The following entries in the */etc/syslog.conf* cause the messages from the switch that have priority alert (switch severity LOG\_CRITICAL) to be stored in the file */var/adm/alert*, and all other messages from the switch to be stored in the file */var/adm/silkworm*.

```
local7.alert /var/adm/alert  
local7.debug /var/adm/silkworm
```

The *local7* prefix identifies the switch the message is from. A file must exist and have the proper permission in order for the syslogd to write to it.



# Chapter 6

## Overview of the Fabric Operating System and QuickLoop

This chapter covers the following topics.

- [Overview of the Fabric Operating System, page 6-1](#)
- [Overview of SAN Switch QuickLoop, page 6-3](#)
- [Using QuickLoop, page 6-6](#)
- [QuickLoop Zoning, page 6-24](#)
- [Using QuickLoop Fabric Assist Mode, page 6-31.](#)

### Overview of the Fabric Operating System

The Fabric Operating System provides a set of services for managing data traffic among SAN devices. The Fabric Operating System includes a complete set of standard Fibre Channel services for fabric and Fibre Channel Arbitrated Loop (FC-AL) management. Sophisticated routing protocols enable you to construct fabrics interconnecting thousands of devices and management services.

The Fabric Operating System lets you:

- Discover the set of connected devices.
- Determine the available data paths through the switches.
- Configure the fabric automatically.
- Configure and manage fabric-wide services such as the Simple Name Service, Alias Service, and Zoning.
- Manage the switch remotely using Telnet, SNMP, or Web Management Tools.

## Fabric OS Features

Table 6-1 describes the software features of the Fabric Operating System.

<b>Table 6-1: Fabric Operating System Features</b>	
<b>Feature</b>	<b>Description</b>
Login (FC)	Explicit fabric login is supported (public and private).
Probing	Devices are automatically discovered and registered with the fabric Simple Name Service (SNS). Translation mode is set so private devices can communicate with other fabric attached devices.
Zoning	Zoning is a fabric management service used to create logical device subsets within a SAN, which enables resource partitioning for management and access control.
Buffer-to-buffer credit	The buffer-to-buffer credit for each F_Port can be up to 27 credits.
Time out values	Time out values are adjustable in one-second increments through Telnet. Time out values include R_A_TOVs (Resource Allocation Time Out Values) and E_D_TOVs (Error Detect Time Out Values).
Fabric name	Fabric names are automatically or manually assigned for a multi-switch configuration.
Frame delivery	Frames are delivered through the destination F_Port in the same order received by the source F_Port. The in-order frame delivery is maintained within a fabric of multiple interconnected switches.
Address assignment	The switch follows the addressing hierarchy defined in the Fibre Channel Standard. The switch port address identifiers are selected using an automatic address assignment protocol. All ports within the switching fabric (F_Ports, FL_Ports and E_Ports) are assigned address identifiers. Each switch maintains its own address pool. The designated address managers within the fabric manage the address identifiers and assign the address pool to the individual switches.
Broadcast and multicast	The system supports up to 256 multicast groups, plus one for broadcast. Any port can be a member of multiple groups. In addition to the unicast routing table, each port has its own multicast routing table. The Alias Server is responsible for setting up and removing multicast groups.
Frame routing	The system supports self-routing of frames between the communicating ports. The path selection in a multiswitch configuration is based on a self-routing protocol.

**Table 6-1: Fabric Operating System Features (Continued)**

Feature	Description
Management	The Fibre Channel SAN Switches can also be managed using SNMP, Web Management Tools, Telnet, and API. (Also, the Compaq StorageWorks Fibre Channel SAN Switch 16 can be managed from the front panel controls). The last three management methods are accessible through the Internet Protocol (IP) over the RJ-45 100BaseT Ethernet port or any Fibre Channel port. You can use any SNMP-based management product, including Compaq SWCC, to access the SNMP agent. You can use any supported Web browser to use Web Management Tools.
Name Server	The Name Server function is based on the Simple Name Server model defined in the Fibre Channel Standard. The Name Server provides a means to determine which N_Ports are allowed to communicate with each other. This function is provided by the embedded N_Port with the alias address FFFFCh to register address mapping between the Nx_Port 24-bit Fibre Channel physical address (Nx_Port identifier) and the logical addresses such as World Wide Names (WWNs), IP addresses, FC-4 device types, and Initial Process Associators. The Name Server also provides deregistration and query functions from other nodes or Nx_Ports for logical address translations to the corresponding Nx_Port identifiers.
Alias Server	The Alias Server is based on the Fibre Channel Standard. The function is provided by the embedded N_Port with the alias address FFFF8h. The server manages multicast groups.

## Overview of SAN Switch QuickLoop

SAN Switch QuickLoop is a unique Fibre Channel topology that combines the services of fabric and Fibre Channel Arbitrated Loop (FC-AL) management. QuickLoop allows hosts with non-fabric-aware drivers to perform I/O operations with storage devices within a loop. Without modifying their drivers, private storage devices on the arbitrated loops can be accessed by public or private hosts elsewhere on the fabric. QuickLoop, combined with Zoning, allows a private host to fully participate in a SAN.

**NOTE:** An arbitrated loop supports communication between devices that are not fabric-aware. Such devices are called private devices, and arbitrated loops are sometimes called private loops.

QuickLoop is a logical Private Loop Fabric Attach (PLFA) consisting of multiple private arbitrated looplets (a set of devices connected to a single port) interconnected by a fabric. Although NL\_Port devices are attached to different arbitrated looplets, the fabric and the physical device locations are transparent. All NL\_Ports share one arbitrated loop physical address (AL\_PA) space and operate in accordance with the FC-AL. This allows private devices to communicate with other devices over the fabric, provided they are in the same QuickLoop.

QuickLoop allows you to use switches instead of hubs in environments where all attached devices are private. No fabric login (FLOGI) is required from these devices. Host drivers that have Private Loop Direct Attach (PLDA) capability do not need to be modified to perform I/O operations with storage devices in QuickLoop.

A particular QuickLoop can be configured to consist of selected devices or looplets connected to the ports of one switch, or to a cascaded switch pair.

QuickLoop allows a logical loop of up to two switches. The loop can include all or a subset of the U\_Ports in a switch. QuickLoop can be part of a large fabric, and multiple QuickLoops (either single-switch or dual-switch) can coexist in a single fabric.

QuickLoop makes the fabric and the physical connectivity transparent to the NL\_Ports by allowing them to communicate with one another using AL\_PAs for device addressing. The NL\_Ports operate in the same manner as in a PLDA environment. QuickLoop creates a single logical loop that provides a reliable connection between private hosts and storage devices connected to multiple U\_Ports (looplets). Loop initializations are propagated to all looplets while detected faults are isolated to a local looplet.

**NOTE:** QuickLoop is not available on the Compaq StorageWorks Fibre Channel SAN Switch 8-EL and 16-EL models.

## **QuickLoop Benefits**

QuickLoop provides a migration path from a single private loop to a fully scalable fabric for constructing SANs. QuickLoop-enabled switches can replace hubs when a SAN is first deployed. When Nx\_Port devices become fabric capable, you can upgrade the SAN to mix QuickLoop and fabric, and continue to expand toward a full fabric.

As an alternative to using Fibre Channel hubs, QuickLoop offers many advantages due to the blending of private arbitrated loops and a fabric. These advantages include:

- More aggregated bandwidth—Each looplet has its own dedicated bandwidth.
- Higher performance—Loop tenancies can occur in parallel in different looplets.
- Better fault isolation—A looplet, containing a faulty device, is localized.

## QuickLoop Features

The SAN Switch QuickLoop features are listed next.

- Consists of any set of ports from any two switches in a fabric.
- Supports a dual-switch configuration for two switches.
- Supports up to 126 devices per QuickLoop.
- Conforms to Fibre Channel standards.
- Combines up to 32 ports (Compaq StorageWorks Fibre Channel SAN Switch 16) or 16 ports (Compaq StorageWorks Fibre Channel SAN Switch 8).

**NOTE:** Each loop attached to a port is referred to as a looplet.

Additional features include:

- Each looplet supports transfer rates of 100 MB/s. Multiple devices can communicate simultaneously in different looplets.
- A fabric can have several QuickLoops, but a switch can only be in one QuickLoop.
- Devices on the QuickLoop are logically attached to the fabric. The first 32 devices are entered into the Name Service and the device address is translated from a 24-bit fabric address to an 8-bit private address.
- Public hosts that support an arbitrated loop attached to QuickLoop ports are treated as private devices.
- Hosts attached to QuickLoop can communicate to all devices attached to QuickLoop.
- Other public hosts connected to the fabric through non-QuickLoop ports can communicate with devices attached to QuickLoop by using single translatable mode.

- Individual looplets can be taken out of service manually or automatically if a looplet error is detected. The looplet is reinstated when the error condition is cleared.
- Individual QuickLoop ports can be converted to Fabric Loop Attach (FLA) compliant FL\_Ports by disabling QuickLoop mode on that port.
- Web Management Tools or a Telnet interface can be used for QuickLoop port management.

## About QuickLoop Fabric Assist Mode

Fabric Assist mode allows the configuration of a virtual private loop in which a private host can see and access public or private targets anywhere on the fabric. Such a private loop is called a QuickLoop Fabric Assist mode zone.

---

**IMPORTANT:** You must obtain a QuickLoop license in order to use the Fabric Assist feature.

---

Fabric Assist mode enables private hosts to access public or private targets anywhere on the fabric, provided they are configured in the same Fabric Assist zone. A public target accessed by a private host remains public, with full fabric functionality.

Fabric Assist mode requires that all switches in the fabric be updated to firmware version 2.4.x or later.

For more information, see [Using QuickLoop Fabric Assist Mode, page 6-31](#).

## Using QuickLoop

You can enable or disable QuickLoop for either the entire switch or for particular ports. When QuickLoop is disabled on a particular port, that port returns to Fabric mode. When QuickLoop is enabled on a port, the port is added to the same QuickLoop to which the switch belongs.

A QuickLoop can be either single switch, where all looplets are located on a single switch, or a dual switch, where looplets are located on either of two cascaded switches. However, each switch can be in only one QuickLoop. A QuickLoop can include all or some of the ports on a switch or cascaded switch pair, and can contain up to 29 private hosts.

Any switch can be configured to operate in any of the modes described in [Table 6-2](#).

**Table 6-2: Switch Operating Modes**

Operating Mode	Description
QuickLoop mode	All ports on the switch, except for E_Ports, are enabled for QuickLoop and participate in a logical Private Loop Direct Attach (PLDA). Upon request, this can be set as the manufacturing default. This mode can also be set by the Telnet command qlEnable.
Fabric mode	No ports are QuickLoop-enabled (none participate in any logical PLDAs), and all operate as Fibre Channel Fabric Loop Attachment (FC-FLA) compliant devices. This mode can be set by the Telnet command qlDisable. Fabric Assist mode may be enabled via Fabric Assist mode zoning on switches operating in Fabric mode.
Mixed mode	Each port is set to QuickLoop on an individual basis. The port's operating mode can be reset during operation. Ports set to QuickLoop become looplets of the QuickLoop to which the switch belongs. Particular ports can be taken in and out of the QuickLoop by the Telnet commands qlPortDisable and qlPortEnable. These modes cannot be configured by SNMP.

A switch has a default mode, which depends on the switch model. When powered up, all the ports of the switch will be set to the default mode.

The next section provides the following information:

- [Administering QuickLoop, page 6-8](#)
- [QuickLoop Topology, page 6-12](#)
- [QuickLoop Implementation, page 6-13](#)
- [Dual-switch QuickLoop, page 6-15](#)
- [Address Translation, page 6-17](#)
- [Operation Modes, page 6-17](#)
- [Configurations, page 6-18](#)
- [Fault Isolation, page 6-23](#)
- [Recovery, page 6-24](#)

## Administering QuickLoop

You can manage quickloops through:

- [Web Management Tools, page 6-8](#)
- [Telnet Commands, page 6-12.](#)

### Web Management Tools

View and modify the Fabric Manager settings through the Fabric Manager Admin tab on the Switch Admin interface view available through Web Management Tools.

1. From Fabric View, click the switch icon for the switch you want to modify.
2. Click the Admin icon.
3. Select the QuickLoop Admin tab (see [Figure 6-1](#)).

**NOTE:** If the Quickloop license is installed the QuickLoop Admin tab will show up on the Switch Admin window (see [Figure 6-1](#)).

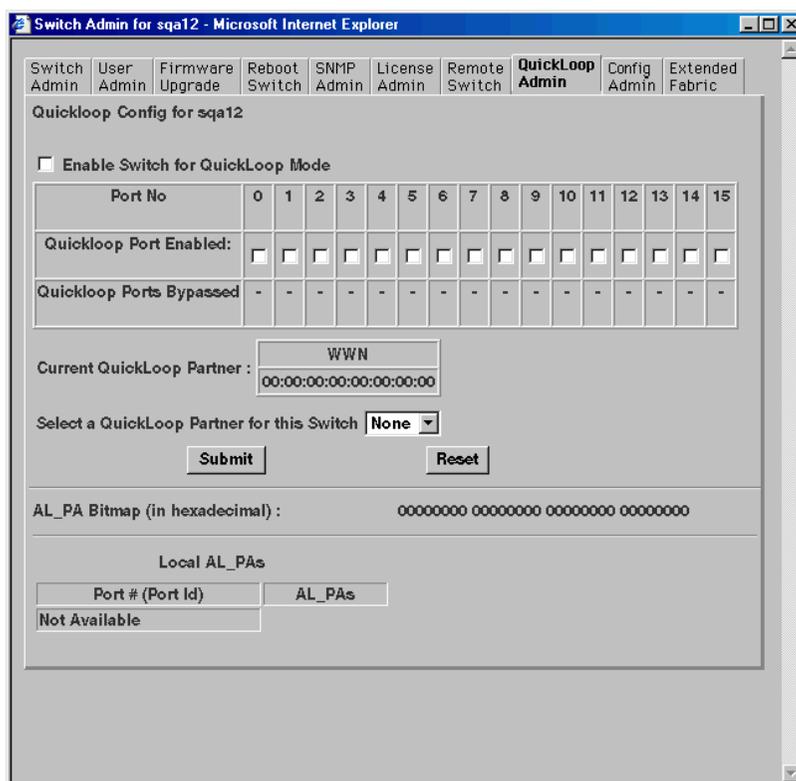


Figure 6-1: QuickLoop Admin tab in Web Management Tools

To configure QuickLoop and Fabric Assist mode from Web Management Tools, first click on the Zone Admin button in Fabric View (see [Figure 6-2](#)).

## 6-10 Fibre Channel SAN Switch Management Guide

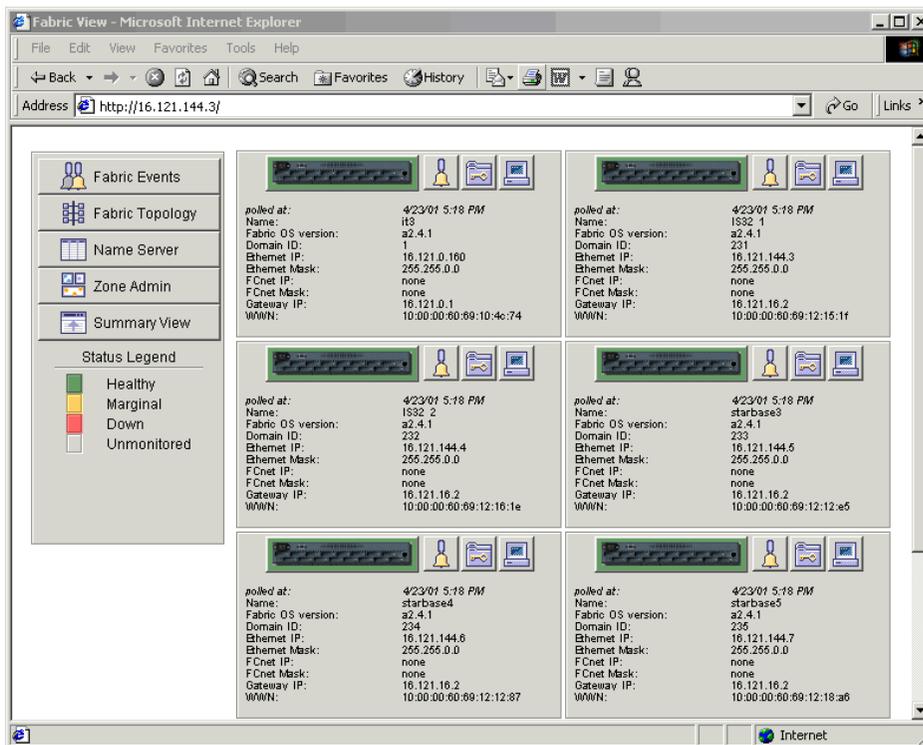


Figure 6-2: Zone Administration button

To view and modify QuickLoop and Fabric Assist modes, use the QuickLoop and Fabric Assist tabs in Zone Administration view. See [Figure 6-3](#) and [Figure 6-4](#).

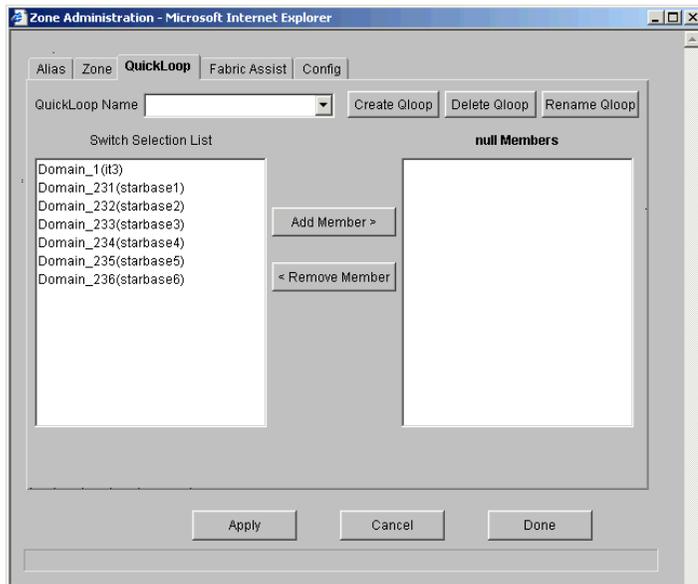


Figure 6-3: QuickLoop tab in Zone Administration view

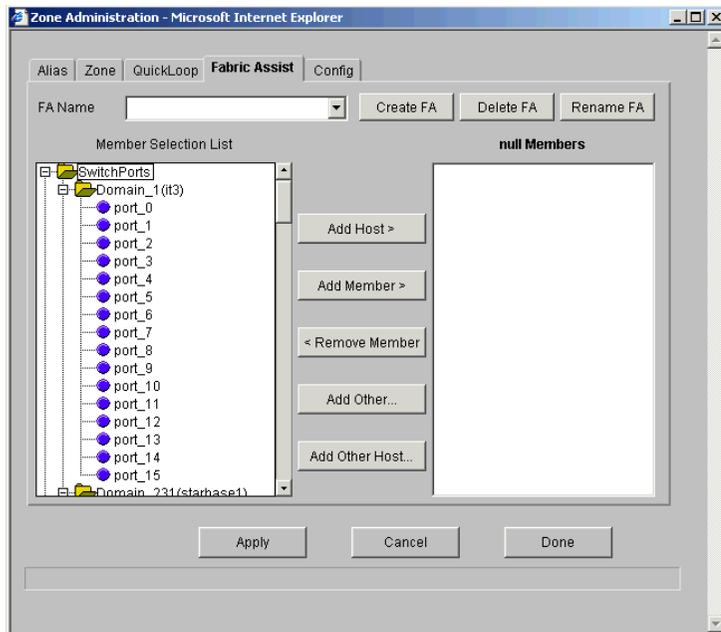


Figure 6-4: Fabric Assist tab in Zone Administration view

## Telnet Commands

To use QuickLoop or Fabric Assist mode Telnet commands, log in to the relevant switch with administrative privileges, enter the command along with any required operands, and press the **Enter** key.

For a description of all the telnet commands provided for managing QuickLoop and Fabric Assist, see [Telnet Commands, Appendix A](#).

## QuickLoop Topology

QuickLoop topology characteristics are listed next.

- A QuickLoop can include up to two switches and can support up to 126 devices.
- Each particular switch can only be included in one QuickLoop.
- A QuickLoop can include either all of, or a subset of, the ports on a particular switch.
- Multiple QuickLoops can exist in a fabric of multiple switches.
- Switches with QuickLoops enabled can exist in the same fabric as non-QuickLoop-enabled switches.
- A device attached to a QuickLoop can communicate with all other devices attached to the same QuickLoop.
- A private device in a QuickLoop can only communicate with devices in the same QuickLoop. Existing PLDA capable host drivers need no modification to perform I/O operations with storage devices.
- Public devices that are arbitrated loop capable are treated as private devices when connected to QuickLoop ports (their fabric login, or “FLOGI,” is rejected).
- Legacy devices may be used in a QuickLoop and may be attached to a fabric and operate as if in a PLDA environment.
- QuickLoop functionality can be enabled or disabled for either the entire switch or for particular ports. When QuickLoop is disabled on a particular port, that port returns to Fabric mode.
- Each looplet in a QuickLoop has its own unshared bandwidth and can support transfer rates up to 100 MB/sec.
- Multiple devices can communicate simultaneously and at full bandwidth within multiple looplets located in the same QuickLoop.
- If a looplet error is detected, QuickLoop automatically takes the looplet out of service. When the error condition is cleared, the looplet is automatically reinstated.

## QuickLoop Implementation

QuickLoop is implemented by a combination of hardware and software components, and requires no actions on the part of the user once it is installed and configured. The hardware components are responsible for the transport of frames among looplets and across switches, and the software components are responsible for QuickLoop initialization and error handling.

### Terminology

The terms and concepts introduced in this section are fundamental to understanding the use of QuickLoop and Fabric Assist mode with Compaq StorageWorks Fibre Channel SAN switches.

The two port types described in [Table 6-3](#) are found on host or storage devices, not on switches.

**Table 6-3: Host or Storage Device Port Types**

Port Type	Description
N_port	A Node port is an equipment port that is not loop capable. Used to connect the equipment to the fabric.
NL_port	An equipment port that is loop capable. Used to connect an equipment port to the fabric in a loop configuration through the FL_Port on a switch.

There are varying numbers of physical ports on different models of Compaq StorageWorks Fibre Channel SAN switches. Certain models constrain the type of port supported by the switch. Each port can be independently configured as one of the port types described in [Table 6-4](#).

**Table 6-4: Switch Port Configuration Capabilities**

Port Type	Description
F_port	A fabric port that is not loop capable. Able to transmit under fabric protocol, and interface over links. N_Ports on equipment connect to F_Ports on switches.

**Table 6-4: Switch Port Configuration Capabilities (Continued)**

Port Type	Description
FL_port	A fabric port on a switch that is loop capable. Used to connect loop capable NL_Ports to the switch in a loop configuration.
E_port	Expansion port. A port is designated an E_Port when it is used as an interswitch expansion port to connect to the E_Port of another switch, to build a larger switch fabric, or to build a two-switch QuickLoop configuration.

Sometimes, a single device is attached to a port. In this case the port would function as an F\_port. The attached device possesses either an N\_port (if the device is fabric-capable) or an NL\_port, in which case the device would be connected to the fabric in a loop configuration through an FL\_Port on a switch. In this latter case a looplet is created.

**NOTE:** A looplet is a set of devices connected in a loop to a port that is itself a member of an arbitrated loop. By contrast, a single device rather than a loop might be connected to a port.

Each device in a private loop must have a unique physical address. The devices in a QuickLoop are assigned a unique AL\_PA.

**NOTE:** Phantom devices are not physically located in a looplet, but are addressable by a local device in the looplet. An AL\_PA is a one byte value used to identify a device in an arbitrated loop.

During the operation of Fibre Channel SAN switches in a QuickLoop, primitives are transmitted by devices as they come online. These primitives, called LIPs, are in addition to normal data traffic. It is desirable to keep “LIPing” to the minimum possible traffic volume.

---

**IMPORTANT:** Compaq does not recommend continuing LIP a loop because loop devices cannot communicate to other devices while initializing.

---

## Dual-switch QuickLoop

In a dual-switch QuickLoop, the initialization process is driven by one of the switches, called the QuickLoop master. The role of the QuickLoop master is dynamically assigned at each instance of QuickLoop initialization, according to the following criteria:

- If one switch receives LIPs from its looplets and the other does not, the switch that receives the LIPs is the QuickLoop master.
- If both switches receive LIPs from their respective looplets, the switch with the lower domain ID is the QuickLoop master.

### Initialization

QuickLoop initialization is an automatic two-pass process that includes.

- Sequential looplet initialization, where each device in a looplet obtains a unique AL\_PA.
- Full QuickLoop initialization, which brings QuickLoop up to operation.

### *Sequential Looplet Initialization*

Each QuickLoop device obtains a unique AL\_PA in a single AL\_PA space. Only looplets from which LIPs are received are initialized using the loop initialization procedure described in FC-AL. AL\_PAs of devices in looplets from which no LIPs are received are preserved during the initialization. The sequential looplet initialization involves:

- Propagating LIPs to all looplets and forcing them into the OPEN-INIT state.
- Collecting an AL\_PA bitmap super set that includes all AL\_PAs in looplets from which no LIPs are received.
- Initializing the loop as described in FC-AL and using the AL\_PA bitmap super set to initialize a looplet from which LIPs are received.
- Adding the AL\_PAs of the newly initialized looplet to the AL\_PA bitmap super set. If the newly initialized looplet has a hard-assigned AL\_PA in conflict with a soft-assigned AL\_PA of another looplet, the soft-assigned AL\_PA is reinitialized.

### *Full Initialization*

Full initialization sets up QuickLoop as a single logical PLDA. This process makes all assigned AL\_PAs addressable by any device in a looplet regardless of whether the destination device and the source device are in the same physical looplet.

If the destination device is not in the same physical looplet as the source device, the hidden FL\_Port in the source device looplet acts on behalf of the destination device. The hidden FL\_Port in the destination device looplet acts on behalf of the source device while the fabric provides the transport service. Devices that are not physically located in a looplet but are addressable by a local device in the looplet are called phantom devices.

Operations performed during full initialization include.

- Initialization of all looplets
- Setting phantom devices in each looplet
- Setting the transport paths across all looplets
- Reinitializing all looplets to an operational state.

### **QuickLoop Master**

In a dual-switch QuickLoop, only one switch can drive the initialization process. The switch that drives a QuickLoop initialization is called the QuickLoop Master.

Switches use the following criteria to elect the QuickLoop Master.

- If one of the switches receives LIPs from one (or more) of its looplets and the other switch does not, the switch that receives the LIPs becomes the QuickLoop Master.
- If both of the switches receive LIPs from their respective looplets, the switch that has the lower Domain ID becomes the QuickLoop Master.

**NOTE:** A dual-switch QuickLoop configuration requires that both switches have a Fabric Operating System license installed.

**NOTE:** The role of the QuickLoop Master is not fixed in one switch. It is determined dynamically each time the QuickLoop is initialized.

## Address Translation

Address translation is transparent and requires no actions on the part of the user. It is achieved through hardware translative mode (also known as phantom mode), in which a device not physically located in a looplet is made addressable by a unique AL\_PA in that looplet. Three hardware translative modes are available to a QuickLoop-enabled switch (see [Table 6-5](#)):

**Table 6-5: Hardware Translative Modes**

Mode	Description
Standard Translative Mode	Allows public hosts to communicate with private target devices across the fabric.
QuickLoop Mode	Allows private hosts to communicate with private target devices across the fabric, provided they are configured in the same QuickLoop.
Fabric Assist Mode	Allows private hosts to communicate with public and/or private target devices across the fabric.

In mixed mode, individual ports within a switch are set by configuration commands to one of the above three modes.

Devices connected to a U\_Port in QuickLoop mode are treated strictly as private devices, even if they are FLA-capable devices. The QuickLoop-enabled U\_Port drops the class 3 FLOGI if an NL\_Port sends one.

QuickLoop uses the translative mode of the switch to achieve the physical connection transparency.

The switch automatically determines and sets the appropriate mode, based on factory defaults and configurations currently in effect.

## Operation Modes

The operation modes are managed with Telnet commands. The system configuration has three control levels (see [Table 6-6](#)):

**Table 6-6: Operation Modes**

Mode	Description
Fabric Mode	No U_Port participates in any logical PLDAs and all U_Ports operate as FC-FLA-compliant devices (default mode). This is level 1: fabric level.
QuickLoop Mode	All U_Ports participate in a logical PLDA (or dual-switch), unless a U_Port is overridden by a level 3 configuration. This is level 2: switch level.
Mixed Mode	Per port configuration that overrides level 2 configurations and can be set during installation. U_Ports can be configured as part of a logical PLDA (QuickLoop mode) or as a standard U_Port within the switch. This is level 3: port level.
<b>NOTE:</b> Operation modes cannot be configured through SNMP.	

## Configurations

QuickLoop supports two basic configurations:

- Single-switch—All looplets of a QuickLoop reside in one switch.
- Dual-switch—Looplets of a QuickLoop span two cascaded switches.

Both configurations allow up to 126 NL\_Port devices in one QuickLoop. In addition to the two basic configurations, QuickLoop can be scaled to coexist within a fabric. In this case, you can reconfigure some of the original QuickLoop looplets to become fabric ports (F\_Ports or FL\_Ports), and additional fabric switches can be added as QuickLoop switches.

In a mixed QuickLoop and fabric configuration, fabric devices (public) can access QuickLoop devices (private) but not vice versa. Multiple QuickLoops can exist within a fabric and each can be either single-switch or dual-switch. However, devices in different QuickLoops cannot communicate with each other.

### Sample Configurations

The following examples illustrate possible configurations of one or two switches, forming a QuickLoop.

- Configuration 1: A simple configuration in which a QuickLoop-enabled switch is used as a hub emulator or concentrator.

- Configuration 2: A dual-switch configuration in which two switches are cascaded by a local fiber connection to make up a QuickLoop.
- Configuration 3: A dual-switch configuration in which two switches, up to 10 kilometers apart, are connected to make up a QuickLoop.
- Configuration 4: A mixed-mode configuration in which only some of the ports of two cascaded switches are enabled for QuickLoop.

**NOTE:** In each of these examples, the dotted line represents the logical QuickLoop or the ports that form the QuickLoop.

### Configuration 1: Emulating a Hub

Figure 6-5 shows multiple hosts and devices connected to a QuickLoop-enabled switch. The switch serves as a concentrator, similar to a hub, except the switch offers throughput performance of 100MB/sec. on each looplet concurrently.

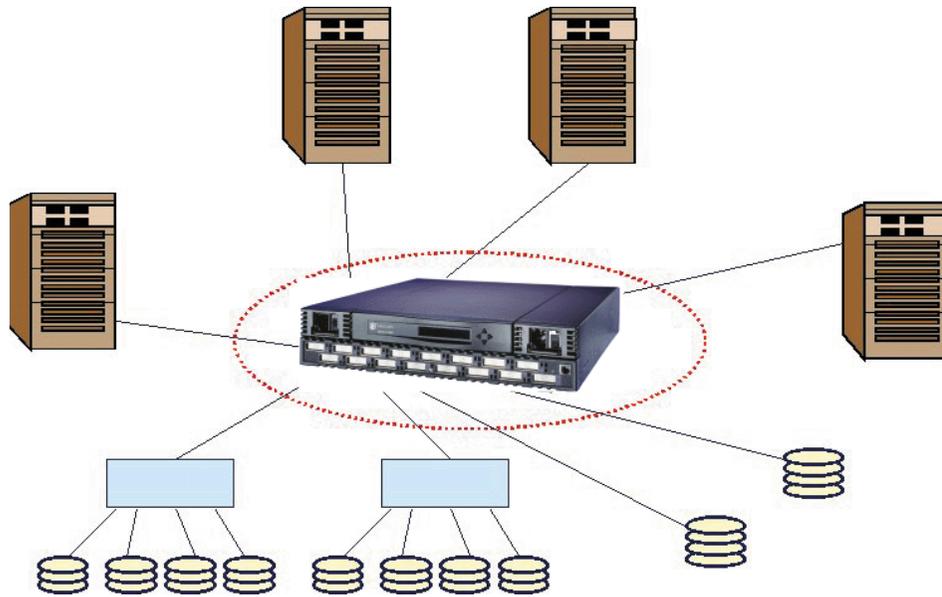


Figure 6-5: QuickLoop-enabled switch used as a concentrator

**Configuration 2: Dual-switch QuickLoop**

Figure 6-6 shows two switches cascaded by a local fiber connection between E\_ports into a single logical PLDA. The ports configured on both switches in QuickLoop share a single AL\_PA space. Neither switch can participate in a different QuickLoop. The QuickLoop can be further subdivided into one or more QuickLoop zones.

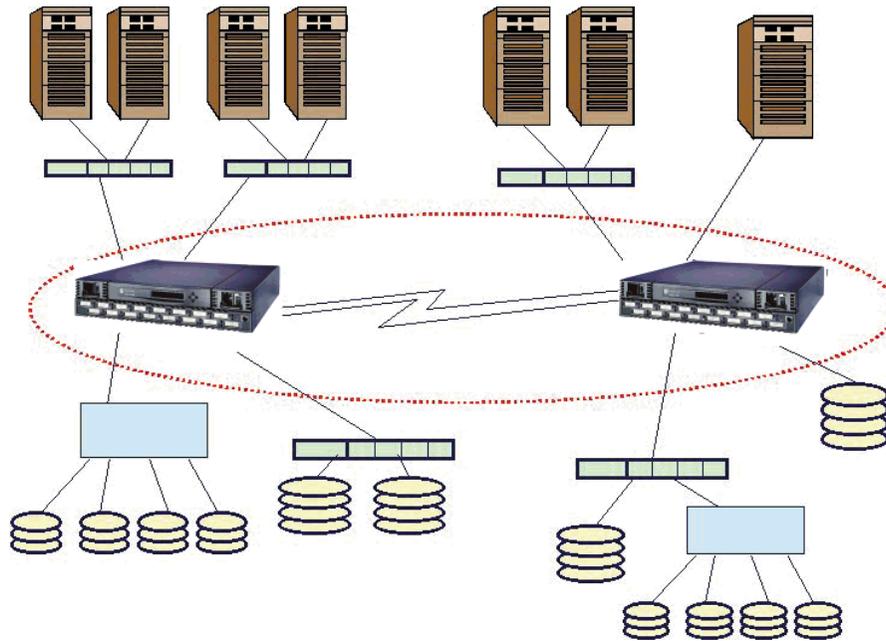


Figure 6-6: QuickLoop configured as a dual switch

**Configuration 3: Long Wave Laser Connection**

Figure 6-7 shows two switches cascaded by a long-wave laser into a single logical PLDA. Both switches operate in QuickLoop mode and connect devices up to 10 kilometers apart.

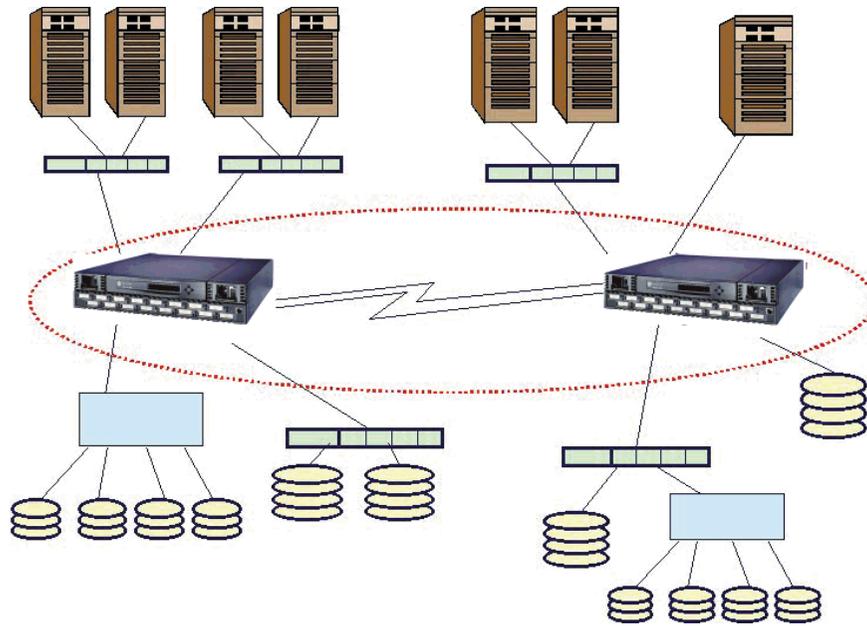


Figure 6-7: QuickLoop configured as a long-distance QuickLoop

**Configuration 4: Mixed QuickLoop Mode and Fabric Mode**

Figure 6-8 shows a sample configuration of a mixed mode environment, with ports set on an individual basis to either QuickLoop mode or Fabric mode. In this example, a fabric is formed from two cascaded switches, IS/1 (Switch 1) and IS/ 2 (Switch 2).

- The ports to which the looplets within the QuickLoop are attached, ports (1,14), (1,15), (2,0), and (2,1), are all QuickLoop-enabled FL\_Ports.

**NOTE:** The first number in the series (1,14) indicates the switch. The second number indicates the port. Therefore, (1,14) denotes Switch #1, Port #14.

- Private target device “a” and public target device “f” are attached to FL\_Ports (1,0) and (2,14). Public host “G” is attached to an F\_Port, (1,1).
- Because it is in the same QuickLoop, private host “J” can access the private target devices “b” and “c” even though they are attached to a different switch.

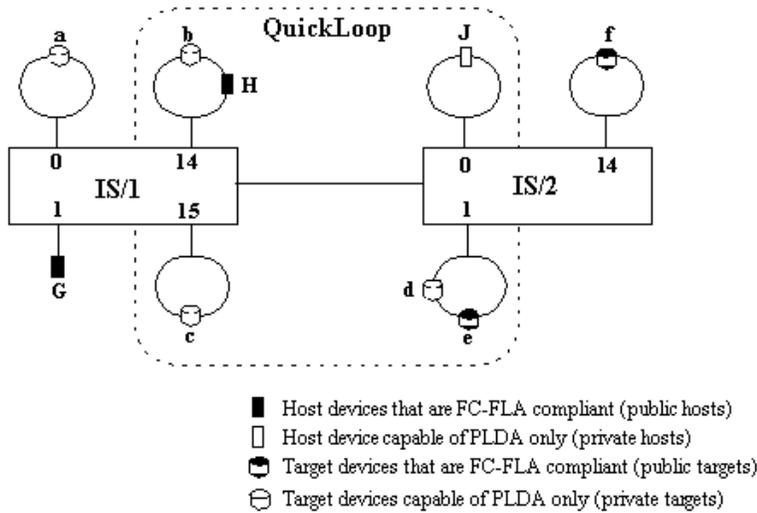


Figure 6-8: QuickLoop configuration in mixed mode

Table 6-7 lists the methods that the hosts in Figure 6-8 would use to communicate with the targets.

**Table 6-7: Configuration Access Methods**

	a	b	c	d	e	f
<b>G</b>	Fabric* (standard translatable) mode	Fabric (FLA)				
<b>H</b>	No Access**	PLDA	QuickLoop mode	QuickLoop mode	QuickLoop mode	No Access**
<b>J</b>	No Access	QuickLoop mode	QuickLoop mode	QuickLoop mode	QuickLoop mode	No Access

\* A public host accesses a device on QuickLoop by translatable mode (phantom), in the same way it accesses a private device attached to an FL\_Port.

\*\* Devices connected to QuickLoop lose their public functions. FLOGIs sent by these devices are dropped, forcing them back to a private loop attachment.

## Fault Isolation

A QuickLoop configuration can consist of multiple looplets across one or two switches. Fault isolation minimizes the impact of faulty looplets or switches on the normal QuickLoop functions.

Fault isolation occurs at two levels:

- Switch Level
- Port Level

### Switch Level

In a dual-switch QuickLoop, the following conditions will trigger a fault.

- No switch configured with the partner switch's WWN is found in the fabric.
- No response was received from the partner switch during initial communication.
- An inconsistent response was received from the partner switch
- The response from the partner was not received in time during the QuickLoop initialization.

When a looplet is determined to be faulty, the entire port is bypassed and is prevented from initializing.

If an error is detected on a switch, the partner reinitializes to form a separate QuickLoop containing only the devices on the partner switch, creating two QuickLoops. If the error condition is removed, the quickloops are reinitialized to form a single QuickLoop. If the recovery procedure fails, the switches remain in the single switch QuickLoops, and the procedure is executed again after a time-out period.

### Port Level

The following conditions are considered faulty with regard to the related looplet.

- Any physical level errors occur, such as loss of synchronization or laser fault.
- The frequency of LIPs received from a port exceeds a threshold.
- A port fails to become the Loop Initialization Master within a time-out period after LIPs are either received from or sent to the port.
- A port does not receive a loop initialization sequence back within a time-out period after the sequence is sent.

If an error is detected on a looplet, the QuickLoop is reinitialized with the looplet excluded. The error condition is monitored, and if the condition is removed, the looplet is reinstated into the QuickLoop.

Complete the following steps for looplet error recovery.

1. LIPs are issued to the looplet, and it is determined whether the hidden FL\_Port enters OPEN-INIT and becomes the Loop Initialization Master.
2. The rest of the standard Loop Initialization Sequences are completed, and it is determined whether the looplet can be fully initialized within a time-out period.
3. The looplet is kept idle and it is determined whether it remains stable.

If the procedure fails at any of the above steps, the looplet remains isolated from the QuickLoop, and the procedure is executed again after the time-out period. If all the steps are successfully completed, the looplet is reinstated into the QuickLoop by full initialization.

## Recovery

If a switch or a U\_Port diagnosed as faulty later recovers, it must be able to participate in the QuickLoop. If two previously disconnected partner switches, each containing a QuickLoop with a set of private devices, are cascaded, the two switches reform a single QuickLoop containing both sets of private devices.

## QuickLoop Zoning

The Fabric Operating System supports Zoning within QuickLoops (QuickLoop Zoning) for switches configured with both QuickLoop and Zoning.

QuickLoop in conjunction with Zoning adds the following features.

- Fabric Assist mode can be enabled. This enables a private host to fully participate in a SAN.
- Devices from multiple QuickLoops can be added to the definition for a fabric zone. Even an identical AL\_PA from two different QuickLoops could be configured under a fabric zone. Zoning can correctly direct traffic to the different devices.
- Additional control over access to QuickLoop devices. Fabric devices in a zoned fabric can only access the QuickLoop (and fabric) devices that are in the same zone.

- Zones can be created within QuickLoops. Zoning can be used to partition QuickLoops. This creates QuickLoop zones (as opposed to fabric zones), whose members are identified by either physical port number or AL\_PA.

In QuickLoop zoning, devices within a QuickLoop can be partitioned off within that QuickLoop to form QuickLoop zones; in other words, a QuickLoop Zone is a subset of a QuickLoop and can include only QuickLoop devices.

By partitioning selected devices within a QuickLoop into a QuickLoop zone you can enhance management of a Fibre Channel Arbitrated Loop (FC-AL) in a legacy environment.

Fabric zones and QuickLoop zones are independent of each other; both types of zones can co-exist in the same zone configuration and QuickLoop devices can be included within a fabric zone configuration. But, while devices within a QuickLoop can be seen by a public host, devices within each QuickLoop are only visible to devices within their own QuickLoop.

QuickLoop zones are hardware enforced; switch hardware prevents unauthorized data transfer between ports within the zone, allowing devices to be partitioned into zones to restrict system access to selected devices. Once devices are included in a zone, they are visible only to other devices within that zone.

QuickLoop zone members are designated by looplet (port number), or by Arbitrated Loop Physical Address (AL\_PA). There are 126 unique AL\_PAs per QuickLoop; therefore, a QuickLoop zone can contain no more than 126 devices.

## Advantages of QuickLoop Zoning

In addition to all the advantages of fabric zoning - security, customizing of environments, and optimization of IT resources - QuickLoop zoning lets you:

- protect devices from disruption by unrelated devices during a critical process, for example, during a tape backup session.
- Segment a QuickLoop into separate, independent loops. You can use QuickLoop Zoning to build multiple loops within a single switch or QuickLoop switch-pair.
- Control unwanted disruption to devices by limiting the scope of LIP propagation to only those looplets in the same zone. A looplet refers to the devices attached to a single switch port. QuickLoop Zoning ensures that all LIPs do not affect operation on unrelated looplets.

- Zone QuickLoops by port or by AL\_PA. QuickLoop zone members cannot be specified by device WWNs.

## Limitations of QuickLoop Zoning

QuickLoop Zoning Limitations are listed next.

- AL\_PA Zoning can only be used on a single QuickLoop on the fabric. Only one QuickLoop can be configured on a fabric.
- Though QuickLoop allows you to create separate, independent loops within a QuickLoop, there is a single AL\_PA address space within a single QuickLoop. Devices with hard AL\_PAs must have unique AL\_PAs within a QuickLoop.
- All QuickLoop zone members must be attached to a QuickLoop port. Zones that do not contain AL\_PAs whose members are defined by ports and WWNs can include public devices and private targets on a QuickLoop.
- If you enable QuickLoop Zoning by defining an AL\_PA list then all switches must be at the same version of firmware, or the fabric will segment.
- If WWN are used for zoning, the QuickLoop devices do not have to be explicitly zoned. You can use WWN to zone the public devices without creating a zone for the QuickLoop.
- If hard zoning (domain, port) is used to zone the public devices, the QuickLoop devices must also be zoned through hard zoning (see [Table 6-8](#)).

**Table 6-8: Hard Zoning Rules**

Zoning	AL_PA	Port	WWN
Public zoning	No	Yes	Yes
QuickLoop zoning	Yes	Yes	No

A QuickLoop Zone limits the scope of LIP propagation and QuickLoop initialization. This scope is determined dynamically upon each LIP incidence and the source of the LIP. A LIP is sent to the smallest possible number of looplets.

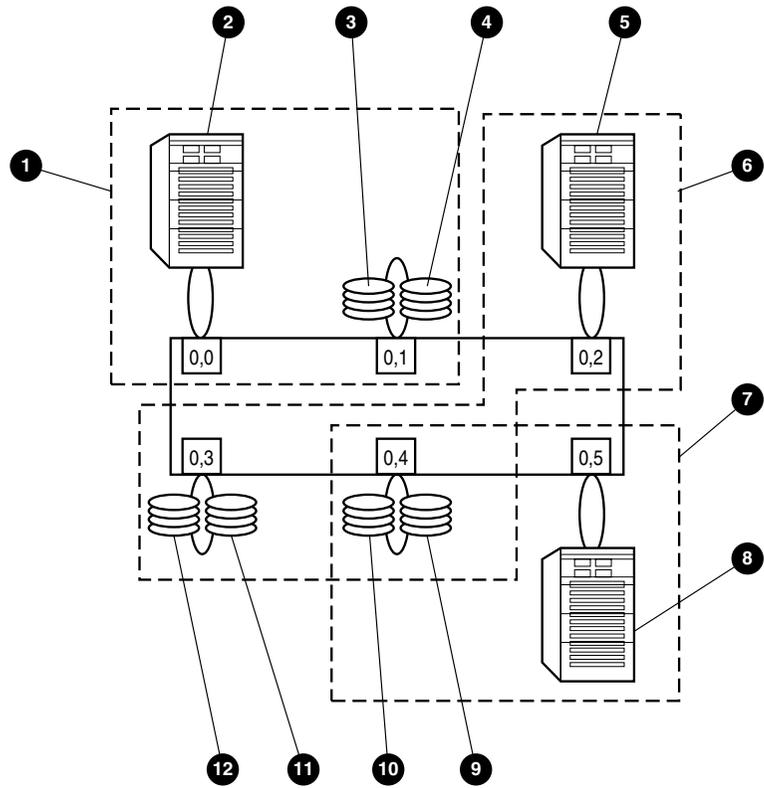


Figure 6-9: Port-based QuickLoop Zoning example

**Table 6-9: Callouts in Port-based QuickLoop Zoning Example**

Callout	Device	Loop Address	Callout	Device	Loop Address
❶	QlZone1	n/a	❷	QlZone3	n/a
❸	Host A	b8	❸	Host B	b9
❹	JBOD1	c0	❹	JBOD3	e3
❺	JBOD2	c1	❺	JBOD4	e2
❻	Host C	ba	❻	JBOD5	e1
❼	QlZone2	n/a	❼	JBOD6	e0

In [Figure 6-9](#), three QuickLoop zones have been defined. The notation is <switch #, port #>.

- qlZone1 includes ports 0,0 and 0,1
- qlZone2 includes ports 0,2, 0,3, and 0,4
- qlZone3 includes ports 0,4 and 0,5

In this example, qlZone2 and qlZone3 have overlapping zone members (0,4). qlZone1 is an exclusive zone such that its ports are exclusively in a single zone.

- Host A will receive the map of devices associated with ports 0,0 and 0,1, for instance, AL\_PA [b8, c0, c1]. The map is used to indicate what devices are part of the loop.
- Host C will receive the map of devices associated with ports 0,2, 0,3, and 0,4, for instance, AL\_PA [ba, e0, e1, e2, e3].
- Host B will receive the map of devices associated with ports 0,4 and 0,5, for instance, AL\_PA [b9, e2, e3].
- LIP initiated within qlZone1 will only be propagated to ports 0,0 and 0,1.
- LIPs initiated within qlZone 2 or qlZone3 will be propagated to ports 0,2, 0,3, 0,4, and 0,5—the union of all ports in common zones.

Whenever a zone is changed or reconfigured, a LIP is generated to all affected looplets to indicate the configuration change. Configuring a QuickLoop Zone uses the same interfaces (Telnet or Web Management Tools) that are used for standard zones. However:

- Only switch ports can be used. QuickLoop zones cannot be configured with WWNs.
- The selected ports must all be in the corresponding switches (single switch or QuickLoop switch-pair) comprising the QuickLoop.
- Only QuickLoop ports can be configured. If fabric ports are included, it is not a QuickLoop Zone.

## QuickLoop Zones using AL\_PAs

AL\_PA Zoning allows zone members to be designated by their AL\_PA and is typically used for devices with hard AL\_PAs. AL\_PA Zoning has the convenience that zoning is still effective if the connection to the switch is changed from any one port to any other port. However, it can be more complex to manage. Valid AL\_PAs are listed in [Table 6-10](#).

Specifying an AL\_PA will indirectly cause LIPs to be received on all devices contained within its corresponding looplet. For example, if you configure qlZone4 to include AL\_PAs [b9, e3] in Figure 6-9, then the device with AL\_PA [e2] will also receive the LIP because it is on the same looplet as device [e3]. However, the map returned to Host C will be [b9, e3] and the host will not be able to send frames to device e2.

There are four methods to create a QuickLoop Zone with AL\_PA components using Telnet commands:

- Create a zone to include multiple AL\_PAs as a list in square brackets:  
zoneCreate "qlzone3", "[b9, e3]"
- Zones can include both ports and AL\_PA components. Separate components by semi-colon:  
zoneCreate "qlzone3", "0.1:[80]"
- An AL\_PA list can be specified, in which case, all AL\_PAs in the list will be included.  
zoneCreate "qlzone3", "0.1:[80,81,82,83,84,85,86,87,88]"
- AL\_PAs can also be included in alias definitions.  
aliCreate "host\_group1", "[80,81,82,83,84,85,86,87,88]"

**Table 6-10: Valid AL\_PAs**

0x00	0x01	0x02	0x04	0x08	0x0f				
0x10	0x17	0x18	0x1b	0x1d	0x1e	0x1f			
0x23	0x25	0x26	0x27	0x29	0x2a	0x2b	0x2c	0x2d	0x2e
0x31	0x32	0x33	0x34	0x35	0x36	0x39	0x3a	0x3c	
0x43	0x45	0x46	0x47	0x49	0x4a	0x4b	0x4c	0x4d	0x4e
0x51	0x52	0x53	0x54	0x55	0x56	0x59	0x5a	0x5c	
0x63	0x65	0x66	0x67	0x69	0x6a	0x6b	0x6c	0x6d	0x6e
0x71	0x72	0x73	0x74	0x75	0x76	0x79	0x7a	0x7c	
0x80	0x81	0x82	0x84	0x88	0x8f				
0x90	0x97	0x98	0x9b	0x9d	0x9e	0x9f			
0xa3	0xa5	0xa6	0xa7	0xa9	0xaa	0xab	0xac	0xad	0xae
0xb1	0xb2	0xb3	0xb4	0xb5	0xb6	0xb9	0xba	0xbc	
0xc3	0xc5	0xc6	0xc7	0xc9	0xca	0xcb	0xcc	0xcd	0xce
0xd1	0xd2	0xd3	0xd4	0xd5	0xd6	0xd9	0xda	0xdc	
0xe0	0xe1	0xe2	0xe4	0xe8	0xef				

## Configuring QuickLoop Zones

To configure QuickLoop Zoning, follow the steps below:

1. Create a QuickLoop by specifying a QuickLoop name (referred to as a qloop name for zoning), followed by a list of AL\_PAs to be included.
  - ❑ A QuickLoop consists of FL\_ports on one or two switches within the fabric. QuickLoop names define the switch (or pair of switches) that make up the QuickLoop.
  - ❑ A QuickLoop name must be a unique alpha-numeric string beginning with an alpha character. The underscore character ( \_ ) is allowed and names are case sensitive. For example, Qloop1 is not the same name as qloop1.
2. Define QuickLoop zone by specifying the list of members to be included and assign a unique zone name.
  - ❑ A QuickLoop zone is a group of FL\_ports or AL\_PAs that can communicate with each other. These ports and AL\_PAs must reside within the same QuickLoop.
  - ❑ To be a QuickLoop zone, every member must be either a looplet (FL\_port) or an AL\_PA within a single QuickLoop.
  - ❑ QuickLoop zones can overlap looplets, but they must be confined to a single QuickLoop.
  - ❑ QuickLoop zones are hardware enforced, but zones within a single looplet are not enforceable; therefore it is recommended that you do not partition devices within a looplet into different zones.
  - ❑ A QuickLoop zone name must be a unique alpha-numeric string beginning with an alpha character. The underscore character ( \_ ) is allowed and zone names are case sensitive. For example, Zone1 is not the same name as zone1.
  - ❑ Specify QuickLoop zone members by looplet, AL\_PA, or a combination of the two.
    - To specify by looplet, specify the QuickLoop zone name, in quotes, and the physical ports to be included, in quotes. For example:  
 “QLZoneName”, “0,0; 0,1; 2,6; 2,7; 2,8”
    - To specify by AL\_PA, specify the QuickLoop zone name, in quotes, with the QuickLoop name, and desired AL\_PAs in quotes. All AL\_PAs must be associated with a QuickLoop name. For example:  
 “QLZoneName”, “qloop1[01,02,04,e0,e1,e2]”
    - To specify a combination of looplet and AL\_PA, for example:  
 “QLZoneName”, “0,2; 0,3; qloop1[ca,cb,e1,e2]”

3. Define QuickLoop zone configuration by assigning a zone configuration name and specifying the QuickLoop zones to be included, by zone name.
  - ❑ A QuickLoop zone configuration is a group of QuickLoop zones that are enforced whenever that zone configuration is enabled.
  - ❑ The QuickLoop names of the QuickLoop zones must also be included in the zone configuration.
  - ❑ A QuickLoop zone configuration name must be a unique alpha-numeric string beginning with an alpha character. The underscore character ( `_` ) is allowed and zone configuration names are case sensitive. For example, `QLConfig_1` is not the same name as `qlconfig_1`.
4. Enable QuickLoop zone configuration by selecting the configuration to be enabled.

## Using QuickLoop Fabric Assist Mode

This section provides detailed information for using QuickLoop Fabric Assist mode. Throughout this section, QuickLoop Fabric Assist mode will be referred to as Fabric Assist mode. A zone created under QuickLoop Fabric Assist mode will be referred to as a Fabric Assist mode zone.

---

**IMPORTANT:** You must obtain a QuickLoop license in order to use the Fabric Assist feature.

---

You can manage Fabric Assist mode through telnet commands or through Web Management Tools. The next section defines Fabric Assist Mode.

### Fabric Assist Mode Zone Characteristics

A Fabric Assist mode zone has the following characteristics.

- Each Fabric Assist mode zone is managed independently.
  - ❑ Multiple private hosts that share storage are no longer required to participate on the same arbitrated loop.
  - ❑ Because each loop is managed separately, loops are isolated from each other.
- The reinitialization of a host (LIP) will not affect operation on another host sharing a common storage device.
- A Fabric Assist mode zone consists of a single private host and at least one target, public or private.

- When included in a Fabric Assist mode zone, a private host can access any fabric or loop storage devices in the SAN.
- The private host is not constrained by topology restrictions typically imposed by hub or switching hub solutions. A private host has the capability to communicate with a private or public storage device that is located anywhere in the fabric.
- Fabric Assist mode allows private hosts to share storage with public hosts. For example, a storage array can be shared between NT and HP/UX hosts.
- Private host LIPs do not interact with public storage devices.
- With Fabric Assist mode, private hosts can access a combination of public or private (FC-AL) storage devices. A storage device may be simultaneously accessible by either private hosts with Fabric Assist or public hosts with standard zoning.
- Each switch can support up to 125 distinct devices assigned to private hosts connected to that switch. The target limit per switch is 125. If you try to zone more than 125 targets with Fabric Assist hosts on one switch, the switch will be unable to allocate a phantom for itself and will be unable to probe private targets. This means the private targets will not be listed in the name server database, and public hosts will not be able to talk to these private targets.
- A Fabric Assist host can access public targets anywhere in the fabric including its own switch. A Fabric Assist host can only access private targets elsewhere in the fabric (not on its own switch.)
- A storage device (public or private target) can be configured into multiple Fabric Assist zones.
- Each virtual loop has a separate AL\_PA domain. Each storage device is assigned a phantom AL\_PA on a Fabric Assist zone. (The same device may be accessed by a different phantom AL\_PA from the private host of a different Fabric Assist zone.)
- A fabric can have a virtually unlimited number of Fabric Assist host loops.
- A Fabric Assist zone is defined by listing zone members by WWN or by fabric port number. If defined with a `fazoneCreate` telnet command, the private host is identified with “H{ }” notation in its WWN or fabric port designation.
- A Fabric Assist mode private host can be registered in a zone either by its location (port address) or WWN. If the private host WWN is used, a Fabric Assist zone is automatically configured when that host initializes anywhere in the fabric.
- A Fabric Assist mode private host may or may not be registered in the Name Server, allowing the user to monitor its status. This depends on whether or not the private host responds to the switch’s PLOGI request.

- Fabric Assist mode supports all Zoning features such as Zoning Configurations, Zone Aliases to specify common elements, and fabric-wide distribution.
- A Fabric Assist zone may be grouped with other zones and placed within various configurations. The Fabric Assist zone Telnet commands are described in Appendix A.
- A Fabric Assist host must be on a loop, all by itself.

**NOTE:** If, when attempting point-to-point communication with your private host, problems arise, issue the `portCfgLport` command to configure the port as a loop-only port.

If you have at least two switches, you can use Fabric Assist mode if you put hosts on one switch and private targets on the second switch. If you want private hosts and private targets on the same switch, you must use QuickLoop.

## Fault Isolation and Security

The components of the Fabric Assist mode zone can be specified as either a port address (hard zoning) or as a WWN (soft zoning). If you specify a WWN, the Name Service guarantees that the associated device is automatically configured into the zone wherever it is found in the Fabric. Currently, hard zoning is more secure than soft zoning.

The creation of separate Fabric Assist mode zones for each host provides superior fault isolation over emulated loop environments.

## How Fabric Assist Mode Works

There are significant implications about the implementation of Fabric Assist zones, especially considerations of LIPs, and the interaction with QuickLoop zones.

The standard QuickLoop implementation imposes the following limitations.

- A QuickLoop is confined to, at most, two switches in a fabric.
- There can only be 29 private hosts supported in a QuickLoop.
- Even though a target device can be public, it is forced to perform as a private loop device in a QuickLoop. This prohibits the public target from using fabric functions such as Extended Fabrics.

Fabric Assist mode zoning supports operations between private initiators and public targets without imposing these limitations. The initiator and target can exist anywhere in the fabric. A public target remains public, with full fabric functionality.

In order to support this, prior to loop initialization, phantom translation tables are set up in the switch that is connected to a private initiator. These tables represent phantom targets on the private initiator's loop. The switch creates a phantom table entry for each target zoned with the private host. Upon completion of the initialization process, the private host will see a valid AL\_PA for each target with which it has been zoned. As the initiator communicates with each phantom, the phantom translation process transforms the frame into a public frame, and transmits it to the fabric.

### **Fabric Assist Mode Zone Configuration Limits**

The number of public targets that may be zoned with a single private host depends on the number of phantom nodes that may be created on the private host's loop. The number of phantoms that may be created are limited only by the number of entries within the phantom tables of the switch, and the total number of available AL\_PAs.

The switch's phantom translation table may contain a maximum of 125 unique phantom translations. The existing translative process utilizes the same phantom translation tables, thus reducing the maximum number of Fabric Assist targets that may exist if this feature is used.

Each private looplet has its own allocation of 126 AL\_PAs. Therefore each private host may be zoned with all 125 public targets.

### **LIP Propagation and Private Targets within Fabric Assist Mode Zones**

LIPs of the private host loop are not propagated back to the loop's Fabric Assist targets. A Registered State Change Notification (RSCN) will be generated, and thus public targets that have registered for SCN will be notified of any configuration changes. If the host reLIPs without causing a configuration change, then no RSCN will be generated.

Private targets will not register for SCN, and without LIP propagation, they rely on higher-level protocols for error recovery. This is similar to QuickLoop Translative Mode, where the private loop targets zoned with public hosts are not reLIPed due to changes in the status of the public host.

Specifying private targets inside a Fabric Assist zone does not affect normal operation of the other public members of the Fabric Assist zone. A phantom AL\_PA for the private host is added to the private target's loop when the first Extended Link Service (ELS) command is sent from the private host. Private hosts LIP only when phantoms are added.

If LIP propagation to the target loop is required, then the private targets that need to be accessed by a private host should be placed within a QuickLoop instead of a Fabric Assist mode zone.

### **Fabric Assist Mode Zoning and QuickLoop Zoning**

Targets within a QuickLoop may be zoned with a Fabric Assist host, but Fabric Assist hosts may not be enabled on a switch that contains a QuickLoop.



# Chapter 7

## Understanding and Using Zoning

This chapter covers the following topics:

- [Overview of SAN Switch Zoning, page 7-1](#)
- [Understanding Zoning, page 7-4](#)
- [Enabling a Zone Configuration, page 7-8](#)
- [Specifications, page 7-9](#)
- [Components, page 7-9](#)
- [Management, page 7-12](#)
- [Implementing Zoning, page 7-15](#)
- [Modifying Configurations, page 7-17](#)
- [Zoning Databases, page 7-20](#)
- [Using QuickLoop Zones, page 7-20](#)

### Overview of SAN Switch Zoning

Zoning is a fabric management service used to create logical device subsets within a SAN. Zoning enables resource partitioning for management and access control.

One or more Fibre Channel switches create the Fibre Channel fabric, an intelligent infrastructure that serves as a backbone for deploying and managing information technology (IT) resources as a network. With Zoning, you can arrange fabric connected devices into logical groups over the physical fabric configuration.

## 7-2 Fibre Channel SAN Switch Management Guide

Zoning provides automatic and transparent management for the SAN, and the flexibility to allocate pools of storage in the SAN to meet different closed user group objectives. By creating zones of storage and computers, you can set up barriers between different operating environments to deploy logical fabric subsets or to create, test, and maintain separate areas within the fabric. Zoning lets you:

- Increase environmental security
- Optimize IT resources
- Customize environments
- Easily manage a SAN

Zoning provides:

- Greater flexibility to manage a SAN with multiple operational objectives
- Easy allocation of computers and storage resources
- Finer configuration granularity to logically configure resources and seclude environments
- Versatility to meet dynamically changing application demands

Figure 7-1 illustrates three zones with some overlap. It also contains devices that are not assigned to a zone, and are thus not active in the fabric if Zoning is enabled.

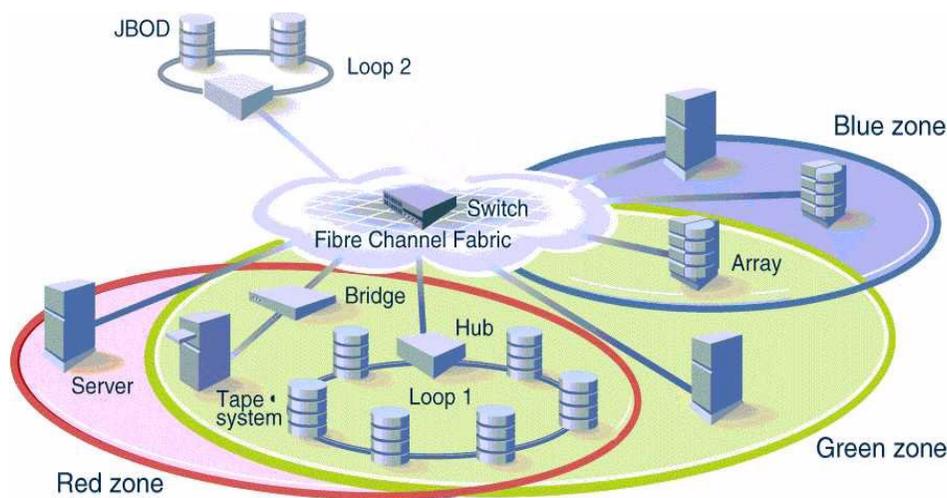


Figure 7-1: A fabric with three zones

Zones can be configured dynamically. They can vary in size depending on the number of fabric connected devices, and devices can belong to more than one zone. Because zone members can access only other members of the same zone, a device not included in a zone is not available to members of that zone. Therefore, you can use zones for:

- [Administering Security, page 7-3](#)
- [Optimizing Resources, page 7-3](#)
- [Customizing Environments, page 7-4](#)

## **Administering Security**

The Fibre Channel fabric provides fast, reliable, and seamless information access within the SAN. Zoning lets you segment the fabric into zones that consist of selected storage devices, servers, and workstations. Since zone members can only see other members in the same zone, you can control access to computers and storage located in specific zones.

Use zones to provide controlled access to fabric segments and to establish barriers between operating environments. For example, isolate systems with different uses or protect systems in a heterogeneous environment.

## **Optimizing Resources**

Zoning helps you optimize IT resources in response to user demand and changing user profiles. You can logically consolidate equipment for convenience, for example, create a temporary zone to back up nonmember devices. Zoning fabric characteristics are the same as other fabric services:

- Administration from any fabric switch
- Automatic, transparent distribution of zone definitions throughout the fabric. A single failure cannot interrupt Zoning Enforcement to other SAN connections.
- Automatic service scaling with fabric size. There is no requirement to upgrade systems as switches are added and connectivity increases.
- Automatic, transparent deployment. There is no requirement for human intervention unless the Zoning Specification must change.

## Customizing Environments

Use zones to create logical subsets of the fabric to accommodate closed user groups or to create functional areas within the fabric. For example, include selected devices within a zone for the exclusive use of zone members, or create separate test or maintenance areas within the fabric.

Zoning lets you customize your SAN environment. With Zoning, you can:

- Integrate support for heterogeneous environments by isolating systems that have different operating environments or uses.
- Create functional fabric areas by separating test or maintenance areas from production areas.
- Designate closed user groups by allocating certain computers and storage, such as RAID disks, arrays, and tapes, to a zone for exclusive use on computers that are zone members.
- Simplify resource utilization by consolidating equipment logically for convenience.
- Facilitate time-sensitive functions by creating a temporary zone to back up a set of devices that are members of other zones.
- Secure fabric areas by controlling port-level access.

## Understanding Zoning

A zone is a group of fabric-connected devices arranged into a specified grouping. Any device connected to a fabric can be included in one or more zones. Devices within a zone possess an awareness of other devices within the same zone; they are not aware of devices outside of their zone. Therefore, if zoning is enabled, any device not in a zone can not communicate with devices that are in a zone.

Zone members (ports, WWNs, or aliases) are grouped into a zone; in turn, zones are grouped in a zone configuration (a collection of zones). Zones can overlap; that is, a device can belong to more than one zone. And a fabric can consist of multiple zones. A zone configuration can include both hard and soft zones and there can be any number of zone configurations resident on a switch; however only one configuration can be active, that is enabled, at a time. Because the number of zones allowable is limited only by memory usage, the maximum number is virtually limitless.

## **Zone Types**

Zones can be:

- [Hard Zones, page 7-5](#) (hardware enforced)
- [Soft Zones, page 7-5](#) (advisory)
- [Broadcast Zone, page 7-6](#) (hardware enforced)

In a hard zone, sometimes referred to as a port zone, zone members are specified by physical port number. In a soft zone, at least one zone member is specified logically by World Wide Name (WWN).

### **Hard Zones**

In a hard zone, all zone members are specified by switch ports; any number of ports in the fabric can be configured to the zone. When a zone member is specified by port number, only the individual device port specified is included in the zone. However, if a switch port is entered into a zone definition, then any devices that are connected to that port are automatically in that zone.

Hard zones are position-dependent, that is, a device is identified by the physical port to which it is connected. Switch hardware ensures that there is no data transfer between unauthorized zone members. However, devices can transfer data between ports within the same zone. Consequently, hard zoning provides the greatest security possible. Use it where security must be rigidly enforced.

### **Soft Zones**

In a soft zone, at least one zone member is specified by WWN. A device is included in a zone if either the node WWN or port WWN specified matches an entry in the name server table.

When a device logs in, it queries the name server for devices within the fabric. If zoning is in effect, only the devices in the same zone(s) are returned. Other devices are hidden from the name server query reply. When a WWN is specified, all ports on the specified device are included in the zone.

Soft zones are name server-dependent and therefore provide more flexibility - new devices can be attached without regard to physical location. However, the switch does not control data transfer so there is no guarantee against data transfer from unauthorized zone members. Use soft zoning where flexibility is important and security can be ensured by the cooperating hosts.

### **Broadcast Zone**

Only one broadcast zone can exist within a fabric. It is named “broadcast” and it is used to specify those nodes that are to receive broadcast traffic.

This type of zone is hardware-enforced; the switch controls data transfer to a port.

## **Zone Enforcement**

When zoning is disabled, the fabric is in nonzoning state and devices can communicate without regard to zone restrictions. When zoning is enabled, zoning is enforced throughout the fabric and devices can communicate only within their zones.

A switch can maintain any number of zone configurations; however, only one zone configuration can be enabled, or enforced, at a time. Because multiple configurations reside in the switch, you can switch from one configuration to another as events dictate. For example, you can set up a pre-specified zone configuration to be enabled at certain times of the day; or, in the event of a disaster, you can quickly enable a defined configuration to implement your disaster policy.

Zone configurations can be:

- [Defined, page 7-6](#)
- [Enabled, page 7-7](#)
- [Saved, page 7-7](#)

### **Defined**

This is the complete set of all zone objects that have been defined in the fabric. When zone objects are defined, the information initially resides on RAM; it must be saved to ensure that it is saved to flash memory and is not lost during power down or when a new zone configuration is enabled.

Changes replicate to all switches in the fabric whenever the zone information is changed. However, changes must be saved to flash memory to be committed to persistent store (that is, to remain across restart).

### **Enabled**

This is the zone configuration that is enabled (active). It resides on RAM; it must be saved to ensure that it is not lost when a new configuration is enabled or during power down. Any changes replicate to all switches in the fabric when the configuration is enabled or saved.

### **Saved**

This is the zone configuration that was last saved. It resides in flash memory and it is persistent.

In the zoning illustration ([Figure 7-2](#)), Config5 is defined (created). When it is defined, it resides only in RAM. To transfer it to flash memory, to be permanently stored and accessible across restarts, it must be saved. This can be accomplished in one of two ways:

- Save it directly to flash (the recommended method)
- Enable it first, then save it to flash.

**NOTE:** Until it has been saved to flash, it is not permanently stored and available across restarts.

**NOTE:** Only the enabled configuration (in the shaded area) is enforced.

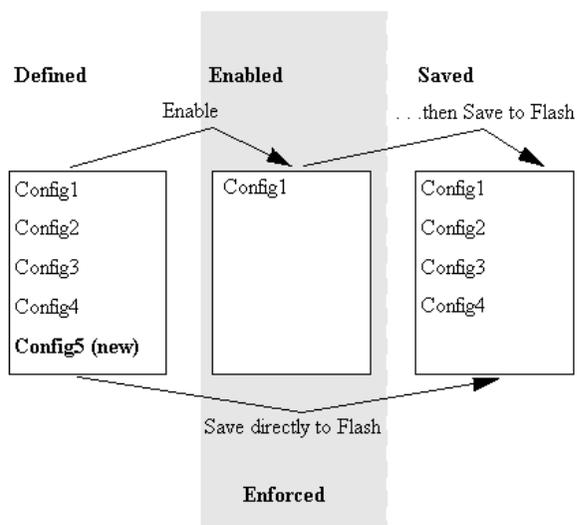


Figure 7-2: Saving a zone configuration

## Enabling a Zone Configuration

When a zone configuration is enabled, all zones within the configuration are enabled. All devices within an enabled zone are visible to each other; however, they cannot communicate outside their zone. Zones can overlap within a zone configuration.

When a zone configuration is enabled the following happens:

1. All aliases are expanded.
2. Inconsistencies are checked.

If any inconsistencies are discovered, an error occurs and the previous state of the fabric is preserved. (For example, if zoning was disabled, it remains disabled; if an existing configuration was enabled, it remains enabled.)

3. Switch hardware is loaded with the zoning information.
4. Zone members are loaded.
5. Registered State Change Notifications (RSCNs) are generated.

## Specifications

Web-based management and Telnet commands are used to create, delete, and display zones, to add or remove zone members, and to configure zone sets. Zone specification functions are:

- Administration
- Zone enforcement
- Zone management
- Zone backup

[Table 7-1](#) summarizes the zone specification functions.

Function	Description
Administration	Lets you create, delete, and display zones, zone members, and aliases.
Zone Enforcement	Automatically and transparently restricts access to only the devices in defined zones (provided by the fabric Simple Name Server) and hardware at the switch port level.
Zone Management	Lets you manipulate zones through Telnet commands.
Zone Backup	Automatically retains zoning configuration data in the switch's flash memory.

## Components

Zoning is comprised of three components. [Table 7-2](#) summarizes the components and their hierarchical relationship.

Component	Description
Zone configuration	A set of zones. When Zoning is enabled, one zone configuration is in effect.
Zone	A set of devices that access one another. All computers, storage, and other devices connected to a fabric can be configured into one or more zones.
Zone member	A device located within a zone.

## Zone Configuration

A zone configuration is a set of one or more zones. When Zoning is enabled, one zone configuration is in effect. When a zone configuration is in effect, all zones that are members of that configuration are valid. You select the type of configuration you want to use:

- [Defined Configuration, page 7-10](#)
- [Effective Configuration, page 7-10](#)
- [Saved Configuration, page 7-10](#)

### Defined Configuration

The defined configuration is the complete set of all zone components that are defined in the fabric. There can be multiple zone configurations defined, although only one configuration can be in effect at a time. For example, you can use one configuration during normal operation and a second configuration can be enabled for nightly data backup. There can be inconsistencies in the definitions, such as zones or aliases that are referenced but not defined, or duplicate members. The defined configuration is the current state of the administrator's input.

### Effective Configuration

The effective configuration is a single-zone configuration that is currently enabled. The effective configuration is built when you enable a specified zone configuration. The switch automatically compiles the effective configuration when you execute the `cfgEnable` command. The switch checks for undefined zone names or zone alias names or other inconsistencies by expanding zone aliases, removing duplicate entries, and then building the effective configuration.

### Saved Configuration

The saved configuration is a copy of the defined configuration and the name of the effective configuration that is saved in flash memory by the `cfgSave` command. There can be differences between the saved configuration and the defined configuration if you modify the configuration and do not save the changes. The switch automatically reloads the saved configuration on power up. If a configuration was enabled when it was saved, the same configuration is automatically reenabled at power up. If no configuration is enabled when you execute the `cfgSave` command, no configuration is loaded at power up.

## Zones

Each zone has a case-sensitive name. Zone names begin with a letter that can be followed by any number of letters, digits, and underscore characters (\_). Spaces are not allowed in zone names.

Zones have the following characteristics:

- Each zone has a member list consisting of one or more zone members. Empty zones are not allowed.
- The maximum number of zones and zone members is constrained by memory usage. Since these limits are far larger than the number of devices connected to a fabric, you can have an almost unlimited amount of zones and zone members.
- Saved zone definitions are persistent. The definition remains in effect across restarts and power cycles unless it is deleted or changed.
- A device can be a member of multiple zones.

## Zone Member

Zone members can be specified using one of the following notations:

- Node World Wide Name
- Port World Wide Name
- Physical fabric port number

A World Wide Name (WWN) notation (for node and/or port) is specified as an eight-hex number separated by colons, for example 10:00:00:60:69:00:00:8a. The number is compared with the node and port WWNs presented by a device in a login frame (FLOGI or PLOGI). When a zone member is specified by node WWN, all ports on that device are in the zone. When a zone member is specified by port name, only that port is in the zone.

A physical fabric port number notation is specified as a pair of decimal numbers s,p where s is the switch number (domain ID) and p is the switch port number. For example, 2,12 specifies port 12 on switch number 2. When a physical fabric port number specifies a zone member, all devices connected to that port are in the zone. If the port is an arbitrated loop, all loop devices on that port are in the zone.

The type of notation used to define zone members can be a combination of WWN and physical fabric port numbers. Consider a zone defined with the following members:

2,12; 2,14; 10:00:00:60:69:00:00:8a

The zone contains the devices connected to switch 2 at ports 12 and 14, as well as the device with the node name or port name of 10:00:00:60:69:00:00:8a.

## Zone Aliases

Zone aliases simplify repetitive port number entries or World Wide Names (WWNs). A zone alias is a C-style name for one or more port numbers or WWNs. For example, the name “host” can be used as an alias for a computer with the WWN of 10:00:00:60:69:00:00:8a.

## Management

Zoning simplifies the SAN management process in several ways:

- Zoning can be administered from any switch in the fabric.  
Changes configured to one switch automatically replicate to all switches in the fabric; if a new switch is added to an existing fabric, all zone characteristics are automatically applied to the new switch. Because each switch stores zoning information, Zoning ensures a high level of reliability and redundancy.
- Zones can be configured dynamically.  
Configuring new zones does not interrupt traffic on unaffected ports or devices. And, zones do not affect data traffic across interswitch links (ISLs) in cascaded switch configurations.
- Zoning uses policy-based administration.  
Because Zoning uses policy-based administration, separating zone specification from zone enforcement, you can manage multiple zone configurations and easily enable a specific configuration when it is required. A fabric can store any number of zone configurations; however, only one configuration is active at a time. But, because the configurations are predetermined and stored, a new configuration can be easily enabled.
- Zoning can be configured and administered via Telnet commands or Web Management Tools through either out-of-band or in-band communication by logging in to a switch. For information on telnet commands, see [Appendix A](#). For information on Web Management Tools, see [Chapter 3](#).

## Using Telnet Command or Web Management Tools

Web Management Tools or Telnet commands can be used to create, delete, and display zones and zone members.

The Telnet commands are based on the three component types:

- Zone alias
- Zone configuration
- Zone

Each component type recognizes five commands:

- Create
- Delete
- Add
- Remove
- Show

## Zone Management Example

Figure 7-4 shows a single zone configuration, USA\_cfg, that has the following three zones defined:

- The Red and Green zones share six disk drives on a loop.
- The Blue and Green zones share one storage array.
- The Blue zone has a dedicated storage array.

**NOTE:** The JBOD with Loop 2 is not in a zone and cannot be accessed from outside of Loop 2 when the configuration is in effect.

The disks are specified by WWN and the hosts are specified by physical port. The graphical representation of the zone configuration includes an additional disk drive loop that none of the zones can access.

```

admin> cfgCreate "USA_cfg", "Red_zone; Blue_zone; Green_zone"
admin> zoneCreate "Red_zone", "0,0; loop1"
admin> zoneCreate "Blue_zone", "0,1; array1; 0,2; array2"
admin> zoneCreate "Green_zone", "0,0; loop1; 0,2; array2"
admin> aliCreate "array1", "21:00:00:20:37:0c:76:85;
21:00:00:20:37:0c:71:df"
admin> aliAdd "array1", "21:00:00:20:37:0c:72:51;
21:00:00:20:37:0c:71:0a"
admin> aliCreate "array2", "21:00:00:20:37:0c:66:23;
21:00:00:20:37:0c:73:7f"
admin> aliAdd "array2", "21:00:00:20:37:0c:9c:6b;
21:00:00:20:37:0c:66:3a"
admin> aliCreate "loop1", "21:00:00:20:37:0c:67:e3;
21:00:00:20:37:0c:76:1f"
admin> aliAdd "loop1", "21:00:00:20:37:0c:6a:40;
21:00:00:20:37:0c:59:7e"
admin> cfgEnable "USA_cfg"
zone config "USA_cfg" is in effect
    
```

Figure 7-3: Zone management example

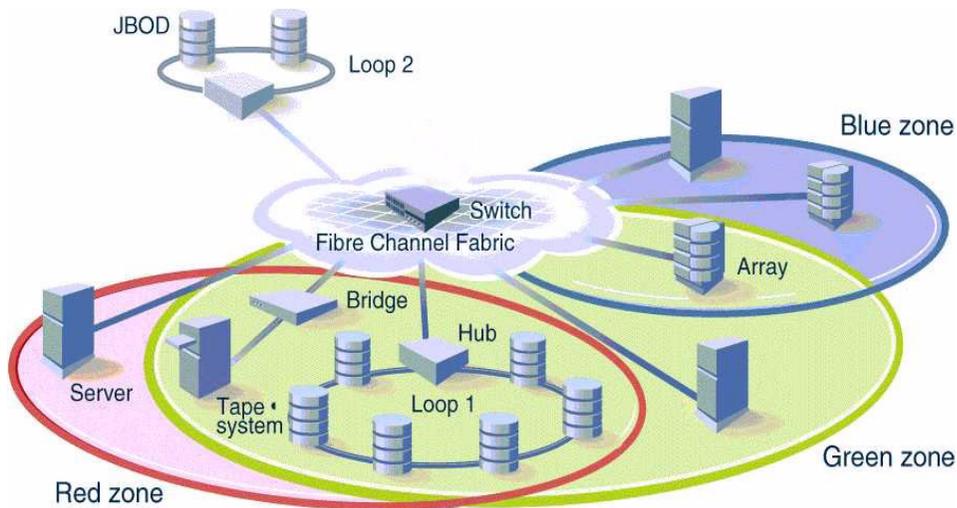


Figure 7-4: Zone management diagram

## Implementing Zoning

Zoning is implemented by following the steps below:

1. [Create Alias \(optional\), page 7-15](#)
2. [Define Zone, page 7-15](#)
3. [Define Zone Configuration, page 7-16](#)
4. [Enable Zone Configuration, page 7-17](#)

---

**IMPORTANT:** Each zone object defined - alias, zone, zone configuration - must have a unique name. An alias can not have the same name as another alias, and it can not have the same name as a zone or a zone configuration.

---

**NOTE:** During the configuration process below, changes should be saved periodically to ensure that they are stored in flash memory and protected against loss due to power outage.

### Create Alias (optional)

An alias is a name assigned to a device or group of devices. By creating an alias you can assign a familiar name to a device, or group multiple devices into a single name. Aliases simplify cumbersome entries and allow an intuitive naming structure such as using NT\_Hosts to define all NT hosts in the fabric.

An alias must be a unique alphanumeric string beginning with an alpha character. The underscore character ( \_ ) is allowed and alias names are case sensitive. For example, nt\_hosts is not the same name as NT\_Hosts.

Aliases simplify the administrative process; however, they are not required to define zones.

### Define Zone

A zone is a group of devices that can communicate with each other. Zone membership can include ports, WWNs, or aliases, or any combination of these. A device can be included in more than one zone.

To define a zone, specify the list of members to be included and assign a unique zone name; the zone name must be a unique alphanumeric string beginning with an alpha character. The underscore character ( `_` ) is allowed and zone names are case sensitive. For example, `green_zone` is not the same name as `Green_Zone`.

Specify zone members by port number, WWN, alias, or a combination.

- To specify by port number, you must specify switch domain ID and port number. For example, `2,12` indicates switch domain ID 2, port number 12. When a member is specified by port number, all devices connected to the port are included in the zone.
- To specify by WWN, specify node name or port/device as an 8- hex number separated by colons, for example, `10:00:00:60:69:00:8a`. These eight numbers are compared to the node and port name presented in a login frame (FLOGI or PLOGI). When a zone member is specified by node name, all ports on the device are included in the zone. When a zone member is specified by port name, only that port on the device (node) is included in the zone.
- To specify by alias, specify the alias name.
- Zone members can also be designated by a combination of these methods. For example, the zone definition in [Figure 7-5](#) contains any devices connected to switch 2, ports 12 and 14, the device with a node name or port name of `10:00:00:60:69:00:00:8a` as well as devices associated with the alias `nt_hosts`.

<code>2,12; 2,14; 10:00:00:60:69:00:00:8a; nt_hosts</code>
--

Figure 7-5: Zone definition

## Define Zone Configuration

A zone configuration is a group of zones that are enforced whenever that zone configuration is enabled. And, a zone can be included in more than one zone configuration.

To define a zone configuration, specify the list of zones to be included and assign a zone configuration name; the zone configuration name must be a unique alphanumeric string beginning with an alpha character. The underscore character ( `_` ) is allowed and zone names are case sensitive. For example, `configuration1` is not the same name as `Configuration1`.

## **Enable Zone Configuration**

To enable a zone configuration, select the zone configuration to be enabled. The configuration is downloaded to the switch hardware. RSCNs are sent to all fabric devices registered for state changes notifying these devices to re-query the name server to discover available devices that can be accessed.

## **Modifying Configurations**

To make changes to an existing configuration, either add or remove individual elements to create the desired configuration. Once the changes have been made, save the configuration. This ensures the configuration is permanently saved in the switch and it also ensures that the configuration is replicated throughout the fabric.

The switch configuration file can also be uploaded to the host for archiving and it can be downloaded from the host to all switches in the fabric.

## **Adding a New Switch**

A new switch is a switch that has not previously been connected to a fabric and has no zone configuration data. When you connect a new switch to a fabric, all zone configuration data is immediately copied from the fabric to the new switch. If a zone configuration is enabled in the fabric, then the same configuration is enabled in the new switch. To add the new switch, attach the E\_ports and the new switch is incorporated into the fabric and the enabled zone configuration.

**NOTE:** A switch that has previously been configured for Zoning can be returned to a new switch state by using the `cfgClear` command before connecting it to the fabric.

## **Adding a New Fabric**

A new fabric is a fabric where there is no zone configuration information. When you add a new fabric to an existing zoned fabric, all switches in the new fabric inherit the zone configuration data from the existing zoned fabric. If a zone configuration is enabled, then the same configuration is enabled in the new switches.

## **Merging Two Fabrics**

When a new fabric (with no zone configuration information) is added to an existing zoned fabric, all switches in the new fabric take on the zoning characteristics present in the existing fabric.

If both fabrics have identical zone configuration data and the same configuration is enabled, the fabrics join to make one larger fabric with the same zone configuration in effect.

If the fabrics have different zone configuration data, the two sets of zone configuration data are merged if possible. A merge is not possible if any of the following exist:

- Zoning is enabled in both fabrics but the zone configurations that are enabled are different (configuration mismatch).
- The name of a zone object in one fabric is used for a different type of zone object in the other fabric (type mismatch).
- The definition of a zone object in one fabric is different from its definition in the other fabric (content mismatch).

If a merge is not possible, the interswitch link (ISL) is segmented. When a segmented condition is detected by the switches between the ISL, each switch displays an error message.

A mismatch can result if a zone definition is changed while a switch that was part of a zone fabric is powered down. To allow a switch with a zone mismatch to join a fabric, clear the zone definitions in the switch that has the wrong zone definition.

## **Splitting a Fabric**

If an ISL fails, causing a fabric to split into two separate fabrics, then each new fabric retains the same zone configuration.

If the ISL is replaced and no changes have been made to the zone configuration in either new fabric, then the two fabrics will merge back into one single fabric. If changes have been made to either zone configuration, the rules in the “Merging Two Fabrics” section apply.

## Adding Multiple Items

Multiple items can be added to a zone with the following command syntax:

```
zoning-command "name of zone", member; member; member"
```

The "name of zone" parameter can be a zone name, an alias name, or a configuration name depending on the type of command you are using. Consider the following example:

```
zoneAdd "Red_zone", "1,10;1,12"
```

This syntax adds domain 1, port 10 and domain 1, port 12 to the Red zone. The following commands allow a multiple item parameter list.

- Alias commands: aliCreate, aliAdd, and aliRemove
- Zone configuration commands: cfgCreate, cfgAdd, and cfgRemove
- Zone commands: zoneCreate, zoneAdd, and zoneRemove

## Enforcing a Zone with Software

A software implementation based on the Simple Name Server (SNS) enforces a zone when you use WWNs for Zoning devices. Zoning does not degrade SNS functionality because there is no change to the SNS access protocol. If no zone configuration is in effect, responses to SNS queries are based on all fabric connected devices. If a zone configuration is in effect, responses to SNS queries contain information about only those devices that are in the requestor's zone.

## Enforcing a Zone with Hardware

Zones are enforced at the physical port level across all fabric switches by hardware blocking of Fibre Channel frames. Hardware zoning enables computers and storage on different switch ports to communicate. Specify a zoned switch by using the physical fabric port number. Hardware zone definitions are in the form of D, P where D is the domain and P is the physical port number on a switch. Hardware zoning prevents computers and storage from communicating with devices that do not share a common zone.

## Zoning Databases

Zoning uses two databases:

- Zone configuration database
- N\_Port login database

### Zone Configuration Database

Zone configuration data is contained in a replicated database. All fabric switches have a complete copy of the zone configuration database. When you make a configuration change, a unique interswitch protocol forwards the change to all fabric switches. Zone configuration data is displayed as the defined configuration by the `cfgShow` command, and is stored in flash memory by the `cfgSave` command.

### N\_Port Login Data

N\_Port login data is stored locally on each switch where it is used to translate WWNs into physical port numbers. The procedure runs entirely on the local switch when a match can be made based only on the physical port number. If the physical port number is not sufficient, the local switch queries the remote switch for login data.

## Using QuickLoop Zones

In addition to zoning fabrics, you can also zone QuickLoops. For more information on using QuickLoop Zones, see the “QuickLoop Zoning” section in Chapter 6.

# Chapter 8

## Upgrading Firmware

This chapter covers the following topics.

- [Upgrading Firmware Using Web Management Tools, page 8-2](#)
- [Upgrading Firmware Using the firmwareDownload Command, page 8-3](#)
- [Downloading Firmware from the Compaq Website, page 8-6](#)
- [Saving and Restoring Switch Configuration Settings, page 8-7](#)

A Fibre Channel SAN Switch comes with preloaded firmware. In most cases there is no need to update the firmware on a new switch. The firmware version can be determined by using:

- The [version](#) Telnet command ([page A-89](#))
- The Switch Management Application page in Web Management Tools
- For a Fibre Channel SAN Switch 16 model only, use front panel controls (see the *Compaq StorageWorks Fibre Channel SAN Switch 16 Installation Guide*, Part Number EK-BCP28-IA).

## Upgrading Firmware Using Web Management Tools

Use the Firmware Upgrade page in Web Management Tools to download firmware, as follows.

1. Copy the files *Rshd.exe* and *Cat.exe* to the root directory on the host system. These files are found in:

*D:\DSGGB\Firmware\NTIntel\Rshd.exe*

*D:\DSGGB\Firmware\NTIntel\Cat.exe*

*D:\DSGGB\Firmware\NTIntel\V2.x.x*

where D:\ is the drive letter for the CD and V2.x.x is the latest version of firmware.

2. Double-click *Rshd.exe*. RSHD is a server program that allows the switch to request the firmware from the host over an Ethernet connection. Leave RSHD running in a separate window.
3. Click the switch whose firmware you want to upgrade. The Switch Management Application page displays.
4. Click on the Admin button from the Switch Management Application page.
5. Click on the Firmware Upgrade tab. The following screen is displayed, see [Figure 8-1](#).

Figure 8-1: Firmware Upgrade page example

6. Enter the host name or host IP address in the Host Name or Host IP field.
 

**NOTE:** For Windows 9x/Windows 2000/Windows NT only, enter the IP address.
7. Enter a user name in the Remote User Name field.
 

**NOTE:** For Windows 9x, Windows 2000, and Windows NT only, enter the default name user.
8. In the Download File From field, enter the path name on which the firmware resides.

---

**IMPORTANT:** You must use the UNIX style of forward slash (/) in the path name.

---

**NOTE:** When the firmware file is located in the same directory as the *Cat.exe* and *Rshd.exe* files, the directory path can be omitted.

9. Click the Download Flash Now! button.

---

**IMPORTANT:** Prior to downloading the firmware, the *Rshd.exe* program must be running from the same directory that contains the *Cat.exe* program or the FTP server must be running.

---

The firmware is downloaded. Use this procedure for each switch that requires an upgrade.

## Upgrading Firmware Using the firmwareDownload Command

Use the `firmwareDownload` command in a Telnet session to download new firmware. The command downloads firmware into flash memory. Execute this command on an operational switch. A restart is required to initiate the new firmware after the download is complete.

The firmware can be downloaded from a UNIX, Windows NT, or Windows 95, 98, 2000 host. For a UNIX host, no special software is needed. For Windows 95 or Windows NT, a daemon to support a Remote Shell is required. Firmware is downloaded through an RCP command running on top of TCP between the switch and the host.

To upgrade the firmware for a Fibre Channel SAN Switch, use the latest version of the Fibre Channel SAN Switch CD. Depending on the operating system, use one of the following procedures:

- [Host with Windows NT Intel, page 8-3](#)
- [Host with Windows NT Alpha, page 8-4](#)
- [Host with Tru64 UNIX, page 8-5](#)

### Host with Windows NT Intel

To load the firmware from a Compaq PC running Windows NT Intel:

1. Copy the files *Rshd.exe* and *Cat.exe* to the root directory on the host system. These files are found in the CD provided with the switch.

2. Double-click *Rshd.exe*. RSHD is a server program that allows the switch to request the firmware from the host over an Ethernet connection. Leave RSHD running in a separate window.
3. Click Start > Run and enter TELNET.
4. Click Connect > Remote System.
5. In the Host Name field, type the IP address of your Fibre Channel SAN Switch and click the Connect button.
6. Log in as:

```
admin  
password: password
```

7. At the prompt, type:

```
firmwareDownload "192.168.60.200", "administrator", "v2.x.x"
```

where "192.168.60.200" is the IP address of the host computer, "administrator" is the account you are using to run *Rshd.exe*, and "v2.x.x" is the firmware image to be downloaded to the switch.

**NOTE:** *Rshd.exe* must be run from the directory that contains the *Cat.exe* file.

The output displays as follows:

```
1330320+203572+427356  
writing flash 0.....  
writing flash 1.....  
download complete  
switch:admin>
```

8. Click the RSHD window and click File | Exit.
9. Click the Telnet window and enter the `reboot` Telnet command. The switch restarts and copies the firmware into RAM.

## Host with Windows NT Alpha

To load the firmware from a host running Windows NT Alpha:

1. Copy the *Alpha NT versions of the Cat.exe and RSHD.exe files from the DSBBG\FirmwareNTAlpha directory*. These files are found in the CD-ROM provided with the switch.
2. Double-click *Rshd.exe*. RSHD is a server program that allows the switch to request the firmware from the host over an Ethernet connection. Leave RSHD running in a separate window.

3. Click Start > Run and type TELNET.
4. Click Connect > Remote System.
5. In the Host Name field, type the IP address of the Fibre Channel SAN Switch and click the Connect button.
6. Log in as:
  - admin
  - password: password
7. At the prompt, type:
 

```
firmwareDownload "192.168.60.200", "administrator", "v2.x.x"
```

 where "192.168.60.200" is the IP address of the host computer, "administrator" is the account you are using to run *Rshd.exe*, and "v2.x.x" is the firmware image to be downloaded to the switch.
 

**NOTE:** *Rshd.exe* must be run from the directory that contains the *Cat.exe* file.

 The output displays as follows:
 

```
1330320+203572+427356
writing flash 0.....
writing flash 1.....
download complete
switch:admin>
```
8. Click the RSHD window and click File > Exit.
9. Click the Telnet window and enter reboot. The switch restarts and copies the firmware into RAM.

## Host with Tru64 UNIX

To load the firmware from a host running Compaq Tru64 UNIX:

1. Mount the CD device by using the following command:
 

```
mount -t cd9660 -r /dev/rz5c /mnt
```

 where "5" is the unit number of your CD drive.
2. Change to the CD directory by entering:
 

```
cd /mnt
```
3. To copy the firmware to the host system, enter the following command:
 

```
cp DSGGB/Firmware/V2.x.x/mary/tmp/V2.x.x
```

where “mary” is the user name on the Tru64 host system and “V2.x.x” is the firmware image to be downloaded to the switch.

**NOTE:** The Fibre Channel SAN Switch uses the remote shell capabilities of UNIX to log in to the Tru64 UNIX host and copy the firmware image. The user (mary) and the switch's IP address must be in the .rhosts file on the Tru64 UNIX host to allow login without a password.

4. Establish a Telnet connection to the switch by entering:

```
telnet <switch_hostname>
user: admin
pswd: <password>
```

**NOTE:** You can substitute the IP address of the switch for <switch\_hostname>.

5. To download the firmware from the host system to the switch flash memory, enter the following command line at the <switch>:admin> prompt:

```
firmwareDownload "16.140.32.60", "mary", "/tmp/v2.x.x"
```

where “16.140.32.60” is the IP address of the host system with the firmware image, “mary” is the user to RSH, and “/tmp/v2.x.x” is the firmware image to be loaded into the switch flash ROM.

**NOTE:** The quote marks are very important in the firmwareDownload command line.

**NOTE:** RSH without a password must be enabled for the user that RSH is executing under. To enable RSH without a password, add the switch IP name to ~<user>/.rhosts). The format of .rhosts is: hostname [user].

6. Enter reboot at the Telnet prompt. The switch restarts and copies the firmware into RAM.

## Downloading Firmware from the Compaq Website

To download the firmware from the Compaq website, go to [www.compaq.com/products/storageworks](http://www.compaq.com/products/storageworks).

The website contains the required files and instructions for downloading the firmware.

## Saving and Restoring Switch Configuration Settings

Configuration settings may be lost when a switch fails. To safeguard against lost configuration information, save switch configuration settings using the `configUpload` Telnet command. In order to restore saved configuration settings, use the `configDownload` Telnet command. See [Telnet Commands](#), [Appendix A](#) for more information on Telnet commands.

### configUpload

This `configUpload` command saves the switch configuration to a host file. The upload process uses either File Transfer Protocol (FTP) or the RSHD protocol (TCP service 514). Both of these services are widely available on UNIX hosts, but less so on Microsoft Windows hosts.

On Windows NT, the FTP server may have to be installed from the distribution media and enabled, or on Windows NT or Windows 9x there are several good freeware and shareware FTP servers available.

The two utilities supplied for RSHD, *Rshd.exe* and *Cat.exe*, currently do not support uploads, only downloads. Therefore, in a Windows environment, FTP must be used and the FTP server must be running before an upload can occur.

The command may be invoked without any parameters, in which case the user is prompted for input, including choice of FTP or RSHD. If invoked with three parameters RSHD is used, otherwise presence of the fourth parameter (FTP password) selects FTP.

[Figure 8-2](#) shows a generic example of the `configUpload` command.

```
switch:admin>configUpload
Server Name or IP Address [host]:
IP Address for Server:
User Name [user]:
File Name [config.txt]:
Protocol (RSHD or FTP) [rshd]:
```

Figure 8-2: `configUpload` command example 1

If the upload fails, it is due to one of the following reasons.

- The switch does not recognize the host name.
- The host IP address cannot be contacted.
- The user does not have permission on the host.
- The user runs a script that prints something at login.
- The RSHD or FTP server is not running on the host.

The configuration file contains two command line types — comments and name:value pairs. Comments are written with “[” as the first character of the line (when read back using `configDownload`, a line beginning with any punctuation character is treated as a comment).

**Table 8-1: Syntax of a Name:Value Pair**

Name	Value Pair
line	whitespace name whitespace “.” whitespace value
name	component {“.” component}
whitespace	{“  “}
component	{“a”-“z”   “A”-“Z”   “0”-“9”   “_”   “-”}
value	{<any character not including “
<b>NOTE:</b> Elements enclosed in curly braces {...} indicate zero or more occurrences of the enclosed elements.	

The configuration file is written as three sections. The first section contains the switch start parameters (otherwise known as the switch identity). It has variables such as the switch name and IP address. This section corresponds to the first few lines of output of the `configShow` command.

The second section contains general switch configuration variables, such as diagnostic settings, fabric configuration settings, and SNMP settings. This section corresponds to the output of the `configShow` command (after the first few lines), although there are more lines uploaded than shown by the command.

The third section contains the zoning configuration. It corresponds to the output of the `cfgShow` command.

## Parameters

The following list defines parameter types.

- **host**—A host name or IP address in quotes, for example “citadel” or “192.168.1.48”. The configuration file is uploaded to this host.
- **user**—A user name in quotes, for example “jdoe.” This user name is used to gain access to the host.
- **file**—A file name in quotes, for example “config.txt.” Absolute path names may be specified using forward slash “/”. Relative path names create the file in the user’s home directory on Unix hosts and in the directory where the FTP server is running on Windows hosts. [Figure 8-3](#) shows an example of the `configUpload` command.
- **passwd**—If present, selects FTP.

```
switch:admin>configUpload
“citadel”, “jdoe”, “config.txt”, “passwd”
upload complete
```

Figure 8-3: `configUpload` command example 2

## configDownload

The download process uses either FTP or the RSHD protocol (TCP service 514) to download a previously-saved configuration file from a host system into the switch. Both of these services are widely available on UNIX hosts, but less so on Windows hosts. See the Telnet `configUpload` command for a description of the configuration file format.

On Windows NT, the FTP server may have to be installed from the distribution media and enabled. There are several good freeware and shareware FTP servers available for Windows NT, Windows 9x, and Windows 2000.

Two utilities are supplied to use RSHD on Windows NT, Windows 9x, or Windows 2000: *Rshd.exe* and *Cat.exe*. The FTP server or RSHD must be running before a download can occur.

The `configDownload` command may be invoked without any parameters, in which case the user is prompted for input, including choice of FTP or RSHD. If invoked with three parameters RSHD is used, otherwise presence of the fourth parameter (FTP password) selects FTP. [Figure 8-4](#) and [Figure 8-5](#) show a generic example of the `configDownload` command.

```
switch:admin>configDownload
Server Name or IP Address [host]:
IP Address for Server:
IP Address for Server:
IP Address for Server:
User Name [user]:
File Name [config.txt]:
Protocol (RSHD or FTP) [rshd]:
```

Figure 8-4: configDownload command example 1

If the download fails, it is due to one of the following reasons.

- The switch does not recognize the host name.
- The host IP address cannot be contacted.
- The user does not have permission on the host.
- The user runs a script that prints something at login.
- The file does not exist on the host.
- The file is not a switch configuration file.
- The RSHD or FTP server is not running on the host.
- The configuration data contains errors.

**NOTE:** The switch identity cannot be changed by configDownload. Parameters such as the switch name and IP address are ignored. They are the lines in the configuration file, which begin “boot”.

**NOTE:** A licenseKey is only accepted if the boot.mac line matches the WWN of the switch performing the download; otherwise it is ignored.

The download process is additive, for example, the lines read from the file are added to the current switch configuration. It is therefore possible to change a single configuration variable by downloading a file with a single line. All other variables remain unchanged.

This is particularly important to understand when downloading a zoning configuration. Since the new zoning information is added to the current configuration there may not be any conflicts. If the current zoning configuration is to be replaced, then the key word “clear:” may be inserted into the configuration file immediately before the zoning lines.

```
switch:admin>configDownload  
"citadel","jdoe","config.txt";"  
Committing configuration...done  
download complete
```

Figure 8-5: configDownload command example 2



# *Appendix* **A**

## **Telnet Commands**

This appendix contains information and examples for managing and monitoring Compaq StorageWorks Fibre Channel SAN Switches using Telnet using:

- [QuickLoop-Specific Telnet Commands, page A-2](#)
  - ❑ [QuickLoop Management Commands, page A-2](#)
  - ❑ [QuickLoop Zoning Commands, page A-8](#)
  - ❑ [QuickLoop Fabric Assist Mode Commands, page A-11](#)
- [Fabric Operating System and QuickLoop Telnet Commands, page A-17](#)
  - ❑ [General Commands, page A-17](#)
  - ❑ [Diagnostic Commands, page A-93](#)
  - ❑ [Routing Commands, page A-112](#)
  - ❑ [License Commands, page A-129](#)
- [Zone-Specific Telnet Commands, page A-130](#)
  - ❑ [Zone Alias Commands, page A-131](#)
  - ❑ [Zone Configuration Commands, page A-133](#)
  - ❑ [Zone Commands, page A-136](#)
  - ❑ [Configuration Management Commands, page A-139](#)
  - ❑ [QuickLoop Zoning Commands, page A-140](#)
- [Fabric Watch Telnet Commands, page A-140](#)
- [Management Server Telnet Commands, page A-146](#)
- [Grouping Telnet Commands, page A-151](#)

You can configure, operate, and test the switch using the following commands and settings through the Telnet interface.

**NOTE:** Screen displays in this appendix are generic. Your display will vary depending on your configuration, licenses, and port type.

## QuickLoop-Specific Telnet Commands

QuickLoop-specific Telnet commands are used to manage the QuickLoop topology. This section contains information and descriptions about the following types of commands:

- [QuickLoop Management Commands, page A-2](#)
- [QuickLoop Zoning Commands, page A-8](#)
- [QuickLoop Fabric Assist Mode Commands, page A-11](#)

## QuickLoop Management Commands

QuickLoop management commands are used to manage and configure QuickLoops in the fabric. [Table A-1](#) provides a brief description of the commands covered in this section:

**Table A-1: QuickLoop Management Commands**

Command	Description
<a href="#">qlDisable</a>	Disables QuickLoop mode
<a href="#">qlEnable</a>	Enables QuickLoop mode
<a href="#">qlPortDisable</a>	Sets a port to fabric mode
<a href="#">qlPortEnable</a>	Sets a port to QuickLoop mode
<a href="#">qlPartner</a>	Prints and sets QuickLoop partner
<a href="#">qlPortShowAll</a>	Print QuickLoop port information
<a href="#">qlShow</a>	Displays current QuickLoop configuration
<a href="#">qlStatsShow</a>	Displays QuickLoop statistics
<a href="#">qlHelp</a>	Displays list of QuickLoop commands

### **qlDisable**

[Figure A-1](#) shows the `qlDisable` command, which disables QuickLoop. This command resets the switch to fabric mode and reenables the ports as U\_Ports.

```
admin> qlDisable
Setting switch to Fabric mode,
Committing configuration...done.
Re-enable FL_Ports
```

Figure A-1: qlDisable command example

### qlEnable

Figure A-2 shows the qlEnable command, which enables QuickLoop. This command sets the switch to QuickLoop mode.

```
admin> qlEnable
Setting switch to QuickLoop mode,
Committing configuration...done.
Initialize QuickLoop
```

Figure A-2: qlEnable command example

### qlPortDisable

Figure A-3 shows the qlPortDisable command, which sets a port on a switch to fabric mode.

```
admin> qlPortDisable 6
Setting port to Fabric mode,
Committing configuration...done.
De-activate looplet 6
```

Figure A-3: qlPortDisable command example

### qlPortEnable

Figure A-4 shows the qlPortEnable command, which sets a port on a switch to QuickLoop mode.

```
admin> qlPortEnable 6
Setting port to QuickLoop mode,
Committing configuration...done.
Activate looplet 6
```

Figure A-4: qlPortEnable command example

## qlPartner

Figure A-5 shows the qlPartner command, which prints and sets the QuickLoop partner. For a dual-switch QuickLoop, both switches must have the Fabric Operating System license installed. Issue the qlPartner command on both switches by including the WWN of the remote switch. To set QuickLoop in single-switch mode, include a zero (0) with the command (refer to Figure A-5).

```
admin> qlPartner 0
Setting QuickLoop to single-switch mode,
Committing configuration...done.

admin> qlPartner
QuickLoop is in single-switch mode, partner is not specified.

admin> qlPartner "10:00:00:60:69:10:02:0d"
Setting QuickLoop to dual-switch mode,
Committing configuration...done.

admin> qlPartner
QuickLoop is in dual-switch mode, partner is
10:00:00:60:69:10:02:0d.
```

Figure A-5: qlPartner command example

## qlPortShowAll

Figure A-6 shows the qlPortShowAll command, which displays the following QuickLoop port information:

QuickLoop Mode:

- Enabled—QuickLoop mode enabled
- Disabled—QuickLoop mode disabled

Looplet state:

- Online—Completed loop initialization
- Lipped—NL\_port lipped
- Lipping—FL\_port lipped
- Initializing—Loop initialization in progress
- Bypassed—Looplet being bypassed

- Error—Error found in this looplet
- Offline—Looplet offline
- Fabric—OLD\_PORT state
- Not in QuickLoop Mode—Port is not in QuickLoop mode.

Figure A-6 displays QuickLoop port information:

```
sw5:admin> qlPortShowAll
```

PortNum	QuickLoop Mode	Port State	
0	Disabled	----	E PORT
1	Disabled	----	
2	Disabled	----	
3	Enabled	offline	
4	Disabled	----	E PORT
5	Disabled	----	
6	Disabled	----	E PORT
7	Disabled	----	
8	Disabled	----	E PORT
9	Disabled	----	
10	Disabled	----	
11	Disabled	----	
12	Disabled	----	E PORT
13	Disabled	----	
14	Disabled	----	
15	Disabled	----	

Figure A-6: qlPortshowAll command example

## qlShow

Figure A-7 shows the qlShow command, which displays the current QuickLoop configuration. In this example, QuickLoop is in the dual-switch mode. Table A-2 describes the command fields.

**NOTE:** Port 10 is missing as part of the QuickLoop configuration because port 10 is actually an E\_Port cascaded to another switch.

```

admin> qlShow
Self:          10:00:00:60:69:10:02:09 domain 1
Peer:          10:00:00:60:69:10:02:0d domain 2
State:         Master
Scope:         dual
AL_PA bitmap:  18000000 00000000 00000000 000000ff
Remote AL_Pas
[021600]:     e2 e4 e8 ef
[021700]:     04
[021900]:     da dc e0 e1
Local AL_Pas
[011900]:     02
Local looplet states
Member: 0    1    2    3    4    5    6    7    8    9    11   12   13   14   15
Online: -    -    -    -    -    -    -    -    -    9    --   --   --   --
Looplet 0:   offline
Looplet 1:   offline
Looplet 2:   offline
Looplet 3:   offline
Looplet 4:   offline
Looplet 5:   offline
Looplet 6:   offline
Looplet 7:   offline
Looplet 8:   offline
Looplet 9:   offline
Looplet 10:  offline
Looplet 11:  offline
Looplet 12:  offline
Looplet 13:  offline
Looplet 14:  offline
Looplet 15:  offline
    
```

Figure A-7: qlShow command example

**Table A-2: qlShow Command Field Descriptions**

Field	Description
Self	The local switch with its WWN and domain number
Peer	The remote switch with its WWN and domain number (if QuickLoop is in a dual-switch mode)
State	Indicates if the local switch is the master or nonmaster
Scope	Indicates if the QuickLoop mode is dual or single
AL_PA bitmap	All AL_PAs in the QuickLoop
Remote AL_PAs	The looplets and devices in QuickLoop mode on the remote switch
Local AL_PAs	The looplets and devices in QuickLoop mode on the local switch
Local looplet states	The looplets, member switch ports, online QuickLoop ports, and looplet port status

### qlStatsShow

Figure A-8 shows the qlStatsShow command. This command displays the following QuickLoop switch statistics:

- Last QL init time: Time of last QuickLoop initialization
- QL init attempted: Number of QuickLoop initialization attempts
- QL init succeeded: Number of times QuickLoop is initialized
- Single switch QL: Number of times as single-switch QuickLoop
- Dual switch QL: Number of times as dual-switch QuickLoop
  - NOTE:** The numbers for single- and dual-switch statistics are only valid when two switches are configured to run as peers in QuickLoop.
- QL enabled: Number of times QuickLoop is enabled
- QL disabled: Number of times QuickLoop is disabled
- Port caused QL init: Port that caused last QuickLoop initialization

```
IS32_1:admin> qlstatsshow
Quick loop statistics for switch 231
Last QL init time      : Jan 1 00:00:00.000
QL init attempted     : 0
QL init succeeded      : 0
Single switch QL      : 0
Dual switch QL        : 0
QL enabled             : 0
QL disabled           : 0
Port started last init : 0 on switch 0
```

Figure A-8: qlStatsShow command example

### qlHelp

The qlHelp command displays a list of QuickLoop commands.

## QuickLoop Zoning Commands

QuickLoop Zoning commands are used to manage and configure QuickLoop zones. [Table A-3](#) provides a brief description of the commands covered in this section:

**Table A-3: QuickLoop Zoning Commands**

Command	Description
<a href="#">qloopAdd</a>	Add a member to a QuickLoop
<a href="#">qloopCreate</a>	Creates a QuickLoop
<a href="#">qloopDelete</a>	Deletes a QuickLoop
<a href="#">qloopRemove</a>	Removes a member from a QuickLoop
<a href="#">qloopShow</a>	Shows QuickLoop information

### qloopAdd

[Figure A-9](#) shows the qloopAdd command. Use this command to add one or more members to an existing QuickLoop. When a configuration is enabled, all QuickLoops defined in the configuration must resolve to one or two switch WWNs.

The following operands are required:

- **qloopName**: Name of QuickLoop, in quotes.
- **qloopMemberList**: List of QuickLoop members, in quotes, separated by semicolons. Can include one or more of the following:
  - WWNs
  - Zone alias names

To add an alias for a second worldwide name to “qlp1”:

```
sw5:admin> qloopAdd "qlp1","wwn2"
```

Figure A-9: qloopAdd command example

### qloopCreate

Figure A-10 shows the qloopCreate command. Use this command to create a QuickLoop. A QuickLoop name is a C-style name beginning with a letter and followed by any number of letters, digits, and underscore characters. Names are case sensitive, for example “Qloop\_1” indicates a different QuickLoop than “qloop\_1”. Blank spaces are ignored.

The QuickLoop member list must have one or two members. An empty list is not allowed. When a configuration is enabled, all QuickLoops defined in the configuration must resolve to a maximum of two switch WWNs.

The following operands are required:

- **qloopName**: Name of QuickLoop to be created, in quotes. Name cannot be used for another zone object.
- **qloopMemberList**: List of members to be added to QuickLoop, in quotes, separated by semicolons. Can be one or more of the following:
  - WWNs
  - Zone alias names

To create two QuickLoops, a single switch and one dual switch:

```
sw5:admin> qloopCreate "qlp1", "10:00:00:60:69:00:60:11"
sw5:admin> qloopCreate "qlp2", "wwn2; wwn3"
```

Figure A-10: qlCreate command example

## **qloopDelete**

Figure A-11 shows the `qloopDelete` command. Use this command to delete a QuickLoop. When a configuration is enabled, all QuickLoops defined in the configuration must resolve to a maximum of two switch WWNs.

The following operand is required:

■ `qloopName`: Name of QuickLoop, in quotes.

To delete QuickLoop “qlp2”:

```
sw5:admin> qloopDelete "qlp2"
```

Figure A-11: `qloopDelete` command example

## **qloopRemove**

Figure A-12 shows the `qloopRemove` command. Use this command to remove one or more members from a QuickLoop.

The member list is identified through an exact string match; therefore, when removing multiple members, order is important. For example, if a QuickLoop contains “wwn2; wwn3; wwn4”, removing “wwn3; wwn4” succeeds, but removing “wwn4; wwn3” fails.

If all members are removed, the QuickLoop is deleted. When a configuration is enabled, all QuickLoops defined in the configuration must resolve to one or two switch WWNs.

The following operands are required:

- `qloopName`: Name of QuickLoop, in quotes.
- `qloopMemberList`: List of QuickLoop members to be removed, in quotes, separated by semicolons. Can be one or more of the following:
  - WWNs
  - Zone alias names

To remove member “wwn2” from “qlp1”:

```
sw5:admin> qloopRemove "qlp1", "wwn2"
```

Figure A-12: `qloopRemove` command example

## qloopShow

Figure A-13 shows the qloopShow command. Use this command to display QuickLoop configuration information. If no parameters are specified, all zone configuration information (defined and enabled) is displayed. See [configShow, page A-34](#) for a description of this display.

If a parameter is specified, it is used as a pattern to match QuickLoop names; those that match in the defined configuration are displayed.

The following operand is optional:

**pattern:** A POSIX style regular expression used to match QuickLoop names.

Patterns may contain:

- ❑ Question mark “?” that matches any single character.
- ❑ Asterisk “\*” that matches any string of characters.
- ❑ Ranges “[0-9a-f]” that match any character within the range.

To display all QuickLoops beginning with the letter “q”:

```
sw5:admin> qloopShow "q*"
qloop: qlp1    10:00:00:60:69:00:60:11
              10:00:00:60:69:00:30:02
qloop: qlp2    10:00:00:60:69:00:60:13
```

Figure A-13: qloopShow command example

## QuickLoop Fabric Assist Mode Commands

QuickLoop Fabric Assist Mode commands allow you to manage and configure the Fabric Assist mode.

**NOTE:** Fabric Assist mode can be accessed simultaneously from different connections, by telnet or the web. If this happens, changes from one connection might not be updated to the other, and some may be lost. If “Committing configuration...” displays during a telnet session, the configuration may have been modified from another connection.

The Telnet commands for administering Fabric Assist mode zones and hosts operating in Fabric Assist mode are summarized in [Table A-4](#).

**Table A-4: QuickLoop Fabric Assist Mode Commands**

Command	Description
<a href="#">fazoneAdd</a>	Adds members to an existing Fabric Assist mode zone
<a href="#">fazoneCreate</a>	Creates a Fabric Assist mode zone
<a href="#">fazoneDelete</a>	Deletes an existing Fabric Assist mode zone
<a href="#">fazoneRemove</a>	Removes members from an existing Fabric Assist mode zone
<a href="#">faShow</a>	Shows the port ID of each private Fabric Assist mode host on the switch and the list of each zoned target port ID on the fabric, with its assigned phantom AL_PA value
<a href="#">faStatsShow</a>	Displays a set of statistics for each Fabric Assist mode host on the switch

### **fazoneAdd**

[Figure A-14](#) and [Figure A-15](#) show the `fazoneAdd` command. This command adds one or more members to an existing Fabric Assist zone. `fazoneName` is the name of an existing Fabric Assist zone. `fazoneMemberList` is a list, separated by semicolons, of one or more of the following:

- Physical fabric port numbers
- WWNs
- Zone alias names
- Exactly one Fabric Assist host member

**NOTE:** This command does not change the defined configuration (which you can view using the `cfgShow` command) until the `cfgSave` command is issued. For the change to become effective, an appropriate Fabric Assist zone configuration must be enabled using the `cfgEnable` command. For the change to be preserved across switch restarts, it must be saved to nonvolatile memory using the `cfgSave` command.

The following operands are required:

- `fazoneName`: A name for the Fabric Assist zone in quotation marks.
- `fazoneMember`: A list of Fabric Assist Zone members. The list must be enclosed in quotation marks, and each member must be separated by a semicolon.

To add aliases for some disk arrays to “Blue\_fazone”:

```
sw5:admin> fazoneAdd “Blue_fazone”, “array3; array4; array5”
```

Figure A-14: fazoneAdd command example 1

To add a Fabric Assist host member to “Blue\_fazone”:

```
sw5:admin> fazoneAdd “Blue_fazone”, “H{5,6}”
```

Figure A-15: fazoneAdd command example

### **fazoneCreate**

[Figure A-16](#) shows the `fazoneCreate` command. This command creates a new Fabric Assist zone. `fazoneName` is a name for the new Fabric Assist zone. The name cannot have been previously used for any other Fabric Assist zone object. `fazoneMemberList` is a list, separated by semicolons, of one or more of the following:

- Physical fabric port numbers
- WWNs
- Fabric Assist zone alias names
- Exactly one Fabric Assist host member

A Fabric Assist zone name is a C language-style name. It is a name beginning with a letter and followed by any number of letters, digits and underscore characters. Names are case sensitive, for example “Zone\_1” and “zone\_1” are different Fabric Assist zones. Blank spaces are ignored.

The Fabric Assist zone member list has at least one member (empty lists are not allowed). Physical fabric port numbers are specified as a pair of decimal numbers “s,p” where “s” is the switch number (domain ID) and “p” is the port number on that switch. For example, “2,12” specifies port 12 on switch number 2.

When a Fabric Assist zone member is specified by physical fabric port number, then any and all devices connected to that port are in the Fabric Assist zone. If this port is an arbitrated loop, then all devices on the loop are in the Fabric Assist zone. WWNs are specified as eight hex numbers separated by colons, for example “10:00:00:60:69:00:00:8a”. Zoning has no knowledge of the fields within a WWN; the eight bytes are simply compared with the Node and Port names presented by a device in a login frame (FLOGI or PLOGI).

When a Fabric Assist zone member is specified by Node Name, then all ports on that device are in the Fabric Assist zone. When a Fabric Assist zone member is specified by Port Name, only that single device port is in the Fabric Assist zone. Zone alias names have the same format as Fabric Assist zone names and are created with the `aliCreate` command. The alias must resolve to a list of one or more physical fabric port numbers, WWNs, or a Fabric Assist host.

A Fabric Assist host member is defined by enclosing the physical fabric port number or a physical device number (a WWN) between “H{” and “}”. For example, “H{5,6}” or “H{10:00:00:60:69:00:00:8a}”. The type of Fabric Assist zone members used to define a Fabric Assist zone may be mixed and matched. For example, a Fabric Assist zone defined with the following members: “2,12; 2,14; 10:00:00:60:69:00:00:8a” contains devices connected to switch 2, ports 12 and 14, and the device with a WWN of “10:00:00:60:69:00:00:8a” (either Node Name or Port Name - whichever port in the fabric to which it is connected.)

**NOTE:** This command does not change the defined configuration (which you can view using the `cfgShow` command) until the `cfgSave` command is issued. For the change to become effective, an appropriate Fabric Assist zone configuration must be enabled using the `cfgEnable` command. For the change to be preserved across switch restarts, it must be saved to nonvolatile memory using the `cfgSave` command.

The following operands are required:

- `fazoneName`: A name for the Fabric Assist zone in quotes.
- `fazoneMemberList`: A semicolon-separated list of members in quotes.

To create three Fabric Assist zones using a mixture of port numbers and Fabric Assist zone aliases:

```
sw5:admin> fazoneCreate "Red_fazone", "H{1,0}; loop1"  
sw5:admin> fazoneCreate "Blue_fazone", "H{1,1}; array1; 1,2; array2"  
sw5:admin> fazoneCreate "Green_fazone", "1,0; loop1; H{1,2}; array2"
```

Figure A-16: `fazoneCreate` command example

### **fazoneDelete**

Figure A-17 shows the `fazoneDelete` command. Use this command to delete an existing Fabric Assist mode zone on a fabric.

The following operand is required:

**fazoneName:** Name for the zone to be deleted, in quotes.

**NOTE:** This command does not change the defined configuration (which you can view using the `cfgShow` command) until the `cfgSave` command is issued. For the change to become effective, an appropriate Fabric Assist zone configuration must be enabled using the `cfgEnable` command. For the change to be preserved across switch restarts, it must be saved to nonvolatile memory using the `cfgSave` command.

The following entry deletes Fabric Assist mode zone “02”:

```
sw5:admin> fazoneDelete “FaZone02”
```

Figure A-17: `fazoneDelete` command example

### **fazoneRemove**

[Figure A-18](#) shows the `fazoneRemove` command. This command removes one or more members from an existing Fabric Assist zone. `fazoneName` is the name of an existing Fabric Assist zone. `fazoneMemberList` is a list, separated by semicolons, of one or more of the following:

- Physical Fabric port numbers
- WWNs
- Fabric Assist alias names
- Exactly one Fabric Assist host member

The member list is found by an exact string match. Order is important when removing multiple members of a Fabric Assist zone. For example, if a Fabric Assist zone contains “array2; array3; array4” then removing “array4; array3” fails, but removing “array3; array4” succeeds. If issuing this command results in all members being removed, the Fabric Assist zone is deleted.

**NOTE:** This command does not change the defined configuration (which you can view using the `cfgShow` command) until the `cfgSave` command is issued. For the change to become effective, an appropriate Fabric Assist zone configuration must be enabled using the `cfgEnable` command. For the change to be preserved across switch restarts, it must be saved to nonvolatile memory using the `cfgSave` command. The following operands are required:

The following operands are required:

- **fazoneName:** A name for the Fabric Assist zone in quotes.
- **fazoneMemberList:** A semicolon-separated list of members in quotes.

To remove “array2” from “Blue\_fazone”

```
sw5:admin> fazoneRemove “Blue_fazone”, “array2”
```

Figure A-18: fazoneRemove command example

### **faShow**

Figure A-19 shows the **faShow** command, which displays the port ID of each private Fabric Assist mode host on the switch, along with a listing of each zoned target port ID and assigned phantom AL\_PA value. If the **faShow** command is issued prior to any Fabric Assist mode host loop going online, then the message is displayed indicating that no Fabric Assist mode hosts exist on this switch.

This command works only when invoked on a switch that contains an active Fabric Assist mode private host loop. Issuing this command on a switch without a Fabric Assist mode private host loop causes a message to be displayed indicating that no Fabric Assist mode hosts exist on the switch.

Figure A-19 displays the port ID of each Fabric Assist mode host on switch sw5:

```
sw5:admin> faShow
```

Figure A-19: faShow command example

### **faStatsShow**

Figure A-20 shows the **faStatsShow** command, which displays a set of statistics for each Fabric Assist mode host on the switch. The total number of times that the private host loop was reinitialized due to Fabric Assist mode zoning is displayed. The last target port ID that was responsible for the latest Fabric Assist mode initialization is also indicated.

Figure A-20 displays the statistics of each Fabric Assist mode host on switch sw5:

```
sw5:admin> faStatsShow
```

Figure A-20: faStatsShow command example

## Fabric Operating System and QuickLoop Telnet Commands

The following categories of commands are described in this section:

- [General Commands, page A-17](#)
- [Diagnostic Commands, page A-93](#)
- [Routing Commands, page A-112](#)
- [License Commands, page A-129](#)

### General Commands

You can control basic switch operations using the commands defined in this section.

#### **agtcfgSet**

[Figure A-21](#) shows the `agtcfgSet` command, which is used to set the SNMP agent configuration to a Fibre Channel switch. [Table A-5](#) describes the fields.

**NOTE:** Any change to the SNMP configuration is not shown until you restart the switch.

```
admin> agtcfgSet

Customizing MIB-II system variables ...

At each prompt, do one of the following:
 <Return> to accept current value,
 enter the appropriate new value,
 <Control-D> to skip the rest of configuration, or
 <Control-C> to cancel any change.

To correct any input mistake:
<Backspace> erases the previous character,
<Control-U> erases the whole line,
sysDescr: [Fibre Channel Switch]
sysLocation: [End User Premise]
sysContact: [Field Support]
authTrapsEnabled (true, t, false, f): [false]

SNMP community and trap recipient configuration:
Community: [Secret C0de]
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [OrigEquipMfr]
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [private]
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [public]Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [common]
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [FibreChannel]
Trap Recipient's IP address in dot notation: [0.0.0.0]
```

Figure A-21: agtcfgSet command example

## agtcfgShow

Figure A-22 shows the `agtcfgShow` command, which displays the SNMP agent configuration. The fields are described in Table A-5.

```
admin> agtcfgShow
Current SNMP Agent Configuration
Customizable MIB-II system variables:
SysDescr=Fibre Channel Switch
SysLocation=End User Premise
SysContact=Field Support
AuthTraps=0 (OFF)

SNMPv1 community and trap recipient configuration:
Community 1: Secret C0de (rw)
  No trap recipient configured yet
Community 2: OrigEquipMfr (rw)
  No trap recipient configured yet
Community 3: private (rw)
  No trap recipient configured yet
Community 4: public (ro)
  No trap recipient configured yet
Community 5: common (ro)
  No trap recipient configured yet
Community 6: FibreChannel (ro)
  No trap recipient configured yet
```

Figure A-22: `agtcfgShow` command example

## agtcfgDefault

Figure A-23 shows the `agtcfgDefault` command, which lets an admin user reset the configuration of the SNMP agent to factory defaults. Table A-5 describes the fields.

```

switch:admin> agtcfgDefault
Committing configuration...done.
agent configuration reset to factory default
sw5:admin> agtcfgShow
Current SNMP Agent Configuration
Customizable MIB-II system variables:
  SysDescr      =Fibre Channel Switch
  SysLocation   =End User Premise
  SysContact    =Field Support
  SwEventTrapLevel =0
  AuthTraps     =0 (OFF)
SNMPv1 community and trap recipient configuration:
Community 1: Secret C0de (rw)
  No trap recipient configured yet
Community 2: OrigEquipMfr (rw)
  No trap recipient configured yet
Community 3: private (rw)
  No trap recipient configured yet
Community 4: public (ro)
  No trap recipient configured yet
Community 5: common (ro)
  No trap recipient configured yet
Community 6: FibreChannel (ro)
  No trap recipient configured yet
sw5:admin>
    
```

Figure A-23: agtcfgDefault command example

**Table A-5: agtcfgDefault Field Descriptions**

Field	Description
sysDescr	The system description (in MIB-II definition). The default value is set as "Fibre Channel Switch."
sysLocation	The location of the switch (in MIB-II). The default value is set as "End User Premise."
sysContact	The contact information for this system (switch). The default value is set as "Field Support."

**Table A-5: agtcfgDefault Field Descriptions (Continued)**

Field	Description
swEventTrapLevel	<p>The event trap level in conjunction with an event's severity level. When an event occurs with a severity level at or below the set value, the SNMP trap swEventTrap is sent to configured trap recipients. By default, this value is set at 0, implying that no swEventTrap is sent.</p> <p>Possible values are:</p> <ul style="list-style-type: none"> <li>■ 0—None</li> <li>■ 1—Critical</li> <li>■ 2—Error</li> <li>■ 3—Warning</li> <li>■ 4—Informational</li> <li>■ 5—Debug</li> </ul>
authTraps	<p>The authentication trap authenticationFailure is transmitted to configured trap recipients when the agent receives a protocol message that is not properly authenticated. In the context of SNMPv1 and SNMPv2c, this means that a request contains a community string that is not known to the agent.</p> <p>The default value for this parameter is 0 (disabled).</p>

Six communities and respective trap recipients are supported by the agent. The first three communities are for read-write access (rw) and the last three are for read-only access (ro). The factory default value for the trap recipient of each community is 0.0.0.0. The factory default values for the community strings are:

- Secret Code
- OrigEquipMfr
- private
- public
- common
- FibreChannel

## aliasShow

Figure A-24 shows the `aliasShow` command, which displays local alias server information. If there is no local alias group, a message stating that is displayed. The command fields are described in Table A-6.

```
admin> aliasShow
The Local Alias Server has 1 entry
Alias ID Creator Token [rb, type, grptype, qlfr] Member List
fffb01 fffffd [40, 05, 10000060 69000015] {2d0113 2d0813}
```

Figure A-24: `aliasShow` command example

**Table A-6: `aliasShow` Command Field Descriptions**

Field	Description
Alias ID	The multicast address, which has the format of FFBxx, where xx is an odd number starting at 01 and continuing through 239. This is the name of the multicast group.
Creator	The Fibre Channel address ID of the N_Port that created this alias group
Creator Token	The Alias Token provided to map to the alias group. The token consists of four subfields: <ul style="list-style-type: none"> <li>■ rb—Routing bits</li> <li>■ type—Upper level application type</li> <li>■ grptype—Alias group type</li> <li>■ qlfr—Alias Qualifier of the group</li> </ul>
Member List	A list of member address IDs

## backSpace

Figure A-25 shows the `backSpace` command. This command toggles the backspace value used by the shell between the default value of hex 08 (which translates to the standard Backspace key when using Windows NT and Windows 9x), and an alternate value of hex 7F (which translates to the standard Delete key when using Windows NT and Windows 9x). The parameter can be set to “0” or “1”. When set to “0”, the standard backspace character (BACKSPACE) is used. When set to “1”, the alternate backspace character (DEL) is used. The operation may be different depending on the settings for the Backspace and Delete keys in your operating system configurations.

```
admin> backspace 0
Committing configuration...done.
BackSpace character is now BACKSPACE (hex 08)

admin> backspace 1
Committing configuration...done.
BackSpace character is now DEL (hex 7F)

admin> backspace
Committing configuration...done.
BackSpace character is DEL (hex 7F)
```

Figure A-25: backSpace command example

## configure

Figure A-26 through Figure A-28 show the `configure` command, which is used to set some of the switch configuration parameters. This command cannot be executed on an enabled switch. Disable the switch by using the `switchDisable` command.

Navigate the `configure` command by entering a series of collapsible top-level menus. Each menu divides the various switch configuration parameters into logical groups, which include:

- Fabric parameters
- Virtual Channel parameters
- Switch Operating mode
- Zoning Operation parameters
- Arbitrated Loop parameters
- System Service parameters
- Portlog Events disable/enable

Each top-level menu and its associated submenus consist of a text prompt, a list of acceptable values, and the current value (shown in brackets). The current value is used in the absence of an entered value when a carriage return is the only input entered at the prompt.

```
switch:admin> configure
Configure...

Fabric parameters (yes, y, no, n): [no]
Virtual Channel parameters (yes, y, no, n): [no]
Switch Operating Mode (yes, y, no, n): [no]
Zoning Operation parameters (yes, y, no, n): [no]
Arbitrated Loop parameters (yes, y, no, n): [no]
System services (yes, y, no, n): [no]
Portlog events enable (yes, y, no, n): [no]

No changes.
```

Figure A-26: Top-level menus for the configure command

Entering out-of-range or inappropriate values causes error messages to display and the original entry prompt to redisplay. Cancel the command at any time by sending an interrupt control character (Ctrl+C). Complete the command at any time, with the current changes saved, by sending an end-of-file control character (Ctrl+D).

```

switch:admin> configure
Configure...

Fabric parameters (yes, y, no, n): [no] yes
Domain: (1..239) [1]
BB credit: (1..16) [16]
R_A_TOV: (4000..120000) [10000]
E_D_TOV: (1000..5000) [2000]
Data field size: (256..2112) [2112]
Sequence Level Switching: (0..1) [0]
Disable Device Probing: (0..1) [0]
Suppress Class F Traffic: (0..1) [0]
SYNC IO mode: (0..1) [0]
VC Encoded Address Mode: (0..1) [1]
Disable Transitive Mode: (0..1) [0]
Core Switch PID Format: (0..1) [0]
Per-frame Route Priority: (0..1) [0]
Long Distance Fabric: (0..1) [0]

Virtual Channel parameters (yes, y, no, n): [no] yes

VC Link Control: (0..1) [0]
VC Class 2: (2..5) [2]
VC Class 3: (2..5) [3]
VC Multicast: (6..7) [7]
VC Priority 2: (2..3) [2]
VC Priority 3: (2..3) [2]
VC Priority 4: (2..3) [2]
VC Priority 5: (2..3) [2]
VC Priority 6: (2..3) [3]
VC Priority 7: (2..3) [3]

Switch Operating Mode (yes, y, no, n): [no] y

Interoperability Mode: (0..1) [0]
Zoning Operation parameters (yes, y, no, n): [no]
Arbitrated Loop parameters (yes, y, no, n): [no]
System services (yes, y, no, n): [no]
Portlog events enable (yes, y, no, n): [no]

```

Figure A-27: Top-level menus and sub-menus for the configure command (continued on next page)

```
Zoning Operation parameters (yes, y, no, n): [no] y

Standard Mode: (0..1) [0]
Enable TransactZoneManagement: (0..1) [1]
Disable NodeName Zone Checking: (0..1) [0]

Arbitrated Loop parameters (yes, y, no, n): [no] yes

Send FAN frames?: (0..1) [1]
Always Send RSCN: (0..1) [1]
Do Not Allow AL_PA 0x00
QuickLoop Soft Init?: (0..1) [0]

System services (yes, y, no, n): [no] yes

rstatd (on, off): [off] on
rusersd (on, off): [off] on
Disable RLS probing (on, off):[on]
No changes.

Portlog events enable (yes, y, no, n): [no]

ioctl (a port I/O control is executed) (on, off): [on] off
Tx (a frame is transmitted) (on, off): [off]

Committing configuration...done.
```

Figure A-27: Top-level menus and submenus example for the configure command

```
switch:admin> configure
Configure...
Fabric parameters (yes, y, no, n): [no] y
Domain: (1..239) [0] 256
integer must be between 1 and 239 - please re-enter
Domain: (1..239) [0]
BB credit: (1..27) [16] one
Input not acceptable, please re-enter
BB credit: (1..27) [16]
R_A_TOV: (4000..120000) [10000]
E_D_TOV: (1000..5000) [2000] 4900
integer must be a multiple of 1000 - please re-enter
E_D_TOV: (1000..5000) [2000] 5000
Data field size: (256..2112) [2112] ^D
Committing configuration...done.
```

Figure A-28: Configure command with inappropriate inputs

A number of parameters control the overall behavior of the fabric. Some of these values, such as the domain, are normally assigned automatically by the fabric and can be different from one switch to another in the fabric. Other parameters, such as the buffer-to-buffer credit or the timeout values, can be changed to suit particular applications or operating environments but must be in agreement among all switches to allow the fabric to form. [Table A-7](#) defines the adjustable settings which affect the fabric.

**Table A-7: Adjustable Fabric Settings**

Field	Type	Default	Range
Domain	Number	1	Varies
BB Credit	Number	16	1 - 27
R_A_TOV	Number	10000	E_D_TOV * 2 to 120000
E_D_TOV	Number	2000	1000 to R_A_TOV / 2
Data Field Size	Number	2112	256 to 2112
Sequence Level Switching	Boolean	0	0 or 1
Disable Device Probing	Boolean	0	0 or 1
Suppress Class F Traffic	Boolean	0	0 or 1
VC Encoded Address Mode	Boolean	0	0 or 1
Disable Translative Mode	Boolean	0	0 or 1
Per-frame Route Priority	Boolean	0	0 or 1
Long Distance Fabric	Boolean	0	0 or 1

**NOTE:** When employing Extended Fabric, each switch must be configured to support a long distance extended fabric. Each switch must have the Extended Fabric license installed. This is an optional license. Set the Long Distance Fabric parameter to 1.

[Table A-8](#) lists the configurable fabric parameters.

**Table A-8: Fabric Parameters**

Field	Description
Domain	The domain number identifies the switch in a fabric and can be any value between 1 and 239. The Domain should be set manually to the next unused domain ID, in order to prevent conflicting domain IDs.
BB Credit	<p>The buffer-to-buffer (BB) credit represents the number of buffers, in a range from 1 to 27, available to the host. For a complete description of this value, refer to the industry specification Fibre Channel Physical and Signaling Interface (FC-PH).</p> <ul style="list-style-type: none"> <li>■ For a regular switch port. The number of buffers reserved for the port supports links up to 10 km (16 buffer credits).</li> <li>■ For a port configured for Level 1 long-distance (up to 50 km), a total of 27 full size frame buffers are reserved for the port.</li> <li>■ For a port configured for Level 2 long-distance (up to 100 km) A total of 60 full size frame buffers are reserved for the port.</li> </ul> <p>Refer to <a href="#">portCfgLongDistance</a>, page A-62 for more information about configuring ports for long distance.</p>
<p><b>IMPORTANT:</b> When you have a switch that is fully populated with FL hosts and loop devices, and an extremely high amount of data running through that switch, change the BB credit from the default of 16 to 27. Additionally, when using Remote Switch Services, the setting for BB credit must be the same on both switches.</p>	
R_A_TOV	The Resource Allocation Time Out Value (R_A_TOV) is displayed in milliseconds. This variable works with the variable E_D_TOV to determine the switch's actions when presented with an error condition. Allocated circuit resources with detected errors are not released until the time out value has expired. If the condition is resolved prior to the time out, the internal time out clock resets and waits for the next error condition.
E_D_TOV	The Error Detect Time Out Value (E_D_TOV) is displayed in milliseconds. This timer flags a potential error condition when an expected response is not received (an acknowledgment or reply in response to packet receipt, for example) within the set time limit. If the time for an expected response exceeds the set value, then an error condition is met.

**Table A-8: Fabric Parameters (Continued)**

Field	Description
Data Field Size	The Data Field Size specifies the largest possible value, in bytes, for the size of a type 1 (data) frame. The switch advertises this value to other switches in the fabric during construction of the fabric as well as to other devices when they connect to the fabric. Setting this to a value smaller than 2112 can result in decreased performance.
Sequence Level Switching	When this feature is set to 1, frames of the same sequence from a particular source are transmitted together as a group. When this feature is set to 0, frames are transmitted interleaved among multiple sequences. Under normal conditions, Sequence Level Switching should be disabled for better performance. However, some host adapters have performance issues when receiving interleaved frames from multiple sequences.
Disable Device Probing	When device probing is disabled, devices that do not register themselves with the Name Server will not be present in the Name Server database. Set this mode only if the switch's N_Port discovery process (PLOGI, PRLI, INQUIRY) causes some attached device to fail.
Suppress Class F Traffic	Class F frame suppression: All switches participating in the Remote Switch Services, and utilizing ATM (Asynchronous Transfer Mode) must have the Class F frame suppression flag set. Class F frames are automatically converted to Class 2 frames. Set the parameter to 1 for suppression.
SYNC IO mode	Sets the switch to synchronous mode of operation. This is required to determine the presence of a link between two ATM gateways. Synchronous mode makes sure that each frame is sent only after getting a response from a previous frame.
VC Encoded Address Mode	When this mode is set, frame source and destination addresses use an address format compatible with first-generation switches. Set this mode only if the fabric includes such switches. In this mode, the maximum number of switches in a fabric is limited to 32.
Core Switch PID Format	Leave default at 0. This parameter reserved for future use.
Disable Translative Mode	This setting is only relevant if the VC Encoded Address Mode is also set. When set, this setting maintains explicit address compatibility with first-generation switches. However, enabling this feature also disables translative or phantom addressing. Set this mode only if hardware or software systems that explicitly rely on a specific frame address format are attached to the fabric.

**Table A-8: Fabric Parameters (Continued)**

Field	Description
Per-frame Route Priority	In addition to the eight virtual channels used in frame routing priority, support is also available for per-frame based prioritization. When set, the virtual channel ID will be used in conjunction with a frame header to form the final virtual channel ID.
Long Distance Fabric	<p>When this mode is set, ISLs in a fabric can be up to 100 km long. The exact distance level is determined by the per-port configuration on the E_Ports of each ISL. Both E_Ports in an ISL must be configured to run the same long distance level, otherwise, the fabric will be segmented.</p> <p><b>NOTE:</b> The Extended Fabric license is required to set Long Distance Fabric mode.</p>

Tune the switch for a specific application by configuring the parameters for the switch's eight virtual channels. The first two virtual channels are reserved for the switch's internal functions and are not user-configurable. The default virtual channel settings have already been optimized for switch performance.

---

**IMPORTANT:** Changing the default values, if properly selected, can improve switch performance somewhat, but can also severely degrade switch performance. Do not change these settings without fully understanding the effects of those changes.

---

Top-level menus and associated submenus are described in the following tables:

- Virtual Channel parameters, [Table A-9](#)
- Zoning Operation parameters, [Table A-10](#)
- Arbitrated Loop parameters, [Table A-11](#)
- System Services, [Table A-12](#)
- Portlog Events disable/enable, [Table A-13](#)

**Table A-9: Virtual Channel Parameters**

Field	Description	Default
VC Link Control	This changes the virtual channel used for N_Port-generated, Class 2 link control frames (ACKs, P_BSYs, and P_RJTs).  0-Forces N_Port-generated link control frames to be sent back using a Class 2 data virtual channel  1-Forces N_Port-generated link control frames to be sent back using a virtual channel normally reserved for fabric-internal traffic	0
VC Class 2	Sets the virtual channel used for class 2 frame traffic. Can be set to virtual channel 2, 3, 4, or 5.	2
VC Class 3	Sets the virtual channel used for class 3 frame traffic. Can be set to virtual channel 2, 3, 4, or 5.	3
VC Multicast	Sets the virtual channel used for multicast frame traffic. Verify that the multicast channel has the frame class priority set to the frame class of the expected traffic.	7
VC Priority 2-7	The numbers displayed show the priorities assigned to each of the switch's virtual channels. Allowed values are 2 or 3, indicating that the channel gives priority to either Class 2 or Class 3 frame traffic, respectively.	2 or 3

**Table A-10: Zoning Operation Parameters**

Field	Description	Default
Standard mode	Standard mode should always be set to 0. This parameter is reserved for future use.	0
Enable transactZone Management	When set to 1, only zoning changes, such as adding an alias, are sent throughout the fabric rather than resending the entire zoning definition.	1
Disable NodeName Zone Checking	With this set to 0, the user can either zone by the WWN of the Node(host or device) or by the Port WWN. By setting this to 1 the user can only zone by WWN of the port.	0

**Table A-11: Arbitrated Loop Parameters**

Field	Description	Default
Send FAN frames?	Fabric Address Notification (FAN) frames are sent by the fabric to notify public loop devices about their node ID and address. 0-No, do not send Fabric Address Notification frames. 1-Yes, send Fabric Address Notification frames.	1
Always send RSCN?	Following the completion of loop initialization, a remote state change notification (RSCN) is issued only when FL_Ports detect the presence of new devices or the absence of preexisting devices. When this feature is set, an RSCN will always be issued following the completion of loop initialization, regardless of the presence or absence of new or preexisting devices.	0
Enable CLOSE on OPEN received?	With this feature enabled (set to 1) when an OPEN is received and the switch has no available buffers, a CLOSE will be immediately sent. With this disabled (set to 0), there will be a short delay before issuing the CLOSE.	0
Do Not Allow AL_PA 0x00?	Prevents the FL_Port from using AL_PA 0x00. Set this parameter to 1 to force the FL_Port to go to the next available AL_PA upon initialization.	0

**Table A-12: System Services**

Field	Description	Default
rstatd	Dynamically enables or disables a server that returns information via remote procedure calls (RPC) about system operation information. The protocol provides for a wide range of system statistics; however, only the Ethernet interface statistics and system up time are supported. The retrieval of this information is supported by a number of operating systems that support RPC. On most UNIX-based systems (HP-UX, Irix, Linux, Solaris, and so on) the commands to retrieve the information are rup and rsysinfo. Refer to your local system documentation for the appropriate usage of the rup, rsysinfo, or equivalent commands.	off

**Table A-12: System Services (Continued)**

Field	Description	Default
usersd	Dynamically enables or disables a server that returns information via remote procedure calls (RPC) about the user logged in to the system. The information returned includes: the user login name, the system name, the login protocol or type, login time, idle time, and remote login location (if applicable). The retrieval of this information is supported by a number of operating systems that support RPC. On most UNIX-based systems (HP-UX, Irix, Linux, Solaris, and so on) the command to retrieve the information is rusers. Refer to your local system documentation for the appropriate usage of the rusers or equivalent command.	off
rapid	This is for the API it uses the "rpc.rapid" key to calculate if the RPC daemon that receives requests from API host library should be created or not. "rpc.rapid" is set to 1 by default and settable through command "configure" and uploading a config file with the key set to 0 or 1. Also by enabling or disabling using "configure" takes affect during run time. In other word, disabling removes FAL related RPC daemons and enabling creates them as you exit "configure"	on
Disable RLS probing	This will turn off the Read Link Error Status (RLS) probing from the switch.	on

**Table A-13: Portlog Events Disable/Enable**

Field	Description	Default
Portlog events enable	Enabling Portlog events sets a filter for the portlogdump, for troubleshooting purposes. Turning off any of the parameters filters them out of the portlogdump.	no
start	A switch start or re-start event	on
disable	A port is disabled	on
enable	A port is enabled	on
ioctl	A port I/O control is executed	on
Tx	A frame is transmitted	on
Tx1	A frame is transmitted, Class 1	on
Tx2	A frame is transmitted, Class 2	on
Tx3	A frame is transmitted, Class 3	on
Rx	A frame is received	on
Rx1	A frame is received, Class 1	on

**Table A-13: Portlog Events Disable/Enable (Continued)**

Field	Description	Default
Rx2	A frame is received, Class 2	on
Rx3	A frame is received, Class 3	on
stats	Port status or statistics	on
scn	A state change notification	on
pstate	A port changes physical state	on
reject	A received frame is rejected	on
busy	A received frame is busied	on
ctin	A CT based request is received	on
ctout	A CT based response is transmitted	on
errlog	A message is added to the error log	on
loopscn	A loop state change notification	on
create	A task is created	on
debug	A generic debug info	on
nbrfsm	Neighbor state transition	on
timer	A timer is running	on

**configShow**

The `configShow` command displays the current settings of configurable switch parameters. [Figure A-29](#) shows the operation of the command. The output of the command is divided into two sections: the first displays the start settings and the second displays other configuration parameters, most of which are set from the `configure` command.

```
switch:admin> configShow
Ethernet address: 0:60:69:0:60:10
Nvram data: fei(0,0)host/usr/switch/firmware e=192.168.1.2
g=192.168.1.254
u=user tn=switch
Type <CR> to continue, Q<CR> to stop:
diag.postDisable:
fabric.domain: 1
fabric.ops.BBCredit: 16
fabric.ops.E_D_TOV:2000
fabric.ops.R_A_TOV:10000
fabric.ops.dataFieldSize:2112
fabric.ops.mode.fcpProbeDisable:0
fabric.ops.mode.isolate:0fabric.ops.mode.noClassF:0
fabric.ops.mode.tachyonCompat: 0
fabric.ops.mode.unicastOnly: 0
fabric.ops.mode.useCsCtl:0
fabric.ops.mode.vcEncode:0
fabric.ops.vc.class.2: 2
fabric.ops.vc.class.3: 3
fabric.ops.vc.config: 0xc0
fabric.ops.vc.linkCtrl: 0
fabric.ops.vc.multicast:7
fc4.fclp.address:0.0.0.0
fc4.fclp.mask: 0.0.0.0
fcAL.alwaysSendRSCN:1
fcAL.fanFrameDisable:0
fcAL.useAltBBCredit:0
lcdContrast:128
lcdContrast.orange:208
licenseKey:none
route.delayReroute:0
route.embeddedPortBcast:1
route.stickyRoutes:0
rpc.rstatd:0
rpc.rusersd:0
xrelativeModeDisable:0
```

Figure A-29: configShow command example

## configDefault

Figure A-30 shows the configDefault command, which resets some of the switch configuration values to their factory default values. This command also configures the switch to start from its internal firmware if it has been previously configured to start from the network. This command cannot be executed on an enabled switch; you must first disable the switch using the switchDisable command.

```
switch:admin> configDefault
Committing configuration...done.
```

Figure A-30: configDefault command example

Because the switch caches some configuration parameters, restart the switch immediately following the execution of the configDefault command, otherwise unexpected behavior can result. With the exception of the following, all configuration parameters are reset to their default values:

- WWN
- Ethernet MAC address
- Ethernet IP address and subnetmask
- IP gateway address
- SNMP configuration
- Zoning configuration
- License keys
- System name

## configDownload

Figure A-31 shows the configDownload command. The switch configuration file (including zoning) may be downloaded from a host using either FTP or RSHD.

```
switch:admin>configDownload
Server Name or IP Address [host]:
IP Address for Server:
IP Address for Server:
IP Address for Server:
User Name [user]:
File Name [config.txt]:
Protocol (RSHD or FTP) [rshd]:
```

Figure A-31: configDownload command example

## configUpload

Figure A-32 shows the configUpload command. The switch configuration file (including zoning) may be uploaded from a host using either FTP or RSHD.

```
switch:admin>configUpload
Server Name or IP Address [host]:
IP Address for Server:
User Name [user]:
File Name [config.txt]:
Protocol (RSHD or FTP) [rshd]:
```

Figure A-32: configUpload command example

## date

Figure A-33 shows the date command, which displays the system date and time. To set the date and time:

1. Type the date command followed by the date in the format “mmddHHMMyy” where:

- mm is month
- dd is the day
- HH is the hour
- MM is the minutes
- yy is the year.

The system is year-2000 compliant, where 00 through 69 equals 20xx and 70 through 99 equals 19xx.

2. Press Enter to set the date and time.

```
admin> date
Mon Jul 7 08:48:01 1997
value = 25 = 0x19
admin> date "060811241998"
Mon Jun 8 11:24:00 1998
```

Figure A-33: date command example

## dlsShow

Figure A-34 shows the `dlsShow` command, which indicates whether Dynamic Load Sharing (DLS) is on or off.

```
switch:admin> dlsShow
DLS is set
```

Figure A-34: `dlsShow` command example

## errDisplayFilter

Figure A-35 shows the `errDisplayFilter` command, which displays or sets the level of errors that are shown on the front panel display. Errors with a higher level (lower severity) than the specified value are stored in the error log but are not shown on the display. With no parameters, the current level is displayed. With a parameter, the new filtering level is set.

**NOTE:** This command is used only for switches with a front panel display.

Error levels are as follows:

1. critical
2. error
3. warning
4. information
5. debug

The following operand is optional:

**level:** The new filtering level.

Figure A-35 displays the current filter level, then changes it to “3” so that information and debug levels will not be displayed on the front panel.

```
sw5:admin> errDisplayFilter
All errors will be reported on the front panel.
sw5:admin> errDisplayFilter 3
Committing configuration...done.
```

Figure A-35: `errDisplayFilter` command example

## errDump

Figure A-36 shows the `errDump` command, which prints the contents of the error log with no page breaks.

```
switch:admin> errDump
Error 02
-----0x103dc470 (tSilkworm): Apr 9 10:41:06
Error SENSOR-FAILED, 3, sensor 7 (Fan 2) is below minimum
Error 01
-----0x103dc470 (tSilkworm): Apr 9 10:40:51
Error DIAG-TIMEOUT, 1,
Port 2 receive timeout.
```

Figure A-36: `errDump` command example

## errShow

Figure A-37 shows the `errShow` command, which displays all detected errors. The error log stores the last 30 error types sensed by the switch. The log shows:

- Error number (01 to 30)
- Date and time the first occurrence of each error type was sensed
- Total number of occurrences of each error type (up to 999)
- Error type
- Error level for each error type:
  - 0-Panic (When this level is reached, the switch automatically restarts and the display no longer shows the error.)
  - 1-Critical
  - 2-Error
  - 3-Warning
  - 4-Debug

```
admin> errShow
Error 02
-----
0x103dc470 (tSilkworm): Apr 9 10:41:06
  Error SENSOR-FAILED, 3, sensor 7 (Fan 2) is below minimum
Type <CR> to continue, Q<CR> to stop:
Error 01
-----
0x103dc470 (tSilkworm): Apr 9 10:40:51
  Error DIAG-TIMEOUT, 1,
  Port 2 receive timeout.
Type <CR> to continue, Q<CR> to stop:
```

Figure A-37: errShow command example

### **fabricShow**

Figure A-38 shows the fabricShow command, which displays a list of switches and multicast alias groups in a fabric. Table A-14 describes the fields.

```
admin> fabricShow
```

Switch ID	Worldwide Name	Enet IP Addr	FC IP Addr	Name
0: fffc40	10:00:00:60:69:00:10:63	192.168.1.1	0.0.0.0	"sw1"
1: fffc41	10:00:00:60:69:00:0a:12	192.168.1.2	0.0.0.0	"sw2"
2: fffc42	10:00:00:60:69:00:01:b4	192.168.1.3	0.0.0.0	>"sw3"

Figure A-38: fabricShow command example

**Table A-14: fabricShow Command Field Descriptions**

Fabric Element	Description
switch n	Each line shows the following information for the switch: <ul style="list-style-type: none"> <li>■ domain ID (0 - 31)</li> <li>■ embedded port ID</li> <li>■ WWN</li> <li>■ Ethernet and FC IP addresses</li> <li>■ name (a greater than [&gt;] symbol indicates the principle switch in the fabric)</li> </ul>
multicast alias group	Each line shows: <ul style="list-style-type: none"> <li>■ The alias group number (0-30)</li> <li>■ The alias group ID</li> <li>■ The alias token</li> </ul> Alias groups are only created on demand by requests to the alias server. Typically no groups are listed.

### fakeModel

Figure A-39 shows the `fakeModel` command, which changes the view of the switch from the default model to an alternate model to ensure compatibility between new switch models and older versions of firmware within the same fabric. The command allows new switch models to be viewed as a similar but alternate model in the fabric window of Web Management Tools. This is only necessary in fabrics with mixed firmware, with some switches running firmware earlier than v2.1.

A similar alternate model should be used. For example, an 8-port model should be used for an 8-port representation. When the switch is selected, the actual switch model is displayed, regardless of the `fakeModel` setting. Table A-15 shows `fakeModel` parameters.

**NOTE:** This command is not included in the help list of commands.

```
admin> fakeModel
Fakemodel number is 1

admin> fakeModel 0
Committing configuration...done.
```

Figure A-39: `fakeModel` command example

**Table A-15: fakeModel Parameters**

Value	Description
None	Current setting is displayed
0	Sets the switch to the actual model type
1	Sets the switch model to Fibre Channel SAN Switch 8-EL
2	Sets the switch model to Fibre Channel SAN Switch 16
3	Sets the switch model to Fibre Channel SAN Switch 8

### fanShow

Figure A-40 shows the fanShow command, which displays the current status of the switch fans. The format of the display varies according to the switch model and number of fans present. The status of each fan is shown as:

- OK—Fan is functioning correctly
- Absent—Fan is not present
- Below minimum—Fan is present but not rotating or rotating too slowly

```
admin> fanShow
Fan 1 is OK, speed is 8460 RPM
Fan 2 is OK, speed is 8220 RPM
Fan 3 is OK, speed is 8340 RPM
Fan 4 is OK, speed is 8850 RPM
```

Figure A-40: fanShow command example

### fastboot

Figure A-41 shows the fastboot command, which is a warm restart that bypasses Power On Self-Test (POST) and takes about one minute to restart the switch. The switch can be in any operational state (enabled or disabled) before restarting.

```
admin> fastboot
Rebooting...
```

Figure A-41: fastboot command example

### **firmwareDownload**

The `firmwareDownload` command downloads firmware into flash memory. This command can be executed on an operational switch. A restart is required to initiate the new firmware after the download has completed.

Firmware can be downloaded from a UNIX host, Windows 95 host, or Windows NT host. For a UNIX host, no special software is needed. For Windows 95 or Windows NT, a daemon to support an RSH is required. Firmware is downloaded through an RCP command running on top of TCP between the switch and the host.

A Fibre Channel SAN Switch comes with preloaded firmware. In most cases there is no need to update the firmware on a new switch. The firmware version can be determined by using the front panel of a Fibre Channel SAN Switch 16 or by using the `version` Telnet command.

To upgrade the firmware of a Fibre Channel SAN Switch, use the latest version of the Fibre Channel SAN Switch CD. Use one of the three procedures (Windows NT Intel, Windows NT Alpha, or Tru64 UNIX) described in Chapter 8, “Upgrading Firmware.”

### **gbicShow**

[Figure A-42](#) shows the `gbicShow` command, which displays information about Serial Identification GBICs (also known as module definition “4” GBICs). These GBICs provide extended information that describes the GBIC’s capabilities, interfaces, manufacturer, and other information.

This command with no parameters displays a summary of all GBICs in the switch. The summary shows the GBIC type (see [switchShow](#), [page A-84](#) for an explanation of the two-letter codes). If the GBIC is a Serial ID GBIC, the vendor name and GBIC serial number are also shown.

With a port number parameter, detailed information is shown about the Serial ID GBIC in that port.

If the GBIC is a Finisar “smart” GBIC, four additional fields are displayed: the module temperature, the received optical power, the transmitted optical power (longwave only), and the laser diode drive current.

The following operand is optional:

`port_number`: The port number to be displayed (0-7 or 0-15).

Figure A-42 shows the summary information for an eight port switch, followed by detailed information for a Finisar “smart” GBIC.

```
sw5:admin> gbicShow
port      0:   id   Vendor: FINISAR CORP.      Serial No: 103980
port      1:   id   Vendor: HEWLETT-PACKARD    Serial No: 9809100953460702
port      2:   id   Vendor: FINISAR CORP      Serial No: 103960
port      3:   sw
port      4:   sw
port      5:   cu
port      6:   sw
port      7:   sw
sw5:admin> gbicShow 2
Identifier: 1 GBIC
Connector:  1 SC
Transceiver: 010d102202000000 100_MB/s SM M5 M6 Longwave Inter_dist
Encoding:    1 8B10B
Baud Rate:  12 (units 100 megabaud)
Length 9u:  100 (units 100 meters)
Length 50u: 55 (units 10 meters)
Length 625u: 55 (units 10 meters)
Length Cu:  0 (units 1 meter)
Vendor Name: FINISAR CORP.
Vendor OUI: 00:5a:41
Vendor PN:  FTR 1319
Vendor Rev:  S
Options:    001a Loss_of_Sig Tx_Fault Tx_Disable
BR Max:    0
BR Min:    0
Serial No: 103960
Date Code: 990119
Temperature: 39 Centigrade
RX Power:  0 uWatts
TX Power:  289 uWatts
Current:   15 mAmps
```

Figure A-42: gbicShow command example

Figure A-43 shows the `h` command, which displays the shell history of the previous 20 commands. The older commands are replaced by new commands. The shell history is similar to the UNIX Korn shell history facility with a built-in line editor that allows previously typed commands to be edited.

**NOTE:** The shell history is reset by a restart.

```
admin=> h
11 date
12 dateShow
13 switchName
14 date "0117130198"
15 nsShow
16 fabricShow
17 portDisable 5
18 portEnable 5
19 portLogShow 100
20 h
21 portShow 5
22 portStatsShow 5
23 ipAddrShow
24 diagShow
25 switchDisable
26 switchShow
27 portLoopbackTest
28 portShow 5
29 diagShow
30 switchEnable
```

Figure A-43: `h` command example

## help

Figure A-44 shows the `help` command, which displays a list of commands in alphabetical order. The command syntax to display detailed information about individual commands is `help <command>`.

**NOTE:** The `help` display changes depending on the login user level. Only commands that are available to the current user are displayed. This example shows the admin level commands. Commands for optionally licensed products only display if the appropriate license key is installed.

```

S32_1:admin> help
agtcfgSet          Set SNMP agent configuration
agtcfgShow         Print SNMP agent configuration
agtcfgDefault      Reset SNMP agent to factory default
aliasShow          Print Alias Server information
backSpace          Set/clear alternate backspace char
configure          Set switch config parameters
configShow         Print switch config parameters
configDefault      Reset config to factory default
configDownload     Load switch config from a server
configUpload       Save switch config to a server
date               Print/set the system date and time
errDump            Print error log (no page breaks)
errShow            Print error log
faShow             Display Fabric Assist info
faStatsShow        Display Fabric Assist Statistics
fabricShow         Print fabric membership info
fanShow            Print fan status
fastboot           Reboot this switch, bypassing POST
firmwareDownload   Download firmware into switch
faStatsShow        Display Fabric Assist Statistics
fabricShow         Print fabric membership info
fanShow            Print fan status
fastboot           Reboot this switch, bypassing POST
firmwareDownload   Download firmware into switch
gbicShow           Print Serial ID GBIC information
h                  Print shell history
help               Print this list
i                  Print task summary
ifModeSet          Set network link operating mode
ifModeShow         Print network link operating mode
ifShow             Print network interface information
ipAddrSet          Set ethernet and FC IP addresses
ipAddrShow         Print ethernet and FC IP addresses
islTopoCheck       Show ISL sgroup topology/status for this switch
islTopoShow        Show ISL sgroup topology/status for sgroup
    
```

Figure A-44: Help command example (continued on next page)

login	Login as a new user
logout	Logout from remote session
msConfigure	Configure Management Server
msPlatShow	Display Platform Management Server Database
msPICapabilityShow	Display Platform Management Server Capability
msPIClearDB	Clear the Management Server Platform Database fabric-wide
msPIMgmtActivate	Activate Platform Management Services
msPIMgmtDeactivate	Deactivate Platform Management Services
nsAllShow	Print global Name Server information
nsShow	Print local Name Server information
passwd	Set usernames and passwords
portCfgFAport	Set port as Fabric Assist Host port
portCfgLport	Lock port as an L_Port
portCfgMcastLoopback	Configure multicast loopback port
portCfgEport	Disable a port from becoming an E_Port
portDisable	Disable a specified port
portEnable	Enable a specified port
portErrShow	Print port error summary
portLogClear	Clear port activity log
portLogDump	Print port log (no page breaks)
portLogDumpPort	Print port log (no page breaks)
portLogShow	Print port activity log
portLogShowPort	Print port activity log
portPerfShow	Print port throughput numbers
portShow	Print state of specified port
portStatsShow	Print hardware statistics
psShow	Print power supply status
quietMode	Set/clear shell quiet mode
reboot	Reboot this switch
sgroupDelete	Delete an sgroup
sgroupRename	Rename an sgroup
sgroupSet	Set or Replace an sgroup
sgroupShow	Display specified sgroup(s)
sgroupSupportShow	Print all data of support show functions in a group
sgroupSwReplace	Replace a member switch of an sgroup
snmpMibCapSet	Set options for configuring SNMP Mib/Trap Capability
switchBeacon	Set switch beacon on or off

Figure A-44: Help command example (continued on next page)

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switchDisable	Disable this switch
switchEnable	Enable this switch
switchName	Print/set this switch's name
switchShow	Print switch and port status
switchStatusShow	Print overall switch status
switchStatusPolicyShow	Print policy parameters for overall switch status
switchStatusPolicySet	Set policy parameters for overall switch status
syslogdIpAdd	Add syslog daemon IP address
syslogdIpRemove	Remove syslog daemon IP address
syslogdIpShow	Print the syslog daemon targets
tempShow	Print temperature readings
timeOut	Set/clear telnet timeout value
uptime	Print how long switch has been up
version	Print firmware version
diagHelp	Print diagnostic help info
fwHelp	Print Fabric Watch help info
licenseHelp	Print license help info
loopdiagHelp	Print loopdiag help info
qlHelp	Print quick loop help info
routeHelp	Print routing help info
trackChangesHelp	Print Track Changes help info
zoneHelp	Print zoning help info

Figure A-44: help command example

Figure A-45 shows the `i` command, which displays a currently running task summary. Table A-16 describes the command fields.

```

admin>i
NAME          ENTRY          TID          PRI          STATUS        PC          SP          ERRNO        DELAY
-----
tExcTask      excTask        103f7eb0    0            PEND          1014f718   103f8200   3d0001       0
tLogTask      _logTask       103f5f30    0            PEND          1014f718   103f6280   0             0
tShell        _shellTask     103c6e40    1            READY         101367c0   103c70b0   c0002         0
tRlogind      _rlogind       103ee0f0    2            PEND          101331e0   103ee7e0   0             0
tTelnetd      _telnetd       103ec160    2            PEND          101331e0   103ec5d0   0             0
tTelnetOutT   telnetOutTa    103711b0    2            READY         101331e0   103717b0   0             0
tTelnetInTa   _telnetInTas  1036d330    2            READY         101330e4   1036d9b0   0             0
tTimers       _timerTask     103fbd80    10           PEND          1014f718   103fc100   0             0
tNetTask      _netTask       103f0370    50           READY         10134280   103f0740   0             0
tSwitch       _switchTask    103e9500    80           PEND+T        1014f718   103e9900   3d0004        36
tPbmenu       _menuTask      103d7c20    90           PEND          1014f718   103d7fe0   0             0
tReceive      _portRxTask    103d4450    100          PEND          1014f718   103d47d0   0             0
tTransmit     _portTxTask    103d2eb0    100          PEND          1014f718   103d3230   0             0
tFabric       _fabricTask    103b9530    100          PEND          1014f718   103b98f0   3d0004        0
tFspf         _fspfTask     103b7340    100          PEND          1014f718   103b76c0   0             0
tFcp          _fcpTask       103bde50    120          PEND+T        1014f718   103be1d0   3d0004        31
tZone         _cfgTask       10374ef0    130          PEND          1014f718   10375270   0             0
tFcp         _fcpTask       103bbd00    150          PEND+T        1014f718   103bc080   3d0004        773
tSnmpd        101394b0      103b3500    150          PEND          101331e0   103b4250   5b0002        0
tHttpD        _STARTUP_Web  103b1e70    150          PEND          101331e0   103b2330   0             0
tNSd         _ns_svr        103aca10    150          PEND          1014f718   103acda0   0             0
tASd         _as_svr        103812d0    150          PEND          1014f718   10381650   0             0

```

Figure A-45: i command example

**Table A-16: Command Field Descriptions**

Field	Description
Name	Task name
Entry	Task entry point ID
TID	Task ID
PRI	Task priority with VxWorks

**Table A-16: Command Field Descriptions (Continued)**

Field	Description
Status	<ul style="list-style-type: none"> <li>■ READY—Task is not waiting for any resource other than the processor.</li> <li>■ PEND—Task is blocked due to the unavailability of some resource.</li> <li>■ DELAY—Task is asleep for some duration.</li> <li>■ SUSPEND—Task is unavailable for execution, but not delayed or pending.</li> <li>■ DELAY+S—Task is delayed and suspended.</li> <li>■ PEND+S—Task is pending and suspended.</li> <li>■ PEND+T—Task is pending with a timeout.</li> <li>■ PEND+S+T—Task is pending with a timeout and suspended.</li> <li>■ DEAD—Task no longer exists.</li> </ul>
PC	Program counter
SP	Stack pointer
ERRNO	Last error number generated by this task
Delay	For pending tasks, the amount of time a task has been waiting to execute

**ifModeSet**

Figure A-46 shows the ifModeSet command, which sets the link operating mode for a network interface. The interface name is in quotes “interface”. The “interface” argument is of the form <name><physical-unit>, where <name> is the name of the network interface and <physical-unit> is the instance of that interface, for example “fei0”.

The network interfaces available on the system are listed with the ifShow command.

The command begins by prompting the current operating mode and continues prompting other possible operating modes until one has been selected or until all the possibilities have been displayed. An operating mode is confirmed with a “y” or “yes” at a prompt. If an operating mode is selected different from the current mode, the change is saved and the command exits.

Restarting is required for the changes to take effect.

```
admin>ifModeSet "fei0"
Auto-negotiate (yes, y, no, n): [no]
100Mbps/Full Duplex (yes, y, no, n): [no]
100Mbps/Half Duplex (yes, y, no, n): [no]
10Mbps/Full Duplex (yes, y, no, n): [no]
10Mbps/Full Duplex (yes, y, no, n): [no] yes
```

Figure A-46: ifModeSet command example

Changing the link mode is not supported for all network interfaces and not necessarily supported for all Ethernet network interfaces. This command is only functional for “fei” interfaces.

**NOTE:** Forcing the link to an operating mode not supported by the network equipment to which it is attached can result in an inability to communicate with the system by its Ethernet interface.

### ifModeShow

Figure A-47 shows the ifModeShow command, which displays the link operating mode for a network interface. The interface name is in quotes “interface”. The “interface” argument is of the form <name><physical-unit>, where <name> is the name of the network interface and <physical-unit> is the instance of that interface, for example “fei0”.

The network interfaces available on the system are listed with the ifShow command.

```
admin> ifModeShow "fei0"
fei (unit number 0):
Link mode: Auto-negotiate
```

Figure A-47: ifModeShow command example

**NOTE:** The link operating mode is not changeable for all network interfaces and not necessarily changeable for all Ethernet network interfaces. For interfaces in which this is not supported, the output for the link mode is “Not applicable”.

### ifShow

Figure A-48 shows the ifShow command, which displays network interface information. The display includes three sections organized by interface:

- ei—Ethernet 10/100BaseT port
- lo—loopback interface
- fc—Fibre Channel (This section is omitted if IP over Fibre Channel is not configured.)

```
admin> ifShow
ei (unit number 0):
  Flags: (0x63) UP BROADCAST ARP RUNNING
  Internet address: 192.168.64.146
  Broadcast address: 192.168.64.255
  Netmask 0xfffff00 Subnetmask 0xfffff00
  Ethernet address is 00:60:69:00:04:64
  Metric is 0
  Maximum Transfer Unit size is 1500
  2089 packets received; 156 packets sent
  0 input errors; 0 output errors
  3 collisions
lo (unit number 0):
  Flags: (0x69) UP LOOPBACK ARP RUNNING
  Internet address: 127.0.0.1
  Netmask 0xff000000 Subnetmask 0xff000000
  Metric is 0
  Maximum Transfer Unit size is 4096
  0 packets received; 0 packets sent
  0 input errors; 0 output errors
  0 collisions
```

Figure A-48: ifShow command example

### iodReset

Figure A-49 shows the `iodReset` command, which allows out-of-order delivery of frames during fabric topology changes. This is the default behavior, and allows fast rerouting after a fabric topology change.

The command example shown in Figure A-49 turns off the in-order delivery option.

```
switch:admin> iodReset
```

Figure A-49: iodReset command example

### iodSet

Figure A-50 shows the `iodSet` command, which enforces in-order delivery of frames during fabric topology changes. In a stable fabric, frames are always delivered in order, even when the traffic between switches is shared among multiple paths. However, when some topology change occurs in the fabric (for instance, a link goes down), traffic is

rerouted around the failure. In general, there is no guarantee in this case that some frame, queued behind a congested link, will not be delivered after a frame that has been transmitted later, but is now taking the new path.

This command insures that frames will not be delivered out-of-order, even during fabric topology changes. The default behavior is for the in-order delivery option to be off.

This command should be used with care, because it will cause a delay in the establishment of a new path when a topology change occurs. Only if there are devices connected to the fabric that do not tolerate occasional out-of-order delivery of frames, should this command be used.

The command example in [Figure A-50](#) turns on the in-order delivery option.

```
switch:admin> iodSet
```

Figure A-50: iodSet command example

### **iodShow**

[Figure A-51](#) shows the iodShow command, which indicates whether in-order delivery during topology changes is on or off.

```
switch:admin> iodShow  
IOD is not set
```

Figure A-51: iodShow command example

### **ipAddrSet**

[Figure A-52](#) shows the ipAddrSet command, which sets the switch's Ethernet IP address, Ethernet subnetmask, Fibre Channel IP address, Fibre Channel subnetmask, and gateway address. [Table A-17](#) describes the command fields.

```
admin> ipAddrSet  
Ethernet IP Address [192.158.1.14]:  
Ethernet Subnetmask [255.255.255.0]:  
Fibre Channel IP Address [none]:  
Fibre Channel Subnetmask [none]:  
Gateway Address [192.158.1.1]:
```

Figure A-52: ipAddrSet command example

**Table A-17: ipAddrSet Command Field Descriptions**

Field	Description
Ethernet IP Address	The default IP address on a new switch is a temporary number. Enter a valid IP address.
Ethernet Subnetmask	The Ethernet subnetmask value. The default subnetmask value is none. See your network administrator for the appropriate subnetmask value.
Fibre Channel IP Address	The Fibre Channel IP address for the switch. Enter a valid IP address.
Fibre Channel Subnetmask	The Fibre Channel subnetmask for the switch. The default is none.
Gateway Address	The gateway address. The default gateway address on a new switch is none. Enter a valid gateway address if required.

### ipAddrShow

Figure A-53 shows the ipAddrShow command, which displays the switch's IP addresses. The field descriptions are the same as those of the ipAddrSet command. See Table A-17.

```
admin> ipAddrShow
Ethernet IP Address: 192.158.1.14
Ethernet Subnetmask: 255.255.255.0
Fibre Channel IP Address: none
Fibre Channel Subnetmask: none
Gateway Address: 192.158.1.1
```

Figure A-53: ipAddrShow command example

### linkCost

Figure A-54 shows the linkCost command, which sets or displays the cost of an ISL. The cost of a link is a positive number. It is used by the Fibre Channel Shortest Path First (FSPF) path selection protocol to determine the path that a frame will take going from the source to the destination switch. The chosen path is the path with minimum cost. The cost of a path is the sum of the costs of all the ISLs traversed by the path. The cost of a path is also known as the “metric.”

FSPF supports load sharing over a number of equal cost paths. Every ISL has a default cost, that is inversely proportional to the bandwidth of a the ISL. For a 1Gb/s ISL, the default cost is 1000. This command changes the actual link cost only. It does not affect the default cost. The command interfaceShow displays both the default and the actual cost.

Without parameters, this command displays the actual cost of all the ISLs. With one parameter, it displays the actual cost of a specific ISL. With two parameters, it sets the cost of a specific ISL.

The following operands are optional:

- **port\_number**: The interface whose cost has to be set or printed.
- **cost**: The new cost of the link connected to interface “port\_number.”

```
switch:admin> linkCost 1
Interface: 1 cost 1000

switch:admin> linkCost 1,2000
Committing configuration...done.

switch:admin> linkCost 1
Interface: 1 cost 2000
```

Figure A-54: linkCost command example

## login

[Figure A-55](#) shows the login command, which logs in a user from a remote host. If a user is already logged in, the command logs out the user and lets a new user log in.

```
switch:user> login
login:admin
Password:
switch:admin>
```

Figure A-55: login command example

## logout

[Figure A-56](#) shows the logout command, which logs a user out from a remote session.

```
admin> logout
Connection closed.
```

Figure A-56: logout command example

### **nbrStatsClear**

[Figure A-57](#) shows the `nbrStatsClear` command, which resets the counters of all the different FSPF frames transmitted and received on an interfaces on the switch. Without parameters, this command resets the counters on all the interfaces.

The following operand is optional:

`port_number`: The number of the interface whose counters have to be reset.

```
switch:admin> nbrStatsClear 4
switch:admin> interfaceShow 4
idbP                = 0x10f61f40
Interface 4 data structure:
nghbP               = 0x10f61d90
ifNo                = 4
defaultCost         = 1000
cost                = 1000
delay               = 1
lastScn             = 5
lastScnTime         = Mar 29 12:57:52.833
upCount             = 2
lastUpTime          = Mar 29 12:57:52.833
downCount           = 1
lastDownTime        = Mar 29 12:57:47.566
downReason          = 2
iState              = UP
Neighbor 4 data structure:
state               = NB_ST_FULL
lastTransition       = Mar 29 12:57:52.865
nghbCap             = 0x0
nghbld              = 2
idbNo               = 4
remPort             = 1
nflags              = 0x3
initCount           = 1
lastInit            = Mar 29 12:57:52.849
&dbRetransList      = 0x10f61db0
&lsrcRetransList     = 0x10f61dc0
&lsrcAckList         = 0x10f61dd0
inactTID            = 0x10f61d40
helloTID            = 0x10f61cf0
```

Figure A-57: nbrStasClear command example (continued on next page)

dbRtxTID	= 0x10f61ca0
lsrRtxTID	= 0x10f61c50
inactTo	= 80000
helloTo	= 20000
rXmitTo	= 5000
nCmdAcc	= 0
nInvCmd	=0
nHloIn	= 0
nInvHlo	= 0
nLsuIn	= 0
nLsaln	= 0
attHloOut	= 0
nHloOut	=0
attLsuOut	= 0
nLsuOut	=0
attLsaOut	= 0
nLsaOut	= 0

Figure A-57: nbrStatsClear command example

### nsAllShow

Figure A-58 shows the nsAllShow command, which displays a list of port IDs connected to the fabric. The nsAllShow command optionally takes an integer parameter, the value of the FC-PH type. For example, nsAllShow 8 shows all SCSI-FCP nodes. If the parameter is not provided, then Nx\_Ports displays.

```
admin> nsAllShow
2 Nx_Ports in the Fabric {
  614001 614301
}
value = 0 = 0x0

admin> nsAllShow 8
2 FCP Ports {
  6042ef 6045e8
}
```

Figure A-58: nsAllShow command example

**nsShow**

Figure A-59 shows the nsShow command, which displays the local name server information, including information about devices connected to the switch and cached information about devices connected to other switches in the fabric. The nsAllShow command shows information about all switches.

The message "There is no entry in the Local Name Server" displays if there is no information about the local switch. If information about the local switch is available, the number of name service entries displays. Table A-18 shows the command fields.

```
admin> nsShow
The Local Name Server has 2 entries {
TypePid COSPortNameNodeNameTTL(sec)
NL 614001;3;00:00:00:00:00:00:00:00:00:00:00:00:na
NL 614301;3;00:00:00:00:00:00:00:00:00:00:00:00:na
}
```

Figure A-59: nsShow command example

**Table A-18: nsShow Command Field Descriptions**

Field	Description
Type	The port type with one of the following values: <ul style="list-style-type: none"> <li>■ N-Indicates that this is an N_Port.</li> <li>■ NL-Indicates that this is an NL_Port.</li> </ul>
Pid	The address ID of the port in hexadecimal format
COS	The class of service supported by the port
PortName	The port WWN
NodeName	The node WWN associated with the port
TTL	The time-to-live value of the entry. This field is typically set to not applicable (na) for a local entry. An entry can be a cached version of a remote port, that is, not directly connected to this switch. In that case, the value equals the number of seconds before the cached entry expires and is deleted from the local database. A cached entry is marked with an asterisk (*).

## passwd

Figure A-60 shows the `passwd` command, which sets usernames and passwords.

```
admin> passwd
username 1 [admin]:
"admin" password:
username 2 [user]:
"user" password:
username 3 [other]:
"other" password:
```

Figure A-60: `passwd` command example

The command syntax is `passwd ["user name"]`. The optional parameter `<username>` is a valid user name enclosed by quote marks.

**NOTE:** If the current password is incorrect, the command exits without saving any changes. If the number of attempts to connect is exceeded, the command either steps to the next user or exits without saving any changes.

The following is a list of `passwd` command input and output examples. Only passwords at the current level and below can be changed.

1. Invalid user name.

```
admin> passwd "nobody"
passwd: nobody is not a valid user name.
```

2. Invalid command usage.

```
admin> passwd ""
Usage: passwd [username]
```

3. Permission denied.

```
admin> passwd "root"
passwd: Permission denied.
```

4. Change the user name.

```
admin> passwd "admin"
New username [admin]: maint
Old password:
passwd: Password unchanged.
Updating flash...done.
```

5. Change the user name and password.

```
maint> passwd "maint"  
New username [maint]: admin  
Old password:  
New password:  
Re-enter new password:  
Updating flash...done.
```

6. Skip through the prompts without changes.

```
admin> passwd  
New username [admin]:  
Old password:  
passwd: Password unchanged.  
New username [user]:  
Old password:  
passwd: Password unchanged.  
New username [other]:  
Old password:  
passwd: Password unchanged.
```

7. Surpass failure limit, then cancel the command.

```
admin> passwd  
New username [admin]:  
Old password:  
New password:  
Re-enter new password:  
passwd: Passwords do not match; try again.  
New password:  
Re-enter new password:  
passwd: Passwords do not match; try again.  
New password:  
Re-enter new password:  
passwd: Number of failure attempts exceeded.  
New username [user]: ^C
```

8. Change the user name and then finish with Ctrl+D.

```
admin> passwd  
New username [admin]: maint  
Old password: ^D  
Updating flash...done.  
maint>
```

## portCfgLongDistance

Figure A-61 shows the `portCfgLongDistance` command, which allows a user to allocate enough full size frames buffers on a particular port to support a long distance link up to 100km. The port can be used as either an `Fx_Port` or an `E_Port`. The configuration is saved in the nonvolatile memory and is persistent across switch restart or power cycle.

When this command is invoked without the optional operand, the user will be prompted to enter the long distance level number. The value must be one of the following:

- 0: De-configure the port to be a regular switch port. The number of buffers reserved for the port supports up to 10km links.
- 1: Level one long distance, up to 50km. A total of 27 full size frame buffers will be reserved for the port.
- 2: Level two long distance, up to 100km. A total of 60 full size frame buffers will be reserved for the port.

An input of CTL-D cancels the configuration update. When a port is configured to be a long distance port, the output of `portShow` and `switchShow` will print the long distance level. In the `portShow` output, the long distance level is indicated as “medium” for level one long distance, and “long” for level two long distance. In the `switchShow` output, the format of “Lx” is used; x being the long distance level number described above.

The following operand is required:

`port_number`: The port number to be configured (0-7 or 0-15).

The following operand is optional

`long_distance_level`: The long distance level (0, 1, or 2)

Since the total number of frame buffers is assigned by groups of four ports (quad), when one of the ports in the quad is configured as a long distance port, all remaining ports must be level zero ports only (i.e. none of the remaining ports in the quad can be a long distance port). Furthermore, if one port is configured as a level 2 long distance port, none of the remaining ports in the quad can be used as an `E_Port`.

**NOTE:** A quad is defined as a group of four adjacent ports that share a common pool of frame buffers. Port 0-3 belong to a quad, so do port 4-7, etc.

In order to have a long distance port take effect, all switches in the fabric must be configured to run the long distance fabric mode (i.e. the long distance fabric mode bit must be set to be one). Otherwise, the fabric will be segmented.

---

**IMPORTANT:** A long distance port can not be configured in a switch unless the long distance fabric mode is on for that switch. Additionally, when all ports are deconfigured back to non-long distance ports, you must deconfigure the long distance fabric mode for that switch.

---

Figure A-61 configures switch port 3 to support a 100km link:

```
sw5:admin> portCfgLongDistance 3
Please enter the long distance level --: (0..2) [0] 2
Committing configuration...done.
```

Figure A-61: portCfgLongDistance command example

### portCfgMcastLoopback

Figure A-62 shows the portCfgMcastLoopback command, which allows a user to dedicate an unused port in a leaf (edge) switch (with no F\_Port belonging to a multicast group) to receive multicast frames.

When multicast frames are received at an edge switch with no member port, traffic will slow down in the kilobytes per second (KB/s) range as embedded processor intervention is required to process it. However, when a port is assigned as the multicast loopback port, frames destined for any multicast group will be routed to that multicast loopback port where it is loopbacked to the port's receiver, which is turned off. This effectively sends the frames to a black hole. Since an embedded processor is not involved, traffic moves at normal (and full) speed.

Executing this command on a branch (middle) switch will not affect traffic. It can be configured for future use as an edge switch. The disadvantage is that the port cannot be used to connect to other devices.

The configuration is saved in the non-volatile memory and is persistent across switch restart or power cycle.

The user will be prompted if:

- The selected port is already in use as an E\_Port, or Fx\_port
- Other ports are already configured as multicast loopbacks
- When a port is configured as a multicast loopback port:

- ❑ The port LED will blink a slow green indicating a loopback state. The laser, if optical GBIC, will be disabled. It will not respond to any attempt to connect it to any device.
- ❑ The comment field of `switchShow` will show that it is looped back to itself, for example:  
"port 3: sw No\_Light Loopback@3"
- ❑ The `portFlags` line of `portShow` will display the "F\_PORT" and "INT\_LB" flags, for example:  
"portFlags: 0x20249 PRESENT F\_PORT U\_PORT INT\_LB LED"
- ❑ `mcastShow` will show the port as a member in its "Member Ports" column.

The command syntax is `portCfgMcastLoopback <port #, mode>`. The "port #" parameter can be configured 0-7 or 0-15. The "mode" parameter is either "0" or "1". "0" means that the "port #" will be dedicated as a multicast loopback port. "1" means that the "port #" will be deconfigured from its previous role as a multicast loopback port.

```
admin> portCfgMcastLoopback 3, 1
Committing configuration...done.
```

Figure A-62: `portCfgMcastLoopback` command example

### portDisable

Figure A-63 shows the `portDisable` command, which disables a specified port. Devices attached to a disabled port cannot communicate with the fabric. The command syntax is `portDisable <port #>`.

```
admin> portDisable 2
```

Figure A-63: `portDisable` command example

**NOTE:** Unlike inserting a GBIC module into an interface card, `portDisable` and `portEnable` do not generate SNMP traps.

### portEnable

Figure A-64 shows the `portEnable` command, which enables a specified port. The command syntax is `portEnable <port #>`.

```
admin> portEnable 2
```

Figure A-64: `portEnable` command example

**portErrShow**

Figure A-65 shows the `portErrShow` command, which displays an error summary for all ports. One output line displays per port, and shows error counters in ones, thousands (the number is followed by “k”), or millions (the number is followed by “m”). This example shows an 8-port switch, where port 6 has a high number of errors. The command fields are described in Table A-19.

Switch:admin>portErShow														
	frames	enc	crc	too	too	bad	enc	disc	link	loss	loss	frjt	fbsy	
	tx	rx	in	err	shrt	long	eof	out	c3	fail	sync	sig		
0:	0:0	0	0	0	0	0	0	0	0	0	0	1	0	0
1:	1:2.5m	38	0	0	0	0	0	2	0	0	1	1	0	0
2:	2:0	0	0	0	0	0	0	0	0	0	0	1	0	0
3:	3:95k	15k	0	0	0	0	0	3	0	0	1	0	0	0
4:	4:0	0	0	0	0	0	0	0	0	0	0	1	0	0
5:	5:0	0	0	0	0	0	0	0	0	0	0	1	0	0
6:	6:61k	48	2	15	0	0	0	3k	0	0	2	0	0	0
7:	7:0	0	0	0	0	0	0	0	0	0	0	1	0	0

Figure A-65: `portErrShow` command example**Table A-19: portErrShow Command Field Descriptions**

Field	Description
frames tx	Frames transmitted
frames rx	Frames received
enc in	Encoding errors inside of frames
crc err	Frames with CRC errors
too shrt	Frames shorter than minimum
too long	Frames longer than maximum
bad eof	Frames with bad end-of-frame delimiters
enc out	Encoding error outside of frames
disc c3	Class 3 frames discarded
link fail	Link failures (LF1 or LF2 states)
loss sync	Loss of synchronization
loss sig	Loss of signal
frjt	Frames rejected with F_RJT

**Table A-19: portErrShow Command Field Descriptions (Continued)**

Field	Description
fbsy	Frames busied with F_BSY
<p><b>NOTE:</b> Non-zero values in the portErrShow command fields do not indicate a bad switch. It is normal to have errors when connecting cables and powering up devices that are connected to the switch.</p>	

### portLogClear

Figure A-66 shows the portLogClear command, which clears the data from the port log. The command syntax is portLogClear.

```
admin> portLogClear
```

Figure A-66: portLogClear command example

### portLogDump

Figure A-67 shows the portLogDump command, which displays the port log without page breaks. The portLogDump and portLogShow commands are the same except for how much information the port log displays without intervention.

```

admin> portLogDump
time          task      event    port  cmd  args
-----
May 18 21:35:21.000  tSwitch  create   0     0    tTimers
May 18 21:35:22.383  tSwitch  create   0     0    tPBmenu
May 18 21:35:22.383  tSwitch  create   0     0    tReceive
May 18 21:35:22.383  tSwitch  create   0     0    tTransmit
May 18 21:35:22.383  tSwitch  start    0     0    100
May 18 21:35:22.633  tSwitch  pstate   4     OL1
May 18 21:35:22.633  tSwitch  pstate   5     OL1
May 18 21:35:22.633  tSwitch  pstate   6     OL1
May 18 21:35:22.633  tSwitch  pstate   7     OL1
May 18 21:35:38.066  tSwitch  Tx3      3     2112 02ffffff,00ffffff,4723bcbc
May 18 21:35:38.083  tReceive Rx3      3     2112 02ffffff,00ffffff,4723bcbc
May 18 21:35:38.083  tSwitch  ioctl    3     80    a,0
May 18 21:35:38.083  tSwitch  Tx3      5     2112 02ffffff,00ffffff,4723bcbc
May 18 21:35:38.083  tReceive Rx3      5     2112 02ffffff,00ffffff,4723bcbc
May 18 21:35:38.083  tSwitch  ioctl    5     80    a,0
May 18 21:35:38.083  tSwitch  Tx3      7     2112 02ffffff,00ffffff,4723bcbc
May 18 21:35:38.099  tReceive Rx3      7     2112 02ffffff,00ffffff,4723bcbc
May 18 21:35:38.099  tSwitch  ioctl    7     80    a,0
May 18 21:35:41.049  tSwitch  disable  0     0     2
May 18 21:35:41.083  tSwitch  pstate   2     OL1
May 18 21:35:41.583  tSwitch  start    0     0     0
May 18 21:35:41.599  tSwitch  pstate   0     LF2
May 18 21:35:41.599  tSwitch  pstate   2     OL1
May 18 21:35:41.599  tSwitch  pstate   3     LF2
May 18 21:35:54.216  tSwitch  enable   16    0
May 18 21:35:55.266  tSwitch  errlog   3     FANS-1_FAILED

```

Figure A-67: portLogDump command example

### portLogShow

Figure A-68 shows the portLogShow command, which displays the port activity. Entries consist of fabric login (link service request to a fabric F\_Port 22ffffffe), port login (link service request to the management server 22ffffffa), and an inquiry request (unsolicited command to the management server 06ffffffa). The entries are like the initial handshake between an F\_Port and the Host Bus Adapter (HBA). Table A-20 describes the command fields.

```
admin> portLogShow
```

time	task	event	port	cmd	args
----	----	----	----	----	----
Jun 15 16:00:21.899	tReceive	pstate	2	OL2	
Jun 15 16:00:21.899	tReceive	pstate	2	LR3	
Jun 15 16:00:21.899	tReceive	pstate	2	AC	
Jun 15 16:00:21.899	interrupt	scn	2	2	
Jun 15 16:00:21.899	interrupt	scn	2	1	
Jun 15 16:00:21.899	tFspf	ioctl	2	ab	ffffff,16
Jun 15 16:00:21.899	tFspf	ioctl	16	ab	ffffff,2
Jun 15 16:00:21.899	tReceive	Rx3	2	116	22ffffffe, 00000000, 04000000
Jun 15 16:00:21.899	tReceive	ioctl	2	a2	210213,2
Jun 15 16:00:21.899	tReceive	scn	2	6	
Jun 15 16:00:21.899	tFspf	ioctl	2	ac	0,0
Jun 15 16:00:21.899	tFspf	ioctl	2	aa	ffffff,16
Jun 15 16:00:21.899	tFspf	ioctl	16	aa	ffffff,2
Jun 15 16:00:21.899	tFspf	ioctl	2	ad	0,0
Jun 15 16:00:21.899	tFspf	Tx3	2	116	23210213, 00ffffffe, 02000000
Jun 15 16:00:21.899	tReceive	Rx3	2	116	22ffffffa, 00210213, 03000000
Jun 15 16:00:21.899	tSwitch	Tx3	2	116	23210213, 00ffffffa, 02000000
Jun 15 16:00:21.899	tFcp	Tx3	2	116	22210213, 00fffc41, 03000000
Jun 15 16:00:21.899	tReceive	Rx3	2	32	06ffffffa, 00210213, 00000000
Jun 15 16:00:21.899	tFcp	Tx3	2	36	01210213, 00ffffffa, 0d000302
Jun 15 16:00:21.899	tFcp	Tx3	2	24	07210213, 00ffffffa, 00000000

Figure A-68: portLogShow command example

**Table A-20: portLogShow Command Field Descriptions**

Field	Description
Time	The event's date and time in milliseconds.
Task	The task name that logged the event, or "interrupt" if the event was recorded from interrupt level code.
Event	<p>The possible switch events include:</p> <ul style="list-style-type: none"> <li>■ start—The switch starts running.</li> <li>■ disable—A port is disabled.</li> <li>■ enable—A port is enabled.</li> <li>■ ioctl—A port I/O control is executed.</li> <li>■ Tx—A frame is transmitted using class x.</li> <li>■ Rx—A frame is received using class x.</li> <li>■ scn—A state change notification is posted.</li> <li>■ pstate—A port changes physical state.</li> <li>■ ctin—A CT-based request is received (name server request).</li> <li>■ ctout—A CT-based response is transmitted (name server request).</li> </ul>
Port	Either the port number of the affected port or the last byte of a well-known address (for example, fc for the well-known Name Server address).
cmd	<p>The cmd field represents different values depending on the task and event. The following definitions are included:</p> <ul style="list-style-type: none"> <li>■ For ioctl events, cmd is the I/O control command code.</li> <li>■ For Tx and Rx events, cmd is the payload size.</li> <li>■ For scn events, cmd is the new state.</li> <li>■ For pstate events, cmd is the new physical state.</li> <li>■ For ctin events, cmd consists of two 2-byte subfields.</li> <li>■ For ctout events, cmd consists of two 2-byte subfields.</li> </ul>

**Table A-20: portLogShow Command Field Descriptions (Continued)**

Field	Description
pstate	<p>For pstate events, the cmd field entries in upper case are Fibre Channel ANSI Standard (PC-PH) as follows:</p> <ul style="list-style-type: none"> <li>■ AC—Active State</li> <li>■ LR1—Link Reset: LR Transmit State</li> <li>■ LR2—Link Reset: LR Receive State</li> <li>■ LR3—Link Reset: LRR Receive State</li> <li>■ LF1—Link Failure: NOS Transmit State</li> <li>■ LF2—Link Failure: NOS Receive State</li> <li>■ OL1—Offline: OLS Transmit State</li> <li>■ OL2—Offline: OLS Receive State</li> <li>■ OL3—Offline: Wait for OLS State</li> </ul>

**Table A-20: portLogShow Command Field Descriptions (Continued)**

Field	Description
ioctl	<p>For ioctl events, the cmd field entries in lower case are switch-specific as follows:</p> <ul style="list-style-type: none"> <li>■ a1—Port is an E_Port</li> <li>■ a2—Port is an F_Port</li> <li>■ a3—Port is segmented</li> <li>■ a4—Domain name is known</li> <li>■ a5—Port enable</li> <li>■ a6—Port disable</li> <li>■ a7—Link reset</li> <li>■ a8—Add unicast route</li> <li>■ a9—Delete unicast route</li> <li>■ aa—Add multicast route</li> <li>■ ab—Delete multicast route</li> <li>■ ac—Unicast routing table done</li> <li>■ ad—Multicast routing table done</li> <li>■ ae—Add a phantom device</li> <li>■ af—Remove a phantom device</li> </ul> <p>For a ctin event, the first subfield indicates whether “argument 1” and “argument 2” would be valid:</p> <ul style="list-style-type: none"> <li>■ 0000—no argument 1 and 2</li> <li>■ 0001—argument 1 is valid</li> <li>■ 0003—arguments 1 and 2 are valid</li> </ul> <p>For ctout event, the cmd field consists of two 2-byte subfields, similar to ctin. The second subfield should contain a CT command code indicating an accept or reject:</p> <ul style="list-style-type: none"> <li>■ 8001—reject</li> <li>■ 8002—accept</li> </ul>

**Table A-20: portLogShow Command Field Descriptions (Continued)**

Field	Description
args	<p>The args field represents different values depending on the task and event. The following definitions are included:</p> <ul style="list-style-type: none"> <li>■ For ioctl events, the I/O controls arguments.</li> <li>■ For Tx and Rx events, the first two header words and the first payload word.</li> <li>■ For ctin events, the args field generally represents the first and second words of the CT payload where they are valid. When there is an IPv4 address involved, this field shows the value of the IPv4 address, which is neither the first nor second word of the CT payload.</li> <li>■ For ctout events, if the event is associated with an accept, then the args field generally represents the first and second words of the CT payload. When there is an IPv4 address involved, this field shows the value of the IPv4 address, which is neither the first nor second word of the CT payload.</li> <li>■ If the event is associated with a rejection, the args field contains the reason for the rejection and an explanation code.</li> </ul>
loopscn	<p>For loopscn events:</p> <ul style="list-style-type: none"> <li>■ OLP—Offline (disconnected or nonparticipating)</li> <li>■ LIP—LIP sent (if the next argument is 8xxx) or received (if the next argument contains the lower two bytes of the LIP Primitive Sequence received), port entered OPEN-INIT state.</li> <li>■ LIM—FL_Port is elected as LIM.</li> <li>■ BMP—AL_PA bitmap is collected by the FL_Port.</li> <li>■ ERR—An error occurred during the loopinit process, such as a loss of sync.</li> <li>■ OLD—Port entered OLD_PORT state.</li> <li>■ TMO—Loopinit timed out.</li> </ul>

**portPerfShow**

Figure A-69 shows the portPerfShow command, which displays the throughput for all ports. The output is terminated by pressing Enter or Ctrl+C. The throughput number represents the number of bytes received plus the number of bytes transmitted and displays

as bytes per second (B/s). Throughput numbers are shown either as B/s, kilobytes per second (KB/s), or megabytes per second (MB/s). This information is used to monitor port performance. One line per second is printed summarizing the traffic on all ports.

admin> portPerfShow															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A-69: portPerfShow command example

### portRouteShow

Figure A-70 shows the portShow command, which displays the port address ID and the following port routing tables contents:

- External unicast routing table:

This table shows how a unicast frame will be routed to another switch element in the fabric. The format of the output is a list of `domain_number: ports_bitmap`. The `domain_number` is the switch element number that a unicast frame can reach from the `port_number` port. The `ports_bitmap` contains all output port numbers, in bitmap hex format, that can forward unicast frames from `port_number` to `domain_number`. For any active port, this table contains at least one entry: `local_switch_domain_number: 0x10000` This is for routing unicast frames to the embedded port of the local switch element.

- Internal unicast routing table:

This table lists all ports in the local switch that a unicast frame can reach from `port_number`. The format for each entry is: `destination_port: output_ports_bitmap`. Since the `destination_port` is in the local switch, `output_ports_bitmap` usually only contains one bit whose bit position number represents the `destination_port` number.

- Multicast routing table:

This table shows how a multicast frame will be to the destination multicast group. The format of the output is a list of “`mcast_group_number: (mcast_group_id) ports_bitmap`”, where `mcast_group_number` if the multicast group number,

mcast\_group\_id is the multicast frame's destination ID, and the ports\_bitmap is a hex bitmap of all output port numbers that can forward a multicast frame from the port\_number to mcast\_group\_id.

■ Broadcast routing table:

This is actually a bitmap, listing all ports that a received broadcast frame can reach. Bit 16 of the bitmap is always set so that the switch element will always receive broadcast frames.

```
port_number is the required operand.  
JR-6910:other> portRouteShow 3  
port address ID: 0x604300  
external unicast routing table:  
  0: 0x10000  
  1: 0x2  
internal unicast routing table:  
  0: 0x1  
  3: 0x4  
  6: 0x40  
multicast routing table:  
broadcast routing table:  
  0x10045
```

Figure A-70: portRouteShow command example

**portShow**

Figure A-71 shows the portShow command, which displays a summary of all ports. The fields are described in Table A-21. The command syntax is portShow <port #>.

```

admin> portShow 2
portFlags:    0x20021    PRESENT L_PORT LED
portType:     2.2
portState:    2         Offline
portPhys:     4         No_Light
portScn:      0
portRegs:     0xa0008000
portData:     0x103ce320
portId:       614200
portWwn:      20:02:00:60:69:00:04:64

Interrupts:   0         Link_failure: 0         Frjt:         0
Unknown:      0         Loss_of_sync: 0         Fbsy:         0
Lli:          0         Loss_of_sig: 0
Proc_rqrd:    0         Protocol_err: 0
Timed_out:    0         Invalid_word: 0
Rx_flushed:   0         Invalid_crc: 0
Tx_unavail:   0         Delim_err:   0
Free_buffer:  0         Address_err: 0
Overrun:      0         Lr_in:       0
Suspended:    0         Lr_out:      0
Parity_err:   0         Ols_in:      0
                Ols_out:      0

```

Figure A-71: portShow command example

**Table A-21: portShow Command Field Descriptions**

Type	Field	Description
Port Definition	portFlags	The bitmap port status
	portType	The port type (G_port or FL_Port)
	portState	The port SNMP state; values include Online or Offline
	portPhys	The port physical state
	portScn	The port LED state*
	portRegs	Pointer of hardware register
	portData	Pointer to driver private data
	portId	The port address ID
	portWwn	The port WWN
Interrupt Statistics	Interrupts	Total number of interrupts
	Unknown	Number of unknown interrupts
	Lli	Number of low level interface (LLI) interrupts
	Proc_rqrd	Number of interrupts with processing (CPU) required
	Timed_out	Number of timed out interrupts
	Rx_flushed	Number of flushed transmissions
	Tx_unavail	Number of interrupted transmissions
	Free_buffer	Number of buffer interrupts
	Overrun	Number of buffer overruns
	Suspended	Number of suspended interrupts
Error Statistics	Parity_err	Number of parity errors
	Link_failure	Number of link failures
	Loss_of_sync	Loss of synchronization
	Loss_of_sig	Loss of signal (no light)
	Protocol_err	Protocol error
	Invalid_word	Invalid word (encoding errors inside of frames)
	Invalid_crc	Invalid CRC in a frame
	Delim_err	Delimiter error (order set)
	Address_err	Address ID error (S_ID D_ID)
	Lr_in	Link reset in (primitive sequence), does not apply to FL_Port
	Lr_out	Link reset out (primitive sequence), does not apply to FL_Port
	Ols_in	Offline reset in (primitive sequence), does not apply to FL_Port
	Ols_out	Offline reset in (primitive sequence), does not apply to FL_Port
	Frjt	Number of frames rejected
Fbsy	Number of frames busy	
<p><b>NOTE:</b> All port topologies except E_port, display F_port for this field. This is the logical state of the port. For example, an L_port in switchShow is an FL_port, thus logically an F_port.</p>		

## portStatsClear

Figure A-72, the `portStatsClear` command, is used to clear the errors listed in the `portErrShow` table (see Figure A-65), so as to provide a refreshed view of the switch errors. Use this command to clear the error statistics from the switch, four ports at a time.

**NOTE:** This command clears the errors from the six columns beginning with “enc in” and ending with “enc out.”

```
admin> portStatsClear 0
```

Figure A-72: `portStatsClear` command example

- To clear the statistics from ports 0 through 3, enter `portStatsClear 0`
- To clear the statistics from ports 4 through 7, enter `portStatsClear 4`
- To clear the statistics from ports 8 through 11, enter `portStatsClear 8`
- To clear the statistics from ports 12 through 15, enter `portStatsClear 12`

See [portErrShow, page A-65](#) and [portErrShow Command Field Descriptions, page A-65](#) for information about errors being cleared.

## portStatsShow

Figure A-73 shows the `portStatsShow` command. When used with a port number, this command gives a static view of port status. For example, to update the command and check if an error count is increasing, reissue the `portStatsShow` to capture another snapshot. The command syntax is `portStatsShow <port #>`. Table A-22 shows the command fields.

```
switch:admin> portStatsShow 2
```

stat_wtx	1379589	4-byte words transmitted
stat_wrx	473913	4-byte words received
stat_ftx	114957	Frames transmitted
stat_frx	40	Frames received
stat_c2_frx	0	Class 2 frames received
stat_c3_frx	34	Class 3 frames received
stat_lc_rx	3	Link control frames received
stat_mc_rx	0	Multicast frames received
stat_mc_to	0	Multicast timeouts
stat_mc_tx	0	Multicast frames transmitted
tim_rdy_pri	599970	Time R_RDY high priority
tim_txcrd_z	0	Time BB_credit zero
er_enc_in	0	Encoding errors inside of frames
er_crc	0	Frames with CRC errors
er_trunc	0	Frames shorter than minimum
er_toolong	0	Frames longer than maximum
er_bad_eof	0	Frames with bad end-of-frame
er_enc_out	74670	Encoding error outside of frames
er_disc_c3	0	Class 3 frames discarded
open	0	loop_open
transfer	0	loop_transfer
opened	0	FL_Port opened
starve_stop	0	tenancies stopped due to starvation
fl_tenancy	0	number of times FL has the tenancy
nl_tenancy	0	number of times NL has the tenancy
frame_nozone	0	frames rejected due to zone protection

Figure A-73: portStatsShow command example

**Table A-22: portStatsShow Command Field Descriptions**

Field	Description
stat_wtx	Number of 4-byte words transmitted from the port.
stat_wrx	Number of 4-byte words received by the port.
stat_ftx	Number of frames transmitted from the port.
stat_frx	Number of frames received by the port.
stat_c2_frx	Number of Class 2 frames received.
stat_c3_frx	Number of Class 3 frames received.
stat_lc_rx	Number of link control frames received.
stat_mc_rx	Number of multicast frames received.
stat_mc_to	Number of timeouts reported for multicast frames. A single frame could cause this counter to increment if it timed out for each multiple destination.
stat_mc_tx	Number of multicast frames transmitted.
tim_rdy_pri	Amount of time (measured in proprietary ticks) that R_RDY transmission has higher priority than frame transmission.
tim_txcrd_z	Time that this port cannot transmit frames due to a transmit buffer-to-buffer credit of zero.
er_enc_in	Received data: The number of 8b/10b encoding errors that have occurred inside frame boundaries. This counter is generally a nonzero value, although occasional errors can occur on a normal link and give a zero result. (Minimum compliance with the link bit error rate specification on a link continuously receiving frames would cause approximately one error every 20 minutes.)
er_crc	Received frames: The number of CRC errors detected.
er_trunc	Received frames: The number of frames that were shorter than the minimum Fibre Channel frame size (such as a header with no payload).
er_toolong	Received frames: The number of frames that were longer than the maximum Fibre Channel frame size (such as a header with a 2,112-byte payload).
er_bad_eof	The number of frames received with a badly formed end-of-frame.
er_enc_out	Receive link: The number of 8b/10b encoding errors recorded outside frame boundaries. This number can become nonzero during link initialization but indicates a problem if it increments faster than the allowed link-bit error rate (approximately once every 20 minutes).

**Table A-22: portStatsShow Command Field Descriptions (Continued)**

Field	Description
er_disc_c3	Receive link: The number of Class 3 frames discarded. Class 3 frames can be discarded due to timeouts or invalid/unreachable destinations. This quantity could increment at times during normal operation but might be used for diagnosing problems in some situations.
open	Loop_open: the number of times FL_Port entered the OPEN state.
transfer	Loop_transfer: the number of times FL_Port entered the TRANSFER state.
opened	FL_Port opened: the number of times FL_Port entered the OPENED state.
starve_stop	Loop tenancies stopped due to starvation.
fl_tenancy	Number of times FL_Port has the loop tenancy.
nl_tenancy	Number of times NL_Port has the loop tenancy.
frame_nozone	Number of frames rejected due to zone protection.

### psShow

Figure A-74 shows the psShow command, which displays power supply status information. The format of the display varies according to the switch model and number of power supplies present. Possible values are:

- OK—The power supply is present and functioning correctly.
- Absent—The power supply is not present.
- Faulty—The power supply is present but faulty (no power cable, power switch turned off, fuse blown, or other internal error).

After the status line, power supply information displays including manufacture date, part number, serial number, and other information.

```
switch:admin> psShow
Power Supply 1 is OK
9835,DH000000208,60-0000734-01, A,00001, E108302A,01, 803350Power
Supply 2 is OK
9839,DH000000253,60-0000734-01, A,00001, E108302A,01, 803522
```

Figure A-74: psShow command example

**NOTE:** Status information is not available on certain Fibre Channel SAN Switches.

## quietMode

Figure A-75 shows the `quietMode` command, which affects the output displayed on the switch's console (serial port or Telnet session). By default, `quietMode` is turned off, and all switch tasks may send output to the console. Some output is caused by asynchronous events, such as the fabric reconfiguring, or by devices logging in. When `quietMode` is turned on, only output produced by shell commands is shown. All asynchronous output produced by other tasks is suppressed. This is useful when driving a Telnet session via a script which may not expect any asynchronous output.

The following operand is optional:

`newMode`: 0 to clear quiet mode (all tasks may print to the console)  
          1 to set quiet mode (only shell commands may print)

Figure A-75 displays the current mode, then changes it to be on:

```
sw5:admin> quietMode
Quiet Mode is OFF
sw5:admin> quietMode 1
Committing configuration...done.
Quiet Mode is now ON
```

Figure A-75: `quietMode` command example

## reboot

Figure A-76 shows the `reboot` command, which restarts the switch to the stored configuration in flash memory. The restart lasts about one-and-a-half minutes. The switch can be in any operational state (enabled or disabled) before restarting.

```
admin> rebootRebooting...
```

Figure A-76: `reboot` command example

## ssn

The switch has a software readable serial number that can be accessed by using the Telnet command `ssn` (see [Figure A-77](#)). If you have a switch with firmware version 2.1.9x or later installed, the switch may display the WWN instead of the software readable serial number. In that case, the `ssn` Telnet command can be used to change the display to show the software readable serial number by following the procedure below.

1. Record the Compaq serial number as it appears on the outside of the switch element.
2. Enter `ssn` "serial number" where "serial number" is the Compaq serial number you recorded in Step 1. For example, if your switch element's serial number is XX012345555, you will enter: `ssn "XX012345555"`

---

**IMPORTANT:** Use quotation marks around the serial number.

---

3. Press the **Return** key. You will see `committing configuration...done.`
4. You can check that the new number was accepted by entering the `ssn` Telnet command.

```
admin> ssn
10:00:00:60:69:12:15:1f
admin> ssn "xx012345555"
Committing configuration...done.
admin> ssn
xx012345555
```

Figure A-77: `ssn` command example

## switchBeacon

[Figure A-78](#) shows the `switchBeacon` command, which sets the switch beaconing mode on or off if the operand is 1 or 0 respectively. When beaconing mode is turned on, the port LEDs will flash amber in a running pattern from port 0 through port 15, port 15 through port 0, and then back to port 15 again. Visually the user sees a running, back and forth pattern in amber from left to right and right to left. The pattern continues until the user turns it off. This mode can be used to beckon the user to a failing unit for example. Beaconing mode merely takes over the port LEDs. Other commands are still executable and functional. The normal flashing LED pattern (associated with an active, faulty or disabled port for example) is suppressed and only the beaconing pattern is shown. However if a diagnostic frame based tests (like `portLoopbackTest`, `crossPortTest`, and

spinSilk) are executed, two patterns are interleaved. The diagnostic test flickers the LEDs green and simultaneously the beaconing mode runs the LEDs amber. The `switchShow` command shows the status of beaconing: whether on or off.

The following operand is required:

**mode:** A value of 1 turns beaconing mode on. A value of 0 turns beaconing mode off.

```
To turn beaconing mode ON:
sw5:admin> switchBeacon 1

To turn beaconing mode OFF:
sw5:admin> switchBeacon 0
```

Figure A-78: switchBeacon command example

### switchDisable

[Figure A-79](#) shows the `switchDisable` command, which is used for diagnostic tests, maintenance functions, or replacement of a faulty switch. You can observe this process by watching the front panel LEDs change color from green to amber as each port inactivates.

```
admin> switchDisable
```

Figure A-79: switchDisable command example

### switchEnable

The `switchEnable` command enables the switch and provides fabric information. Enable the switch after maintenance and diagnostic tests. In [Figure A-80](#), the switch is enabled with a domain ID of 1. After the fabric is reconfigured, this switch is the principal address manager, capable of assigning domain IDs to other switches in the same fabric. The enable process may be observed and verified by watching the front panel LEDs change from slow flashing yellow as each port is enabled. The LEDs change to green for online ports, or may remain black for disconnected ports, or yellow for ports that do not initialize.

```
admin> switchEnable
value = 0 = 0x0
10 9 8 7 6 5 4 3 2 1
fabric: Principal switch
fabric: Domain 1
```

Figure A-80: switchEnable command example

**NOTE:** When a switch is powered on, it is automatically enabled.

## switchName

Figure A-81 shows the `switchName` command, which displays or sets the switch's name. If a new name is specified and enclosed in quotes, the command sets the switch to that name. The command syntax is `switchName <"name-of-switch">`. If no new name is included, the command displays the switch's default name.

```
admin> switchName "sw3"  
sw3
```

Figure A-81: `switchName` command example

The following restrictions apply to the length and format of the switch name:

- Cannot exceed 19 characters in length
- Cannot contain characters other than upper or lower case letters (a-z), the numbers 0-9, or the underscore character (\_)
- Must start with an upper or lower case letter (a-z)

**NOTE:** Switch names should be unique in a cascaded environment.

## switchShow

Figure A-82 shows the `switchShow` command, which displays the switch and port status. The fields are described in Table A-23.

```

admin> switchShow
switchName:    open146
switchType:    3.1
switchState:   Online
switchRole:    Principal
switchDomain:  1
switchId:      ffc41
switchWwn:     10:00:00:60:69:00:04:64
port 0: sw    Online      L-Port  1 private, 1 phantom
port 1: --    No_Module   L-Port
port 2: sw    No_Light    L-Port
port 3: sw    Online      L-Port  1 private, 1 phantom
port 4: --    No_Module
port 5: sw    Online      E-Port  10:00:00:60:69:00:00:12 "sw1"(upstream)
port 6: sw    No_Light
port 7: sw    No_Light
port 8: sw    No_Light
port 9: sw    Online      E-Port  10:00:00:60:69:00:01:b4 "sw3"(downstream)
port 10: sw   No_Light
port 11: sw   No_Light
port 12: sw   No_Light
port 13: sw   No_Light
port 14: sw   No_Light
port 15: sw   No_Light

```

Figure A-82: switchShow command example

**Table A-23: switchShow Command Field Descriptions**

Field	Description
switchName	The switch name
switchType	The switch model and motherboard revision level
switchState	The state of this switch: online, offline, testing, or faulty.

**Table A-23: switchShow Command Field Descriptions (Continued)**

Field	Description
switchRole	<p>There are three possibilities for switchRole:</p> <ul style="list-style-type: none"> <li>■ Master: The principal switch, as defined in FC-SW.</li> <li>■ Slave: The switch is enabled and not the principal switch.</li> <li>■ Disabled: The switch is disabled.</li> </ul>
switchDomain	<p>The domain ID of this switch can range from 0 to 31. The lowest domain numbered switch in a fabric will become the master.</p>
switchID	<p>The domain ID of this switch's embedded port is hex fffc00 to fffc7f.</p>
switchWwn	<p>The World Wide Name (WWN) of this switch, which is a unique identifier for each switch assigned by the manufacturer. A numbering scheme administered globally ensures that the WWN is unique for each switch.</p>
Port Number	<p>One line per port is printed after the switch summary. Each line shows the port number (0 to 15), the GBIC type, the port state, and a comment field.</p>
GBIC type	<p>The GBIC type follows the port number. The three GBIC types include:</p> <ul style="list-style-type: none"> <li>■ --: no GBIC present</li> <li>■ sw: shortwave GBIC</li> <li>■ lw: longwave GBIC</li> </ul>
Port state	<p>The port state follows the GBIC type. The possible port states include:</p> <ul style="list-style-type: none"> <li>■ No_Card: No card is present in this switch slot.</li> <li>■ No_Module: No GBIC module is in this port.</li> <li>■ No_Light: The module is not receiving light.</li> <li>■ No_Sync: The module is receiving light but it is out of sync.</li> <li>■ In_Sync: The module is receiving light and it is in sync.</li> <li>■ Laser_Fit: The module is signaling a laser fault (defective GBIC).</li> <li>■ Port_Fit: The port is marked faulty (defective GBIC, cable, or device).</li> <li>■ Diag_Fit: The port failed diagnostics (defective G_Port or FL_Port card or motherboard).</li> <li>■ Online: The port is up and running.</li> <li>■ Lock_Ref: The port is locking to the reference signal.</li> </ul>
Comment field	<p>The comment field follows the port state. The possible comments include:</p> <ul style="list-style-type: none"> <li>■ Disabled: The port is disabled.</li> <li>■ Loopback: The port is in loopback mode.</li> <li>■ E_Port: The WWN and switch name of the other switch is shown, and the use of this ISL is shown.</li> <li>■ F_Port: The WWN of the N_Port is shown.</li> <li>■ G_Port: The port is online but is not yet an E_Port or F_Port.</li> <li>■ L_Port: The port is connected to an arbitrated loop.</li> </ul>

## syslogdIpAdd

Syslog daemon (syslogd) is a process available on most UNIX systems that reads and forwards system messages to the appropriate log files and/or users, depending on the system configuration.

Figure A-83 shows the `syslogdIpAdd` command, which adds the IP address of a syslog daemon that is the IP address of the server running the syslogd process. When one or more IP addresses are configured, the switch will forward all error log entries (see `errShow`) to the syslogd on all the specified server(s). Up to six servers are supported.

The following operand is mandatory:

`IP_address`: The IP address of the server running syslogd.

The command example in Figure A-83 adds the address 192.168.1.60 to the list of machines where the system messages will be sent.

```
sw5:admin> syslogdIpAdd "192.168.1.60"  
  
Committing configuration...done.
```

Figure A-83: `syslogdIpAdd` command example

## syslogdIpRemove

Figure A-84 shows the `syslogdIpRemove` command, which removes the IP address of a syslog daemon that is the IP address of the server running the syslogd process.

The following operand is mandatory:

`IP_address`: The IP address of the server running syslogd.

The following example removes the address 192.168.1.60 from the list of machines to which system messages will be sent.

```
sw5:admin> syslogdIpRemove "192.168.1.60"  
  
Committing configuration...done.
```

Figure A-84: `syslogdIpRemove` command example

## syslogdIpShow

Figure A-85 shows the `syslogdIpShow` command, which displays all the syslog daemon IP addresses in the configuration database.

```
sw5:admin> syslogdIpShow
syslog.IP.address.1:      192.168.1.60
syslog.IP.address.2:      192.168.1.88
syslog.IP.address.3:      192.168.2.77
```

Figure A-85: `syslogdIpShow` command example

## tempShow

Figure A-86 shows the `tempShow` command, which shows the switch's temperature as measured by five sensors on the motherboard.

```
admin> tempShow
 29 29 31 27 32 Centigrade
 84 84 87 80 89 Fahrenheit
```

Figure A-86: `tempShow` command example

## uptime

Figure A-87 shows the `uptime` command, which displays the amount of time the switch has been in operation, the amount of time since the switch was first powered up, the date and time of the last restart, and the reason for the last restart.

For up and powered-on times less than 60 seconds, the time displays in seconds. For times greater than 60 seconds, the time displays in minutes.

```
switch:admin> uptime
Up for:3 days, 18:35
Powered for: 30 days, 16:05
Last up at: Mon Jan 11 16:17:29 1999
Reason:Reboot
```

Figure A-87: `uptime` command example

**version**

Figure A-88 shows the `version` command. The fields are described in Table A-24.

```
admin> version
Kernel: 5.3.1
Fabric OS: v2.0
Made on: Mon Nov 16 18:15:26 PST 1998
Flash: Mon Dec 28 15:34:05 PST 1998
BootProm: Thu Oct 1 13:34:29 PDT 1998
```

Figure A-88: `version` command example

**Table A-24: `version` Command Field Descriptions**

Field	Description
Kernel	Kernel operating environment version used on the processor
Fabric OS	Switch firmware version
Made on	Switch firmware release date and time
Flash	Build date of the firmware stored in flash memory
BootProm	Build date of the firmware stored in the boot prom

**diagHelp**

Figure A-89 shows the `diagHelp` command, which displays the diagnostic help commands available for troubleshooting switch problems.

```
switch:admin> diagHelp
ramTest          System DRAM diagnostic
portRegTest      Port register diagnostic
centralMemoryTest Central memory diagnostic
cmiTest          CMI bus connection diagnostic
camTest          Quickloop CAM diagnostic
portLoopbackTest Port internal loopback diagnostic
sramRetentionTest SRAM Data Retention diagnostic
cmemRetentionTest Central Mem Data Retention
diagnosticcrossPortTest Cross-connected port diagnostic
spinSilk         Cross-connected line-speed exerciser
diagClearError   Clear diag error on specified port
diagDisablePost  Disable Power On Self-Test
diagEnablePost   Enable Power On Self-Test
setGbicMode      Enable tests only on ports with GBICs
setSplbMode      Enable 0=Dual, 1=Single
supportShow      Print the switch info for debugging
diagShow         Print diagnostic status information
parityCheck      Dram Parity 0=Disabled, 1=Enable
```

Figure A-89: diagHelp command example

### licenseHelp

Figure A-90 shows the licenseHelp command, which displays the commands used to administer license keys. Each switch can save one license key for each optionally licensed product. License keys are unique for every switch.

```
switch:admin> licenseHelp
licenseAdd        Add a license key to this switch
licenseRemove     Remove a license key from this switch
licenseShow       Show current license key
```

Figure A-90: licenseHelp command example

### qlHelp

Figure A-91 shows the qlHelp command, which displays the commands used to administer QuickLoop.

switch:admin> qlHelp	
qlDisable	Disable quick loop mode
qlEnable	enable quick loop mode
qlPortDisable	Set portin non quick loop mode
qlPortEnable	Set port in quick loop mode
qlOnlineHold	Set hold loop in Monitoring option
qlOpenInitHold	Set hold loop in Open-Init option
qlPartner	Print/set quick loop partner
qlShow	Print quick loop info

Figure A-91: qlHelp command example

**routeHelp**

Figure A-92 shows the routeHelp command, which displays the routing help commands.

admin> routeHelp	
bcastShow	Print broadcast tree information
fspfShow	Print FSPF global information
interfaceShow	Print FSPF interface information
dlsReset	Turn off dynamic load sharing
dlsSet	Turn on the dynamic load sharing
iodReset	Turns off the in-order delivery option
iodSet	Turns on the in-order delivery option
LSDbShow	Print Link State Database entry
mcastShow	Print multicast tree information
nbrStateShow	Print neighbor's summary
informationtopologyShow	Print paths to domains
uRouteConfig	Configure static unicast route
uRouteRemove	Remove static unicast route
uRouteShow	Print port's unicast routing info

Figure A-92: routeHelp command example

**trackChangesSet**

Figure A-93 shows the trackChangesSet command, which enables track-changes feature if the mode operand is 1, and disables track-changes feature if the mode operand is a 0. An SNMP-trap can also be enabled if the snmp-trap mode operand is 1 and disabled if the snmp-trap mode operand is 0. Trackable changes are:

- Successful login
- Unsuccessful login

- Logout
- Config file change from task
- Track-changes on
- Track-changes off

The following operands are optional:

- **mode:**                    1 means enable the track-changes feature  
                                 0 means disable  
                                 The default (if no operand is specified) is 0
- **snmp-trap mode**        1 means send SNMP-trap in addition to errlog  
                                 0 means do not send SNMP-trap  
                                 The default (if no operand is specified) is 0

```
sw:admin> trackChangesSet 1, 0
0x10f9bcd0 (tShell): Feb 10 15:04:38
           Error TRACK-TRACK_ON, 4, Track-changes on
Committing configuration...done.
0x10f9bcd0 (tShell): Feb 10 15:04:42
           Error TRACK-CONFIG_CHANGE, 4, Config file change from task:tShell

sw:admin> trackChangesSet 0, 0
0x10f9bcd0 (tShell): Feb 10 15:04:50
           Error TRACK-TRACK_OFF, 4, Track-changes off
Committing configuration...done.
```

Figure A-93: trackChangesSet command example

**zoneHelp**

Figure A-94 shows the zoneHelp command, which displays the zoning help commands.

switch:admin> zoneHelp	
aliAdd	Add member to a zone alias
aliCreate	Create a zone alias
aliDelete	Delete a zone alias
aliRemove	Remove a member from a zone alias
aliShow	Print zone alias information
cfgAdd	Add a zone to a configuration
cfgCreate	Create a zone configuration
cfgDelete	Delete a zone configuration
cfgRemove	Remove a zone from a configuration
cfgShow	Print zone configuration information
zoneAdd	Add a member to a zone
zoneCreate	Create a zone
zoneDelete	Delete a zone
zoneRemove	Remove a member from a zone
zoneShow	Print zone information
cfgClear	Clear all zone configurations
cfgDisable	Disable a zone configuration
cfgEnable	Enable a zone configuration
cfgSave	Save zone configurations in flash

Figure A-94: zoneHelp command example

**Diagnostic Commands**

Diagnostic commands enable you to monitor, test, and evaluate the switch.

**diagHelp**

Figure A-95 shows a list of the diagnostic commands in alphabetical order.

<code>camTest</code>	Quickloop CAM diagnostic
<code>centralMemoryTest</code>	Central memory diagnostic
<code>cmemRetentionTest</code>	Central Mem Data Retention diagnostic
<code>cmiTest</code>	CMI bus connection diagnostic
<code>crossPortTest</code>	Cross-connected port diagnostic
<code>diagClearError</code>	Clear diag error on specified port
<code>diagDisablePost</code>	Disable Power-On-Self-Test
<code>diagEnablePost</code>	Enable Power-On-Self-Test
<code>diagShow</code>	Print diagnostic status information
<code>parityCheck</code>	Dram Parity 0=Disabled, 1=Enable
<code>portLoopbackTest</code>	Port internal loopback diagnostic
<code>portRegTest</code>	Port register diagnostic
<code>ramTest</code>	System DRAM diagnostic
<code>setGbicMode</code>	Enable tests only on ports with GBICs
<code>setSplbMode</code>	Enable 0=Dual, 1=Single port LB mode
<code>spinSilk</code>	Cross-connected line-speed exerciser
<code>sramRetentionTest</code>	SRAM Data Retention diagnostic
<code>supportShow</code>	Print version, error, portLog, etc.

Figure A-95: diagHelp command results

### camTest

Figure A-96 shows the `camTest` command, which verifies that the SID translation required by QuickLoop and implemented using content addressable memories (CAMs) is functioning correctly. This test cannot be executed on an operational switch. Before issuing the `camTest` command, disable the switch using the `switchDisable` command.

```
switch:admin> camTest
Running CAM Test..... passed.
```

Figure A-96: camTest command example

### centralMemoryTest

Figure A-97 shows the `centralMemoryTest` command, which checks the central memory in each Application Specific Integrated Circuit (ASIC). This test ensures that:

- The built-in self-repair (BISR) circuit in each ASIC chip does not report failure to repair bad cells (bISR test).
- The data cells can be uniquely written and read correctly (data write/read test).
- The data in any one ASIC can be read from any other ASIC (asic-asic test\_).
- Bad parity can be detected and flagged in the error register and an interrupt can be posted (parity error test).
- Buffer number error can be detected and flagged in the error register and an interrupt can be posted (buffer number error test).
- Chip number error can be detected and flagged in the error register and an interrupt can be posted (chip number error test).

This test cannot be executed on an operational switch. Before issuing the `centralMemoryTest` command, disable the switch using the `switchDisable` command.

```
switch:admin> centralMemoryTest
Running Central Memory Test... passed.
```

Figure A-97: `centralMemoryTest` command example

### **cmemRetentionTest**

[Figure A-98](#) shows the `cmemRetentionTest` command, which verifies that data written into the SRAMs that make up the central memory is retained and that data bits do not decrease when read after some amount of delay since the write. This test cannot be executed on an operational switch. Before issuing the `cmemRetentionTest` command, disable the switch using the `switchDisable` command.

```
switch:admin> cmemRetentionTest
Running cmemRetention Test..... passed.
```

Figure A-98: `cmemRetentionTest` command example

### **cmiTest**

[Figure A-99](#) shows the `cmiTest` command, which verifies that control messages can be correctly sent from any ASIC to any other ASIC. This command also tests the checksum function. This test cannot be executed on an operational switch. Before issuing the `cmiTest` command, disable the switch using the `switchDisable` command.

```
switch:admin> cmiTest
Running CMI Test..... passed.
```

Figure A-99: cmiTest command example

### crossPortTest

---

**IMPORTANT:** See [setGbicMode](#), page A-104 prior to executing this command.

---

Figure A-100 shows the `crossPortTest` command, which verifies the intended functional operation of the switch. Each port's transmitter sends frames by means of the GBIC module and external cable to another port's receiver. This test exercises the entire path of the switch.

You can connect any port to any other port in the same switch provided the connection is of the same technology, for example, GBIC-SW ports to GBIC-SW ports and GBIC-LW ports to GBIC-LW ports.

---

**IMPORTANT:** All ports on the switch must be connected if the GBIC mode is disabled or if the switch shows an error condition. When running the `crossPortTest`, set the operating mode value to 0 or 1.

---

Related error messages are:

- DIAG-INIT
- DIAG-PORTDIED
- DIAG-XMIT
- DIAG-TIMEOUT
- DIAG-ERRSTAT
- DIAG-STATS
- DIAG-PORTWRONG
- DIAG-DATA
- DIAG-PORTABSENT

```

switch:admin> crossPortTest
Running Cross Port Test.....
switchName: JR-6011
switchType: 3.1
switchState: Testing
switchRole: Disabled
switchDomain: 1 (unconfirmed)
switchId: ffc01
switchWwn: 10:00:00:60:69:00:60:11
port 0: sw Testing Loopback->1
port 1: sw Testing Loopback->0
port 2: sw Testing Loopback->7
port 3: sw Testing Loopback->6
port 4: sw Testing Loopback->5
port 5: sw Testing Loopback->4
port 6: sw Testing Loopback->3
port 7: sw Testing Loopback->2

Port SNMP   Physical   Flags
-----
0: Testing  In_Sync   PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
1: Testing  In_Sync   PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
2: Testing  In_Sync   PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
3: Testing  In_Sync   PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
4: Testing  In_Sync   PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
5: Testing  In_Sync   PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
6: Testing  In_Sync   PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
7: Testing  In_Sync   PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
8: Testing  UNKNOWN   PRESENT ACTIVE G_PORT

```

Figure A-100: crossPortTest command example

The Cross Port test behaves differently according to the activated modes. [Figure A-25](#) shows Cross Port Test Modes:

**Table A-25:** Cross Port Test Modes

Mode	Description
switchEnabled or switchDisabled mode	<p>Online mode (switch enabled before executing the test):                      In the Online mode, only ports cable loopbacked to ports in the same switch are tested. The test ignores ports connected outside of the switch. To be successful, the test must find at least one port (if the singlePortAlso mode is active) or two ports (if the singlePortAlso mode is not active) cable loopbacked to each other. If not, the test displays one of the following messages:</p> <p>Need at least 1 port(s) connected to run this test.</p> <p>Need at least 2 port(s) cross-connected to run this test.</p> <p>Offline mode (switch disabled before executing the test):                      In the Offline mode, all ports cable loopbacked to similar ports in the same switch are tested. The test aborts if one or more ports are not connected. If any pair of ports is improperly connected (improperly seated GBIC modules or cables, nonoperating GBIC modules or cables, improper connection of SW to LW, and so on), the following message displays:</p> <p>One or more ports is not active, please double-check fibres on all ports.</p>
singlePortAlso mode	<p>Specify the singlePortAlso mode by executing the crossPortTest with a second argument value of one: sw:admin&gt; crossPortTest 0, 1.</p> <p>In this mode, the crossPortTest allows a port to be cable loopbacked to itself (port M is connected to port M) in addition to the supported cross connection (port M is connected to port N). This configuration can be used to isolate bad ports.</p>

**diagClearError**

[Figure A-101](#) shows the diagClearError command, which clears diagnostic errors detected on a specified port. Issuing this command does not clear the error log. The command syntax is diagClearError <port #>. Without the <port #> parameter, all errors are cleared.

```
switch:admin> diagClearError
```

Figure A-101: diagClearError command example

### diagDisablePost

Figure A-102 shows the `diagDisablePost` command, which disables POST processing. The start time without POST processing is approximately 50 to 55 seconds. A switch restarted without POST generates the `DIAG-POST_SKIPPED` error.

**NOTE:** Always execute POST processing to ensure the operational status of the switch during the power up stage.

```
switch:admin> diagDisablePost

Committing configuration...done.

On next reboot, POST will be skipped.
```

Figure A-102: `diagDisablePost` command example

### diagEnablePost

Figure A-103 shows the `diagEnablePost` command, which enables POST processing. The start time with POST processing is approximately 110 to 120 seconds for warm POST, and 165 to 175 seconds for cold POST. POST processing is enabled by default.

```
switch:admin> diagEnablePost

Committing configuration...done.

On next reboot, POST will be executed.
```

Figure A-103: `diagEnablePost` command example

### diagShow

Figure A-104 shows the `diagShow` command, which summarizes the diagnostics results, including POST results, since the switch was last started. Table A-26 describes the fields.

The `diagShow` command can be looped. For example, `diagShow 4` executes `diagShow` every four seconds until you stop it by pressing **Enter**. This command can be used to isolate a malfunctioning GBIC module. A port with a changing `LLI_errs` value is prefixed by `**` in the display.

```

switch:admin>diagShow
Diagnostics Status: Sun Jan 1 00:00:00 2000
port#:  0    1    2    3    4    5    6    7    8    9    10   11   12   13   14   15
diags:  OK   OK
state:  UP   UP
      lm0:    39624101 frTx          40128685 frRx          0 LLI_errs. <looped-15>
      lm1:    39309877 frTx          40007305 frRx          0 LLI_errs. <looped-11>
      lm2:    39750791 frTx          39885106 frRx          0 LLI_errs. <looped-7>
      lm3:    39501243 frTx          40065867 frRx          0 LLI_errs.<looped-4>
      lm4:    40066092 frTx          39501463 frRx          0 LLI_errs.<looped-3>
      lm5:    40075160 frTx          40257190 frRx          0 LLI_errs.<looped-9>
      lm6:    39886034 frTx          39751716 frRx          0 LLI_errs.<looped-14>
      lm7:    39989371 frTx          39960595 frRx          0 LLI_errs.<looped-2>
      lm8:    40257892 frTx          40075855 frRx          0 LLI_errs.<looped-13>
      lm9:    39154671 frTx          40250787 frRx          0 LLI_errs.<loop-5>
      lm10:   39767848 frTx          39798346 frRx          0 LLI_errs.<looped-12>
      lm11:   40009605 frTx          39312144 frRx          0 LLI_errs.<looped-1>
      lm12:   39961890 frTx          39990666 frRx          0 LLI_errs.<looped-10>
      lm13:   39799377 frTx          39768879 frRx          0 LLI_errs.<looped-8>
      lm14:   40252478 frTx          39156315 frRx          0 LLI_errs.<looped-6>
      lm15:   40132745 frTx          39628100 frRx          0 LLI_errs.<looped-0>

Central Memory OK
Total Diag Frames Tx: 419264
Total Diag Frames Rx: 447200
    
```

Figure A-104: diagShow command example

**Table A-26: diagShow Command Field Descriptions**

Field	Description
Diagnostics Status	The title header displays the time diagShow was executed.
port#	The port number.
diags	Port's current diagnostic status. Possible values include OK or BAD.
state	Port's current state. Possible values include UP (active) or DN (inactive).

**Table A-26: diagShow Command Field Descriptions (Continued)**

Field	Description
Im0-7 (8-port) Im0-15 (16-port)	The frame counts of active ports. The display shows the number of frames transmitted and received and low level interface counts (LLI_errs).
Central Memory Status	Central memory status. Possible values include OK or FAULTY.
Total Diag Frames Tx	The total diagnostics frames transmitted (Tx) since start. This number usually corresponds to the total frames received (Rx) but can differ because of failure modes.
Total Diag Frames Rx	The total diagnostics frames received (Rx) since start. This number usually corresponds to the total frames transmitted (Tx) but can differ because of failure modes.

**portLoopbackTest**

Figure A-105 shows the `portLoopbackTest` command, which verifies the intended functional operation of the switch by sending frames from each port's transmitter back to the same port's receiver through an internal hardware loopback. This command tests the switch circuitry up to the serial output of the ASIC. The command syntax is `portLoopbackTest nFrames`. This test cannot be executed on an operational switch. Before issuing the `portLoopbackTest` command, disable the switch using the `switchDisable` command.

If you do not include the `nFrames` parameter, the loopback test runs continuously until you press **Enter**.

```

switch:admin> portLoopbackTest
Running Port Loopback Test...
Diags: (Q)uit, (C)ontinue, (S)tats, (L)og: s
Diagnostics Status: Sun Jan 1 00:00:00 2000

port#:      0      1      2      3      4      5      6      7
diags:      OK      OK      OK      OK      OK      OK      OK      OK
state:      UP      UP      UP      UP      UP      UP      UP      UP

          lm0:      4654 frTx      4654 frRx      0      LLI_errs.
          lm1:      4654 frTx      4654 frRx      0      LLI_errs.
          lm2:      4654 frTx      4654 frRx      0      LLI_errs.
          lm3:      4654 frTx      4654 frRx      0      LLI_errs.
          lm4:      4654 frTx      4654 frRx      0      LLI_errs.
          lm5:      4654 frTx      4654 frRx      0      LLI_errs.
          lm6:      4654 frTx      4654 frRx      0      LLI_errs.
          lm7:      4654 frTx      4654 frRx      0      LLI_errs.

Central Memory OK
Total Diag Frames Tx: 38032
Total Diag Frames Rx: 39232

Diags: (Q)uit, (C)ontinue, (S)tats, (L)og: q aborted
    
```

Figure A-105: portLoopbackTest command example

If the test does not find an error, there is no output. You can choose to continue the test, view statistics, or view an error log. [Table A-27](#) describes the loopback error message fields.

**Table A-27: portLoopbackTest Command Field Descriptions**

Field	Description
Diagnostics Status	The title header displays the time diagShow was executed.
port#	The port number.
diags	Port's current diagnostic status. Possible values include OK or BAD.

**Table A-27: portLoopbackTest Command Field Descriptions (Continued)**

Field	Description
state	Port's current state. Possible values include UP (active) or DN (inactive).
lm0-7 (8-port) lm0-15 (16-port)	The frame counts of active ports. The display shows the number of frames transmitted and received and low level interface counts (LLI_errs).
Central Memory Status	Central memory status. Possible values include OK or FAULTY.
Total Diag Frames Tx	The total diagnostics frames transmitted (Tx) since start. This number usually corresponds to the total frames received (Rx) but can differ because of failure modes.
Total Diag Frames Rx	The total diagnostics frames received (Rx) since start. This number usually corresponds to the total frames transmitted (Tx) but can differ because of failure modes.

### portRegTest

Figure A-106 shows the `portRegTest` command, which checks registers and static memory located on the motherboard. Registers are set under firmware control and are used to control the hardware route selection and other internal hardware functions. This test validates that all registers are accessible. This test cannot be executed on an operational switch. Before issuing the `portRegTest` command, disable the switch using the `switchDisable` command.

```
switch:admin> portRegTest

Running Port Register Test.... passed.
```

Figure A-106: portRegTest command example

### ramTest

Figure A-107 shows the `ramTest` command, which checks processor RAM memory. This test validates proper memory function.

```
switch:admin> ramTest

Running System DRAM Test..... passed.
```

Figure A-107: ramTest command example

## setGbicMode

Activate the GBIC mode by executing the following command before executing the `CrossPortTest`:

```
sw:admin> setGbicMode 1
```

When activated, only ports with GBIC modules present are tested. The state of the GBIC mode is activated until it is disabled as follows:

```
sw:admin> setGbicMode 0
```

An example mode of operation would be to disable the switch, set the GBIC mode to 1, and execute the `crossPortTest` with the `singlePortAlso` mode activated to limit testing to:

- Ports with GBIC modules installed
- Ports properly cable loopbacked
- Ports connected to themselves (single port connections)

The command syntax is:

```
crossPortTest <nFrames>, <0 or 1>
```

where `<nFrames>` determines the number of frames to run, and `<0 or 1>` determines if a single port connection is allowed (0=not allowed, 1=allowed). If you do not include the `<nFrames>` parameter, the test runs until you press **Enter**.

[Figure A-108](#) and [Figure A-109](#) show the `setGbicMode` commands. The GBIC mode, when enabled, forces the `crossPortTest` or the `spinSilk` test to limit testing to only ports with detected GBIC modules. To enable GBIC mode, execute the `setGbicMode 1` command.

```
switch:admin> setGbicMode 1
```

Figure A-108: `setGbicMode 1` command example

To disable GBIC mode, execute the `setGbicMode 0` command.

```
switch:admin> setGbicMode 0
```

Figure A-109: `setGbicMode 0` command example

**setSplbMode**

Figure A-110 shows the `setSplbMode` command, which enables and disables the SPLB mode. The parameter can be set to “0” or “1”. When set to “0”, the SPLB mode is disabled. When set to “1”, the SPLB mode is enabled. The default setting is “0”.

The mode is saved in flash memory and stays in that mode until the next execution of `setSplbMode`. Restarting is not required to execute the command.

When enabled, the SPLB mode forces `spinSilk` to disable two port loop-back for M-to-M connected ports. This may be useful to isolate internal switch problems from GBIC problems since the internal paths are used much less with SPLB mode enabled.

When disabled, the SPLB mode forces `spinSilk` to circulate frames between pairs of M-to-M connected ports as follows:

```
P1 TX >>> P1 RX -> P2 TX >>> P2 RX -> P1 TX
>>> cable or internal loop-back
-> routing table entry
```

The connections between pairs of M-to-M ports exercise the connections between as many chips (or bloom quadrants) as possible subject to the setting of `allow_intra_chip` and the availability of pairs M-to-M ports.

Any ports that are cross-cabled are routed to each other in the normal manner regardless of the setting of the SPLB mode:

```
P1 TX >>> P2 RX -> P1 TX and
P2 TX >>> P1 RX -> P2 TX
```

```
switch:admin> setSplbMode 1
Committing configuration...done.
SPLB mode is now ON.
```

```
switch:admin> setSplbMode 0
Committing configuration...done.
SPLB mode is now OFF.
```

Figure A-110: `setSplbMode` command example

## spinSilk

Figure A-111 to Figure A-113 show the `spinSilk` command, which verifies the intended functional operation of the switch. Each port's transmitter sends frames by means of the GBIC module and external cable to another port's receiver at full hardware speed (1 GB/s). The entire path of the switch is exercised. Because the processor does not compare data on each frame, the `spinSilk` test does not report the `DIAG-DATA` error. Other error messages defined for the `crossPortTest` and the corresponding probable causes and actions are applicable to the `spinSilk` test.

The state of the GBIC mode affects the operation of the `spinSilk` test. To activate the GBIC mode, execute the following command prior to executing the `crossPortTest` command:

```
switch:admin> setGbicMode 1
```

When activated, only ports with GBIC modules installed are included in the list of ports to test. For example, if only ports 0 and 3 have GBIC modules installed and the GBIC mode is activated, the `spinSilk` test limits testing to ports 0 and 3. The state of the GBIC mode is saved in flash memory. The GBIC mode stays activated (even after restarts or power cycles) until you disable it with the following command:

```
sw:admin> setGbicMode 0
```

An example mode of operation would be to disable the switch, set the GBIC mode to 1, and execute the `spinSilk` test to limit testing to:

- Ports with GBIC modules installed
- Ports that are properly cable loopbacked

This test cannot be executed on an operational switch. Before issuing the `spinSilk` command, disable the switch using the `switchDisable` command.

**NOTE:** When running the `spinSilk` test, you must set the operating mode value to 0 or 1. Using operating mode 0 when running the Spin Silk test is recommended.

The command syntax is:

```
spinSilk nMillions
```

where `nMillions` is the number of frames for the test to execute expressed in millions of frames. If you do not include the `nMillions` parameter, the `spinSilk` test runs until you press **Enter**.

```
switch:admin> spinSilk 2
Running Spin Silk.....
One moment please...
switchName: SR-7371
switchType: 2.2
switchState: Testing
switchRole: Disabled
switchDomain: 1 (unconfirmed)
switchId: fffc01
switchWwn: 10:00:00:60:69:00:73:71
port 0: cu Testing Loopback->15
port 1: sw Testing Loopback->11
port 2: sw Testing Loopback->7
port 3: lw Testing Loopback->4
port 4: lw Testing Loopback->3
port 5: sw Testing Loopback->9
port 6: sw Testing Loopback->14
port 7: sw Testing Loopback->2
port 8: sw Testing Loopback->13
port 9: sw Testing Loopback->5
port 10: sw Testing Loopback->12
port 11: sw Testing Loopback->1
port 12: sw Testing Loopback->10
port 13: sw Testing Loopback->8
port 14: sw Testing Loopback->6
port 15: cu Testing Loopback->0
Transmitting... done.
Spinning...
port 15 Rx/Tx 1 of 2 million frames.
port 0 Rx/Tx 1 of 2 million frames.
port 1 Rx/Tx 1 of 2 million frames.
port 2 Rx/Tx 1 of 2 million frames.
port 3 Rx/Tx 1 of 2 million frames.
port 4 Rx/Tx 1 of 2 million frames.
port 5 Rx/Tx 1 of 2 million frames.
port 6 Rx/Tx 1 of 2 million frames.
port 7 Rx/Tx 1 of 2 million frames.
```

Figure A-111: spinSilk command example 1

```
port 8 Rx/Tx 1 of 2 million frames.  
port 9 Rx/Tx 1 of 2 million frames.  
port 10 Rx/Tx 1 of 2 million frames.  
port 11 Rx/Tx 1 of 2 million frames.  
port 12 Rx/Tx 1 of 2 million frames.  
port 13 Rx/Tx 1 of 2 million frames.  
port 14 Rx/Tx 1 of 2 million frames.  
port 8 Rx/Tx 2 of 2 million frames.  
port 9 Rx/Tx 2 of 2 million frames.  
port 10 Rx/Tx 2 of 2 million frames.  
port 11 Rx/Tx 2 of 2 million frames.  
port 12 Rx/Tx 2 of 2 million frames.  
port 13 Rx/Tx 2 of 2 million frames.  
port 14 Rx/Tx 2 of 2 million frames.  
port 15 Rx/Tx 2 of 2 million frames.  
port 0 Rx/Tx 2 of 2 million frames.  
port 1 Rx/Tx 2 of 2 million frames.  
port 2 Rx/Tx 2 of 2 million frames.  
port 3 Rx/Tx 2 of 2 million frames.  
port 4 Rx/Tx 2 of 2 million frames.  
port 5 Rx/Tx 2 of 2 million frames.  
port 6 Rx/Tx 2 of 2 million frames.  
port 7 Rx/Tx 2 of 2 million frames.
```

Figure A-112: spinSilk command example 1 (continued)

```

Diagnostics Status: Thu Jul 30 14:43:36 1998
port#:  0    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15
diags:  OK   OK   OK   OK   OK   OK   OK   OK   OK   OK  OK   OK   OK   OK   OK   OK
state:  UP   UP   UP   UP   UP   UP   UP   UP   UP   UP  UP   UP   UP   UP   UP   UP
      lm0:    2044334 frTx          2053602 frRx          0  LLI_errs.<looped-15>
      lm1:    2046987 frTx          2049307 frRx          0  LLI_errs.<looped-11>
      lm2:    2046259 frTx          2050415 frRx          0  LLI_errs.<looped-7>
      lm3:    2048907 frTx          2038532 frRx          0  LLI_errs.<looped-4>
      lm4:    2038717 frTx          2049093 frRx          0  LLI_errs.<looped-3>
      lm5:    2049555 frTx          2052277 frRx          0  LLI_errs.<looped-9>
      lm6:    2048260 frTx          2047600 frRx          0  LLI_errs.<looped-14>
      lm7:    2051407 frTx          2047246 frRx          0  LLI_errs.<looped-2>
      lm8:    2055484 frTx          2048350 frRx          0  LLI_errs.<looped-13>
      lm9:    2053018 frTx          2050297 frRx          0  LLI_errs.<loop-5>
      lm10:   2048345 frTx          2048404 frRx          0  LLI_errs.<looped-12>
      lm11:   2051282 frTx          2048962 frRx          0  LLI_errs.<looped-1>
      lm12:   2048944 frTx          2048885 frRx          0  LLI_errs.<looped-10>
      lm13:   2049535 frTx          2056672 frRx          0  LLI_errs.<looped-8>
      lm14:   2049481 frTx          2050141 frRx          0  LLI_errs.<looped-6>
      lm15:   2056950 frTx          2047666 frRx          0  LLI_errs.<looped-0>

Central Memory OK
Total Diag Frames Tx: 130432
Total Diag Frames Rx: 134752

```

Figure A-113: spinSilk command example 2

**sramRetentionTest**

Figure A-114 shows the `sramRetentionTest` command, which verifies that data written into the ASIC memories are retained and that data bits do not decrease when read after some amount of delay since the write. This test cannot be executed on an operational switch. Before issuing the `sramRetentionTest` command, disable the switch.

```

switch:admin> sramRetentionTest
Running SRAM Retention Test..... passed.

```

Figure A-114: `sramRetentionTest` command example

## **supportShow**

The `supportShow` command prints switch information for debugging purposes. The command executes the following commands in the order shown:

- `version`
- `tempShow`
- `psShow`
- `licenseShow`
- `diagShow`
- `errDump`
- `switchShow`
- `portFlagsShow`
- `portErrShow`
- `mqShow`
- `portSemShow`
- `portShow`
- `portRegShow`
- `portRouteShow`
- `fabricShow`
- `topologyShow`
- `qIShow`
- `nsShow`
- `nsAllShow`
- `cfgShow`
- `configShow`
- `faultShow`
- `traceShow`
- `portLogDump`

[Figure A-115](#) shows the `supportShow` command. The command syntax is:  
`supportShow <firstPort>, <lastPort>, <nLog>`

```

switch:admin> supportShow
VxWorks: 5.3.1
Firmware: v2.0_beta3
Made on: Fri Mar 19 16:29:55 PST 1999
Flash: Fri Mar 19 16:30:19 PST 1999
BootProm: Tue Dec 29 17:32:38 PST 1998
none:
No licenses
28 29 30 29 27 Centigrade
82 84 86 84 80 Fahrenheit
Power Supply #1 is absent
Power Supply #2 is OK

```

Figure A-115: supportShow command example

[Table A-28](#) describes the supportShow command fields.

**Table A-28: supportShow Field Descriptions**

Field	Description
firstPort	The first port in a range of ports about which information is printed. The default (if no operand is specified) is to print the state of port 0. If only firstPort is specified, only the information for firstPort is printed.
lastPort	The last port in a range of ports about which information is printed. If firstPort is specified but lastPort is not specified, only firstPort information is printed for the port-based commands (portShow, portRegShow, and portRouteShow).
nLog	Number of lines of portLogDump to print: <ul style="list-style-type: none"> <li>■ 0 means dump all lines (default)</li> <li>■ N means dump the last N lines</li> <li>■ &lt;0 means skip portLogDump</li> </ul>

## Routing Commands

Routing commands let you view switch routing information.

### bcastShow

Figure A-116 shows the `bcastShow` command, which displays broadcast tree information and all ports that are currently transmitting and receiving broadcast frames. The fields are described in Table A-29.

The `bcastShow` command helps you understand the routes that broadcast frames take through the fabric. A bit set indicates that the corresponding port belongs to a specific set. For instance, the bitmap value `0x00010003` means that port 0, port 1, and port 16 (the embedded port) are members of the set.

Group	Member Ports	Member ISL Ports	Static ISL Ports
31	0x00010003	0x00000000	0x00000000

Figure A-116: `bcastShow` command example

**Table A-29: bcastShow Bitmap Field Descriptions**

Bitmap Field	Description
Group	The multicast group
Member Ports	All ports currently transmitting or receiving broadcast frames
Member ISL Ports	Ports that belong to the interswitch broadcast distribution tree, as selected by the dynamic broadcast path selection protocol. Broadcast frames use these ports to reach all of the fabric switches and to enter into the switch.  Some of the E_Ports on a switch cannot be part of this set since the broadcast paths must constitute a tree.
Static ISL Ports	Ports that belong to the interswitch broadcast distribution tree, as configured through the shell. This field is normally <code>0x00000000</code> .

**fspfShow**

Figure A-117 shows the `fspfShow` command, which displays Fibre Channel Shortest Path First (FSPF) information. The fields are described in Table A-30.

```
switch:admin> fspfShow

version          = 2domain
ID              = 1
isl_ports       = 0x00000000
minLSArrival    = 3
minLSInterval   = 5
LsoriginCount   = 0
startTime       = 18656
fspfQ           = 0x10fa44e0
fabP            = 0x10fa4d60
agingTID        = 0x10f7e4c0
agingTo         = 10000
lSrDlyTID       = 0x10f6e4f0
lSrDelayTo      = 5000
lSrDelayCount   = 0
ddb_sem         = 0x10fa44b0

fabP:
event_sch = 0x0
lSrRefreshCnt = 0
```

Figure A-117: `fspfShow` command example

**Table A-30: fspfShow Command Field Descriptions**

Field	Description
version	The version of the FSPF protocol
domainID	The local switch's domain ID
isl_ports	A bitmap field that shows all local switch E_Ports
startTime	The time the FSPF started, in milliseconds from start.
other	Internal FSPF variables

## interfaceShow

Figure A-118 and Figure A-119 show the `interfaceShow` command, which displays FSPF interface information. This includes static information about the port (for example, variables allocated when a port is down) and “neighbor” information (variables associated with the remote switch connected to the port). An FSPF interface corresponds to an `E_Port`. The fields are described in Table A-31.

The command syntax is `interfaceShow <port#>`. With no parameters, the command result shows the information for all switch interfaces.

```
switch:admin> interfaceShow 10
idbP                = 0x10f7e560
Interface 10 data structure:
nghbP               = 0x0
ifNo                = 0
cost                = 1000
delay              = 1
lastScn             = 5
lastScnTime         = Mar 20 16:09:49.1999
upCount             = 0
lastUpTime          = Mar 20 16:09:49.1999
downCount           = 2
lastDownTime        = Mar 20 16:09:46.516
downReason          = 2
iState              = DOWN

Type <CR> to continue, Q<CR> to stop:
```

Figure A-118: `interfaceShow` command example

Neighbor 10 data structure:	
state	= NB_ST_FULL
nghbCap	= 0x0
nghbld	= 239
idbNo	= 10
remPort	= 10
nflags	= 0x3
initCount	= 1
&dbRetransList	= 0x10e83530
&lSrRetransList	= 0x10e83540
&lSrAckList	= 0x10e83550
inactTID	= 0x10e83200
helloTID	= 0x10e834c0
dbRtxTID	= 0x10e833d0
lSrRtxTID	= 0x10e82cb0
inactTo	= 80000
helloTo	= 20000
rXmitTo	= 5000
nCmdAcc	= 132
nInvCmd	= 0
nHloIn	= 122
nInvHlo	= 0
nLsuIn	= 5
nLsaIn	= 5
attHloOut	= 123
nHloOut	= 123
attLsuOut	= 5
nLsuOut	= 5
attLsaOut	= 5
nLsaOut	= 5

Figure A-119: interfaceShow command example (continued)

**Table A-31: interfaceShow Command Field Descriptions**

Field	Description
idbP	The port number
nghbP	The neighbor (adjacent) switch's port
ifNo	The port number, which should be identical to the value specified in the command line
cost	The cost of sending a frame over the ISL connected to this port. The value 1000 indicates a 1 Gbps link.
delay	The conventional delay incurred by a frame transmitted on this ISL. The delay is required by the FSPF protocol and is a fixed value.

**Table A-31: interfaceShow Command Field Descriptions (Continued)**

Field	Description
lastScn	The last State Change Notification received on this interface.
lastScnTime	The time the last SCN was received.
upCount	The number of times this interface initialized (the transition number from an offline to E_Port state)
lastUpTime	The last time this interface came up.
downCount	The number of times this interface went down.
lastDownTime	The last time this interface went down.
downReason	The reason (SCN) for the interface going down.
iState	The current interface state, which must be up in order for the ISL to forward frames to the adjacent switch
state	The current neighbor state. The state value must be NB_ST_FULL for the ISL to forward frames to the adjacent switch. Other values can be transitory; however, if a value is retained for more than 10 seconds, contact technical support.
nghbCap	Neighbor capabilities have a value of 0.
nghbld	The neighbor (adjacent) switch's domain ID
idbNo	The port number
remPort	The port number on the remote switch connected to this port
inactTo	The inactivity time out (in milliseconds). When this timeout expires, the adjacency with the neighbor switch expires. When this happens, new paths are computed to all possible destination switches in the fabric.
helloTo	The Hello timeout. When this timeout expires, a Hello frame is sent to the neighbor switch through this port.
rXmitTo	The retransmit timeout, which is used to transmit topology information to the neighbor switch. If an acknowledgment is not received within rXmitTo, the frame is retransmitted.
nCmdAcc	The number of commands accepted from the neighbor switch, which include Hellos, Link State Updates, and Link State Acknowledges
nInvCmd	The number of invalid commands received from the neighbor switch. These are commands with a version higher than the one running on the local switch. The current version is 1 and there is no version 0.
nHlOln	The number of Hello frames received from the neighbor switch
nInvHlo	The number of invalid Hello frames received from the neighbor switch. These are Hello frames with invalid parameters.
nLsuln	The number of Link State Updates received from the neighbor switch

**Table A-31: interfaceShow Command Field Descriptions (Continued)**

Field	Description
nLsaln	The number of Link State Acknowledges received from the neighbor switch
attHloOut	The number of attempted transmissions of Hello frames to the neighbor switch
nHloOut	The number of Hello frames actually transmitted to the neighbor switch
attLsuOut	The number of attempted transmissions of Link State Updates to the neighbor switch
nLsuOut	The number of Link State Updates actually transmitted to the neighbor switch
attLsaOut	The number of attempted transmissions of Link State Acknowledgments to the neighbor switch
nLsaOut	The number of Link State Acknowledgments transmitted to the neighbor switch
other	The other fields represent internal FSPF variables.

**dlsReset**

Figure A-120 shows the `dlsReset` command, which turns off the dynamic load sharing option. The `dlsReset` command prevents load sharing when a fabric change occurs if otherwise working ports could be affected. Load sharing will only occur when a switch restarts. Only use this command if devices connected to the fabric cannot properly handle occasional routing changes. Optimal load sharing is rarely achieved with this setting.

```
switch:admin> dlsReset
```

Figure A-120: `dlsReset` command example**dlsSet**

Figure A-121 shows the `dlsSet` command, which allows load sharing when a fabric change occurs. Routing is done on a per source port basis. All traffic coming in from a port that is directed to the same remote domain is routed through the same output E\_Port. To optimize fabric utilization, traffic is shared among all paths when there are multiple equivalent paths to a remote switch. If dynamic load sharing is enabled, the optimal load sharing is recomputed each time a change in the fabric occurs. The default load sharing option is on.

When dynamic load sharing is set, routing changes can affect working ports and applications, especially if the in-order delivery option is set.

```
switch:admin> dlsSet
```

Figure A-121: `dlsSet` command example

## iodReset

Figure A-122 shows the `iodReset` command, which turns off the in-order delivery option. This command allows out-of-order delivery of frames during fabric topology changes. After you execute the `iodReset` command, the switch allows fast rerouting after a fabric topology change. Use the `configShow` command to view the status of the `iodReset` command. If the `route.delay.Reroute` parameter is equal to 0, the in-order delivery option is off.

```
switch:admin> iodReset
```

Figure A-122: `iodReset` command example

## iodSet

Figure A-123 shows the `iodSet` command, which ensures that frames will not be delivered out-of-order, even during fabric topology changes. In a stable fabric, frames are always delivered in order, even when the traffic between switches is shared among multiple paths. Use the `configShow` command to view the status of the `iodSet` command. If the `route.delay.Reroute` parameter is equal to 1, the in-order delivery option is on.

Use this command with care because it will cause a delay in the establishment of a new path when a topology change occurs. Only use this command if there are devices connected to the fabric that do not tolerate occasional out-of-order delivery of frames. By default, the in-order delivery option is on.

```
switch:admin> iodSet
```

Figure A-123: `iodSet` command example

## LSDbShow

Figure A-124 shows the `LSDbShow` command, which displays domain Link State Database (LSD) entries. The fields are described in Table A-32. The database record for any fabric switch can be displayed from any switch. The `LSDbShow` command gives the same information regardless of which switch is used to run the program (unless there is a database update in progress, which occurs every 10 minutes in a stable network).

Every switch keeps a database of topology information associated with itself and the other fabric switches. The topology information for a switch consists of all neighbors that are in `NB_ST_FULL` state and the associated port numbers.

This replicated database remains synchronized at all times so that every switch in the fabric has the same topology view. The topology database, in turn, is used to compute the path from a switch to all other fabric switches.

With no parameters specified, the command shows all of the Link State Records (LSR) in the database instead of the LSR for domain 1.

```

admin> LSDbShow
Domain=0, Link State Database Entry pointer=0x10393140

lsrP                = 0x1036b650
earlyAccLSRs        = 0
ignoredLSRs         = 0
lastIgnored         = Never
installTime         = 0x96a64 (617060)
lseFlags             = 0xau0
utifs               = 0x2000
uPathCost           = 1000
uHopsFromRoot       = 1
mOutfs              = 0x0
parent              = 0x0
mPathCost           = 0
mHopsFromRoot       = 0

Link State Record:
Link State Record pointer = 0x1036b650
lsAge                = 512
reserved             = 0
type                 = 1
options              = 0x0
lsld                 = 0
advertiser           = 0
incarn               = 0x800003a0
length              = 60
chksum               = 0x9afe
linkCnt = 2,         flags = 0x0

LinkId = 1, out port = 8, rem port = 13, cost = 1000, costCnt = 0, type = 1
LinkId = 2, out port = 9, rem port = 8, cost = 1000, costCnt = 0, type = 1

```

Figure A-124: LSDbShow command example

**Table A-32: LSDbShow Command Field Descriptions**

Field	Description
domain	Indicates that domain 1 is the local switch's domain ID
lsrP	Link State Database Entry pointer
earlyAcclSRs	The number of LSRs (Link State Records) accepted within the 5-second window
ignoredLSRs	The number of LSRs ignored because the time was inside the 5-second window
lastIgnored	The time the last LSR was ignored because it was inside the 5-second window
installTime	This is the database entry for domain 1. The keyword installTime is the time when this database record was installed, in milliseconds from start. Values are in hexadecimal and decimal format.
debug fields	These fields contain internal Fibre Channel Shortest Path First (FSPF) information and are used by customer support for debugging purposes only: lseFlags, uOutifs, uPathCost, uHopsFromRoot, mOutifs, parent, mPathCost, and mHopsFromRoot.
lsAge	The record age in seconds since installation time. Records are refreshed throughout the fabric every 30 minutes. This value should never exceed 3600. When lsAge reaches the value 1800, the record is flushed from the fabric if the switch that is described by the LSR is functioning and is connected to the fabric.
reserved	This field is reserved for internal use.
type	Always 1
options	Default 0
lsId	The record's Link State ID is equal to the switch's domain ID, as described by the record.
advertiser	The switch ID of the switch that issued this LSR. Default set to lsId.
incarn	The incarnation number. When a record is refreshed every 10 minutes, its incarnation number is increased by an increment of 1. If data in the record changes (for example, if an E_Port on a switch goes offline), the switch described by that record issues a new instance and increments the incarnation number by 1.
length	The total record length
chksum	The record checksum, which includes all fields except lsAge.

**Table A-32: LSDbShow Command Field Descriptions (Continued)**

Field	Description
linkCnt	The link count, which is the number of neighbors in NB_ST_FULL state that are adjacent to the switch described by this record. The linkCnt field is followed by a number of lines equal to the link count. Each line contains the following information: <ul style="list-style-type: none"> <li>■ linkID-The neighbor switch's domain ID.</li> <li>■ out port-The ISL port number connecting the neighbor switch.</li> <li>■ cost-The cost of sending a frame over the ISL connected to this port. The cost is the same value as the cost in the neighbor data structure of the switch described by this record.</li> </ul>
linkID	The neighbor switch's domain ID
rem port	The port on the remote switch that the local port (out port) is connected to
costCnt	Always 0
type	Always 1

**mcastShow**

[Figure A-125](#) and [Figure A-126](#) show the mcastShow command with and without a parameter (group number). Without parameters, this command shows multicast tree information for all of the multicast groups. With parameters, it shows information about one multicast group only. [Table A-33](#) describes the command fields.

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```
admin> mcastShow
```

Group	Member Ports	Member ISL Ports	Static ISL Ports
0	0x00000084	0x00000084	0x00000000
1	0x00000084	0x00000084	0x00000000
2	0x00000084	0x00000084	0x00000000
3	0x00000084	0x00000084	0x00000000
4	0x00000084	0x00000084	0x00000000
5	0x00000084	0x00000084	0x00000000
6	0x00000084	0x00000084	0x00000000
7	0x00000084	0x00000084	0x00000000
8	0x00000084	0x00000084	0x00000000
9	0x00000084	0x00000084	0x00000000
10	0x00000084	0x00000084	0x00000000
11	0x00000084	0x00000084	0x00000000
12	0x00000084	0x00000084	0x00000000
13	0x00000084	0x00000084	0x00000000
14	0x00000084	0x00000084	0x00000000
15	0x00000084	0x00000084	0x00000000
16	0x00000084	0x00000084	0x00000000
17	0x00000084	0x00000084	0x00000000
18	0x00000084	0x00000084	0x00000000
19	0x00000084	0x00000084	0x00000000
20	0x00000084	0x00000084	0x00000000
21	0x00000084	0x00000084	0x00000000
22	0x00000084	0x00000084	0x00000000
23	0x00000084	0x00000084	0x00000000
24	0x00000084	0x00000084	0x00000000
25	0x00000084	0x00000084	0x00000000
26	0x00000084	0x00000084	0x00000000
27	0x00000084	0x00000084	0x00000000
28	0x00000084	0x00000084	0x00000000
29	0x00000084	0x00000084	0x00000000
30	0x00000084	0x00000084	0x00000000
31	0x00010087	0x00000084	0x00000000

Figure A-125: mcastShow command example 1

```
admin> mcastShow 1
```

Group	Member Ports	Member ISL Ports	Static ISL Ports
1	0x00000011	0x00000011	0x00000000

Figure A-126: mcastShow command example 2

**Table A-33: mcastShow Bitmap Field Descriptions**

Bitmap Field	Description
Group	The multicast group
Member Ports	All ports currently transmitting or receiving broadcast frames
Member ISL Ports	Ports that belong to the interswitch broadcast distribution tree, as selected by the dynamic broadcast path selection protocol. These are all E_Ports, and this set is a subset of m_port. Broadcast frames use these ports to reach all fabric switches and to enter into the switch.  Some of the E_Ports on a switch may not be part of this set since the broadcast paths must constitute a tree.
Static ISL Ports	Ports that belong to the interswitch broadcast distribution tree, as configured through the shell. This field is normally 0x00000000.

**nbrStateShow**

[Figure A-127](#) and [Figure A-128](#) show the `nbrStateShow` command, which displays the neighbor's summary information. You can also see this information by using the `interfaceShow` command. The `nbrStateShow` command provides essential information to determine the fabric topology in a concise way. By using this command, you can discover the domain ID of all switches directly connected to the local switch and the port number on the local and remote switches. The command fields are described in [Table A-34](#).

With no parameters, the `nbrStateShow` command shows the neighbor's state summary for all of the neighbors instead of the neighbor connected to port 0 only. The command syntax to list all neighbors is `nbrStateShow`.

```
admin> nbrStateShow
Local Domain ID: 1
```

Local Port	Domain	Remote Port	State
0	2	0	NB_ST_FULL
1	2	1	NB_ST_FULL
2	2	2	NB_ST_FULL
4	5	4	NB_ST_FULL
5	5	5	NB_ST_FULL
7	5	6	NB_ST_FULL

Figure A-127: nbrStateShow command example 1

The command syntax is `nbrStateShow <port #>` to list the neighbor on the specified port.

```
admin> nbrStateShow 1
Local Domain ID: 3
```

Local Port	Domain	Remote Port	State
1	2	1	NB_ST_FULL

Figure A-128: nbrStateShow command example 2

**Table A-34: nbrStateShow Command Field Descriptions**

Field	Description
Local Port	Corresponds to idbNo in the neighbor data structure.
Domain	Corresponds to nghbld in the neighbor data structure.
Remote Port	Corresponds to remPort in the neighbor data structure.
State	The neighbor's current state. The state value must be NB_ST_FULL for the ISL to forward frames to the adjacent switch. Other values can be transitory; however, if a value is retained for more than 10 seconds, contact technical support.

## topologyShow

Figure A-129 and Figure A-130 show the topologyShow command, which displays all paths to a domain including:

- Output ports used to route frames to the domain
- The routing cost to reach the domain
- The input ports routed through the output port

The FSPF protocol supports equal cost multipaths, so there could be multiple parallel paths between two switches.

The command syntax is topologyShow to list all domains. Table A-35 describes the command fields.

```
admin> topologyShow
Local Domain ID: 1
```

Domain	Metric	Hops	Out Port	In Port	Flags	Name
1	2000	2	2	0x00000050	D	"open348"
		2	1	0x00000020	D	
		2	0	0x00000080	D	
Type <CR> to continue, Q<CR> to stop:						
4	3000	3	2	0x00000050	D	"open375"
		3	1	0x00000020	D	
		3	0	0x00000080	D	
Type <CR> to continue, Q<CR> to stop: q						

Figure A-129: topologyShow command example 1

The command syntax is topologyShow <domain ID> to list a specified domain.

```
admin> topologyShow 1
Local Domain ID: 1
```

Domain	Metric	Hops	Out Port	In Port	Flags	Name
1	2000	2	2	0x00000050	D	"open148"
		2	1	0x00000020	D	
		2	0	0x00000080	D	

Figure A-130: topologyShow command example 2

**Table A-35: topologyShow Command Field Descriptions**

Field	Description
Domain	The destination domain
Metric	The total cost to reach the destination domain, or the sum of all link costs traversed by a frame to reach the destination domain. A metric of 1000 indicates the destination domain is one hop away from the local switch, since 1000 is the cost of a 1 Gbps link.
Hops	The number of hops (switches) between the local and remote switches.
Out Port	The out port used to route frames to the domain.
In Port	A bitmap field that indicates which ports are routed through the out port to reach the destination domain.
Flags	Indicates how the switch acquired this path. Possible values are: <ul style="list-style-type: none"> <li>■ D—The path was dynamically discovered by the FSPF protocol.</li> <li>■ S—The path was statically configured through the shell.</li> </ul>
Name	The switch name in the domain.

### uRouteConfig

Figure A-131 shows the uRouteConfig command, which lets you select the destination traffic's path on a source-port basis. The command syntax is `uRouteConfig <port>, <domain>, <output port>`.

After using this command, traffic coming in from the port addressed to a domain is forwarded through the output port. Make sure that the output port is a viable path for reaching the domain. The port can be an E\_Port or an F\_Port. If it is an E\_Port, make sure that no routing loops are created.

If the output is not an E\_Port, the route is allocated dynamically to a different path, if one is available, as if this was a regular route. If the output port goes down, the route is treated as a regular route and is allocated to a different path if one is available. When the output port comes back up, the port is rerouted back to the static route.

Load sharing continues, taking into account static routes when counting the number of routes that are allocated to a path, acting only on regular, non-static routes.

If the port has a static route, the flags field in `uRouteShow` is set to S instead of D. This does not affect the flags field in the `topologyShow` command. The `topologyShow` command still shows D unless a static path is configured.

```
switch:admin>uRouteConfig 2,2,4
committing configuration...done.
```

Figure A-131: `uRouteConfig` command example

### **uRouteRemove**

[Figure A-132](#) shows the `uRouteRemove` command, which removes the static route configured by the `uRouteConfig` command.

```
switch:admin>uRouteRemove 2,2committing configuration...done.
```

Figure A-132: `uRouteRemove` command example

### **uRouteShow**

[Figure A-133](#) shows the `uRouteShow` command, which displays the port's unicast routing information (the output port used to forward frames from a port to the domain). Only one output port is used to forward frames from one input port to a destination domain.

The command `uRouteShow` has three syntax options:

- `uRouteShow <port #> <domain ID>` displays the route for port `<port #>` to a specific domain `<domain ID>`
- `uRouteShow <port #>` displays the route for port `<port #>` to all of the active domains in the fabric
- `uRouteShow` displays the route for all of the ports on the switch to all the active domains in the fabric

For all three formats, `uRouteShow` displays the domain ID of the next hop and the port number on the next hop for each route. [Table A-36](#) describes the command fields.

```

admin> uRouteShow
Local Domain ID: 1
In Port      Domain    Out Port   Metric    Hops     Flags    Next(Dom,Port)
-----
0           5         7          1000     1        D        5,6
           6         7          2000     2        D        5,6
           7         7          3000     3        D        5,6
           8         7          4000     4        D        5,6
           9         7          5000     5        D        5,6
1           5         5          1000     1        D        5,5
           6         5          2000     2        D        5,5
           7         5          3000     3        D        5,5
           8         5          4000     4        D        5,5
           9         5          5000     5        D        5,5
2           5         4          1000     1        D        5,4
           6         4          2000     2        D        5,4
           7         4          3000     3        D        5,4
           8         4          4000     4        D        5,4
           9         4          5000     5        D        5,4
    
```

Figure A-133: uRouteShow command example

**Table A-36: uRouteShow Command Field Descriptions**

Field	Description
In Port	A bitmap field that indicates what ports are routed through the out port to reach the destination domain
Domain	The destination domain
Out Port	The out ports used to route frames to the domain
Metric	The total cost to reach the destination domain, or the sum of all link costs traversed by a frame to reach the destination domain. A metric of 1000 indicates the destination domain is one hop away from the local switch, since 1000 is the cost of a 1 Gbps link.
Hops	The number of hops (switches) between the local and remote switches

**Table A-36: uRouteShow Command Field Descriptions (Continued)**

Field	Description
Flags	Indicates how the switch acquired this path. Possible values are: <ul style="list-style-type: none"> <li>■ D-The path was dynamically discovered by the FSPF protocol.</li> <li>■ S-The path was statically configured through the shell.</li> </ul>
Next (Dom, Port)	The domain ID that the remote switch (out port) is connected to, and the port ID on the remote switch.

## License Commands

License commands let you view, add, and remove license keys.

### licenseAdd

Figure A-134 shows the `licenseAdd` command, which adds licenses. Check licenses using the `licenseShow` command.

```
admin> licenseAdd "342kj4324KJ23423dn"
```

Figure A-134: `licenseAdd` command example

### licenseRemove

Figure A-135 shows the `licenseRemove` command, which deletes licensed products. The value returned depends on the license keys removed. Check remaining licenses with the `licenseShow` command.

```
admin> licenseRemove "342kj4324KJ23423dn"
```

Figure A-135: `licenseRemove` command example

### licenseShow

Figure A-136 shows the `licenseShow` command, which displays the licensed products installed on the SAN Switch. The value returned depends on the license keys installed. If no software features have been added, no value is returned.

```
admin> licenseShowWebtoolsZoning
```

Figure A-136: `licenseShow` command example

## Zone-Specific Telnet Commands

Zone-specific Telnet commands can be used when you do not have access to the Web interface. This section contains information and examples on managing zones using:

- [Zone Alias Commands, page A-131](#)
- [Zone Configuration Commands, page A-133](#)
- [Zone Commands, page A-136](#)
- [Configuration Management Commands, page A-139](#)

The Zoning commands are added to the switch's admin account to manage zone aliases, zone configurations, and zones.

All add, create, delete, and remove commands modify the defined configuration. This has no effect on the effective configuration until you execute a `cfgEnable` command.

[Table A-37](#) summarizes the commands.

**Table A-37: Zoning Commands**

Command Type	Command
Zone alias	aliAdd
	aliCreate
	aliDelete
	aliRemove
	aliShow
Zone configuration	cfgAdd
	cfgCreate
	cfgDelete
	cfgRemove
	cfgShow
Zone	zoneAdd
	zoneCreate
	zoneDelete
	zoneRemove
	zoneShow
Configuration management	cfgClear
	cfgDisable
	cfgEnable
	cfgSave
	cfgShow

## Zone Alias Commands

Zone alias commands let you manipulate the zone aliases. [Table A-38](#) summarizes the commands.

**Table A-38: Zone Alias Command Descriptions**

Command	Description
aliAdd	Adds a member to a zone alias
aliCreate	Creates a zone alias
aliDelete	Deletes a zone alias
aliRemove	Removes a member from a zone alias
aliShow	Shows zone alias definition

### aliAdd

[Figure A-137](#) shows the aliAdd command, which adds one or more new alias members to an existing zone alias. The alias members list contains one or more physical fabric port numbers or WWNs, separated by semicolons. The alias members list cannot contain other zone aliases.

```
admin> aliAdd "array1", "21:00:00:20:37:0c:72:51;
21:00:00:20:37:0c:71:0a"
admin> aliAdd "array2", "21:00:00:20:37:0c:9c:6b;
21:00:00:20:37:0c:66:3a"
admin> aliAdd "loop1", "21:00:00:20:37:0c:6a:40;
21:00:00:20:37:0c:59:7e"
```

Figure A-137: aliAdd command example

### aliCreate

[Figure A-138](#) shows the aliCreate command, which creates a new zone alias. The alias name cannot be used for any other zone object.

```
admin> aliCreate "array1", "21:00:00:20:37:0c:76:8c;  
21:00:00:20:37:0c:71:d2"  
admin> aliCreate "array2", "21:00:00:20:37:0c:66:23;  
21:00:00:20:37:0c:73:7f"  
admin> aliCreate "loop1", "21:00:00:20:37:0c:67:e3;  
21:00:00:20:37:0c:76:1f"
```

Figure A-138: aliCreate command example

### **aliDelete**

Figure A-139 shows the aliDelete command, which deletes an existing zone alias.

```
admin> aliDelete "array2"
```

Figure A-139: aliDelete command example

### **aliRemove**

Figure A-140 shows the aliRemove command, which removes one or more alias members from an existing zone alias. An exact string match removes the members. If all members are removed when executing this command, the zone alias is deleted.

```
admin> aliRemove "array1", "21:00:00:20:37:0c:71:d2"
```

Figure A-140: aliRemove command example

### **aliShow**

Figure A-141 shows the aliShow command, which shows the specified zone alias definition if a parameter is given. If no parameter is given, all zone configuration information is shown.

```

admin> aliShow
Defined configuration:
  cfg:USA_cfg Red_zone; Blue_zone
  zone:Blue_zone
                                0,1; array1; 0,2; array2
  zone: Red_zone
                                0,0; loop1
alias:   array1   21:00:00:20:37:0c:76:8c; 21:00:00:20:37:0c:71:02
alias:   array2   21:00:00:20:37:0c:66:23; 21:00:00:20:37:0c:73:7f
alias:   loop1    21:00:00:20:37:0c:76:85; 21:00:00:20:37:0c:71:df
Effective configuration:
  no configuration in effect

```

Figure A-141: aliShow command example

## Zone Configuration Commands

Zone configuration commands let you manipulate the zone configurations. [Table A-39](#) summarizes the commands.

**Table A-39: Zone Configuration Command Descriptions**

Command	Description
cfgAdd	Adds a zone to a configuration
cfgCreate	Creates a zone configuration
cfgDelete	Deletes a zone configuration
cfgRemove	Removes a zone from a configuration
cfgShow	Shows a zone configuration definition

### cfgAdd

[Figure A-142](#) shows the `cfgAdd` command, which adds one or more new members to an existing zone configuration.

```
admin> cfgAdd "USA_cfg", "Green_zone"
```

Figure A-142: cfgAdd command example

### **cfgCreate**

Figure A-143 shows the `cfgCreate` command, which creates a new zone configuration. The name used for the zone configuration cannot be used for any other zone object. The members list contains one or more zone names, separated by semicolons. Blank spaces are ignored.

```
admin> cfgCreate "USA_cfg", "Red_zone; Blue_zone; Green_zone"
```

Figure A-143: `cfgCreate` command example

### **cfgDelete**

Figure A-144 shows the `cfgDelete` command, which deletes an existing zone configuration.

```
admin> cfgDelete "USA_cfg"
```

Figure A-144: `cfgDelete` command example

### **cfgRemove**

Figure A-145 shows the `cfgRemove` command, which removes one or more members from an existing zone configuration. An exact string match removes the members. If all members are removed when executing this command, the zone configuration is deleted.

```
admin> cfgRemove "USA_cfg", "Green_zone"
```

Figure A-145: `cfgRemove` command example

### **cfgShow**

Figure A-146 shows the `cfgShow` command, which shows the specified zone configuration definition if a parameter is given. If no parameter is given, all zone configuration information is shown.

```
admin> cfgShow
Defined configuration:
  cfg:USA_cfg Red_zone; Blue_zone; Green_zone
  zone:Blue_zone
                                0,1; array1; 0,2; array2
  zone: Red_zone
                                0,0; loop1
  alias:   array1                21:00:00:20:37:0c:76:8c; 21:00:00:20:37:0c:71:02
  alias:   array2                21:00:00:20:37:0c:76:22; 21:00:00:20:37:0c:76:28
  alias:   loop1                 21:00:00:20:37:0c:76:85; 21:00:00:20:37:0c:71:df
Effective configuration:
  cfg:USA_cfg
  zone: Blue_zone
                                0,1
                                21:00:00:20:37:0c:76:8c
                                21:00:00:20:37:0c:71:02
                                0,2
                                21:00:00:20:37:0c:76:22
                                21:00:00:20:37:0c:76:28
  zone:Red_zone
                                0,0
                                21:00:00:20:37:0c:76:85
                                21:00:00:20:37:0c:71:df
```

Figure A-146: cfgShow command example

## Zone Commands

Zone commands let you manipulate the zones within a fabric. [Table A-40](#) summarizes the commands.

**Table A-40: Zone Command Descriptions**

Command	Description
zoneAdd	Adds a member to a zone
zoneCreate	Creates a zone
zoneDelete	Deletes a zone
zoneRemove	Removes a member from a zone
zoneShow	Shows a zone definition

### zoneAdd

[Figure A-147](#) shows the `zoneAdd` command, which adds one or more new zone members to an existing zone.

```
admin> zoneAdd "Blue_zone", "array2"
```

Figure A-147: zoneAdd command example

### zoneCreate

[Figure A-148](#) shows the `zoneCreate` command, which creates a new zone. The zone name cannot be used for any other zone object. The zone members list contains one or more physical fabric port numbers, WWNs, or zone alias names, separated by semicolons. Blank spaces are ignored.

```
admin> zoneCreate "Red_zone", "0,0; loop1"
admin> zoneCreate "Blue_zone", "0,1; array1; 0,2; array2"
admin> zoneCreate "Green_zone", "0,0; loop1; 0,2; array2"
```

Figure A-148: zoneCreate command example

**zoneDelete**

Figure A-149 shows the `zoneDelete` command, which deletes an existing zone.

```
admin> zoneDelete "Blue_zone"
```

Figure A-149: `zoneDelete` command example

**zoneRemove**

Figure A-150 shows the `zoneRemove` command, which removes one or more zone members from an existing zone. An exact string match removes the members. If all zone members are removed, the zone is deleted.

```
admin> zoneRemove "Blue_zone", "array2"
```

Figure A-150: `zoneRemove` command example

**zoneShow**

Figure A-151 shows the `zoneShow` command, which shows the specified zone definition if a parameter is given. If no parameter is given, all zone configuration information is shown.

```
admin> zoneShow
Defined configuration:
  cfg:USA_cfg Red_zone; Blue_zone; Green_zone
  zone:Blue_zone
                                0,1; array1; 0,2; array2
  zone: Red_zone
                                0,0; loop1
  alias:   array1      21:00:00:20:37:0c:76:8c; 21:00:00:20:37:0c:71:02
  alias:   array2      21:00:00:20:37:0c:76:22; 21:00:00:20:37:0c:76:28
  alias:   loop1       21:00:00:20:37:0c:76:85; 21:00:00:20:37:0c:71:df
Effective configuration:
  cfg:USA_cfg
  zone: Blue_zone
                                0,1
                                21:00:00:20:37:0c:76:8c
                                21:00:00:20:37:0c:71:02
                                0,2
                                21:00:00:20:37:0c:76:22
                                21:00:00:20:37:0c:76:28
  zone:Red_zone
                                0,0
                                21:00:00:20:37:0c:76:85
                                21:00:00:20:37:0c:71:df
```

Figure A-151: zoneShow command example

## Configuration Management Commands

Configuration management commands let you configure the zones.

Table A-41 summarizes the commands.

**Table A-41: Configuration Management Command Descriptions**

Command	Description
cfgClear	Clears all zone configurations
cfgDisable	Disables a zone configuration
cfgEnable	Enables a zone configuration
cfgSave	Saves zone configurations in flash
cfgShow	Shows a zone configuration definition (see <a href="#">cfgShow</a> , page A-134)

### cfgClear

Figure A-152 shows the `cfgClear` command, which should be used with caution. If a zone configuration is enabled, this command disables it, deletes all zone components, and erases the zone configuration stored in flash memory. After you execute this command, no zone information remains in the fabric.

---

**IMPORTANT:** Use of this command removes all zone information from the fabric.

---

```
admin> cfgClear
```

Figure A-152: `cfgClear` command example

### cfgDisable

Figure A-153 shows the `cfgDisable` command, which disables the current zone configuration. The fabric returns to nonzoning mode, where all devices can access each other.

```
admin> cfgDisable "USA_cfg"
```

Figure A-153: `cfgDisable` command example

## **cfgEnable**

Figure A-154 shows the `cfgEnable` command. The specified zone configuration is compiled after checking for undefined zone names, zone alias names, or other inconsistencies by expanding zone aliases, removing duplicate entries, and then building the effective configuration. If the compilation fails, the previous state is unchanged. If the compilation succeeds, the previous effective configuration is disabled and the new configuration is installed and enabled.

```
admin> cfgEnable "USA_cfg" zone config "USA_cfg" is in effect
```

Figure A-154: `cfgEnable` command example

## **cfgSave**

Figure A-155 shows the `cfgSave` command, which writes a copy of the defined configuration, the name of the effective configuration, and the state of the configuration (enabled or disabled) to flash memory in all fabric switches. When the system is powering up, the switch automatically reloads the most recent saved configuration.

```
admin> cfgSaveUpdating flash...
```

Figure A-155: `cfgSave` command example

## **QuickLoop Zoning Commands**

See [QuickLoop Zoning Commands](#), page A-8 in the [QuickLoop-Specific Telnet Commands](#) section.

## **Fabric Watch Telnet Commands**

This section provides information about the Telnet commands available for managing the Fabric Watch feature.

Fabric Watch commands let you set thresholds, monitor errors, temperature, fan status and other switch events.

Table A-42 summarizes the commands.

**Table A-42: Fabric Watch Command Descriptions**

Command	Description
<a href="#">fwAlarmsFilterSet</a>	Configure alarms filtering for Fabric Watch
<a href="#">fwAlarmsFilterShow</a>	Show alarms filtering for Fabric Watch
<a href="#">fwClassInit</a>	Initialize all Fabric Watch classes
<a href="#">fwConfigure</a>	Modify thresholds and configuration information
<a href="#">fwConfigReload</a>	Reload the Fabric Watch configuration
<a href="#">fwSetToCustom</a>	Set boundary and alarm level to custom
<a href="#">fwSetToDefault</a>	Set boundary and alarm level to default
<a href="#">fwShow</a>	Show thresholds monitored by Fabric Watch

To use a Telnet command, log into the relevant switch with administrative privileges, enter the command along with any required operands, and press the Enter key.

**NOTE:** Fabric Watch can be accessed simultaneously from different connections: Telnet, SNMP, Web Management Tools, or by modifying and uploading the Fabric Watch configuration file to the switch. If Fabric Watch is simultaneously accessed from different connections, changes from one connection might not be updated to the other, and some may be lost. If `Committing configuration...` displays during a Telnet session, then the configuration may have recently been modified from another connection.

### **fwAlarmsFilterSet**

Figure A-156 shows the `fwAlarmsFilterSet` command, which configures alarms filtering for Fabric Watch. By turning off the alarms, all nonenvironment class alarms are suppressed. By turning on the alarms, all class alarms are generated.

The following operand is optional:

alarm-on/off: 1 for turning on alarms, 0 for turning off alarms. If not specified, 0 by default.

```
sw:admin> fwAlarmsFilterSet
Committing configuration...done.
FW: Alarms are disabled

sw:admin> fwAlarmsFilterSet 1
Committing configuration...done.
FW: Alarms are enabled
```

Figure A-156: `fwAlarmsFilterSet` command example

### **fwAlarmsFilterShow**

Figure A-157 shows the `fwAlarmsFilterShow` command, which allows all users to show alarms filtering status for Fabric Watch.

```
sw:admin> fwAlarmsFilterShow
FW: Alarms are enabled
sw:admin> fwAlarmsFilterShow
FW: Alarms are disabled
```

Figure A-157: `fwAlarmsFilterShow` command example

### **fwClassInit**

Figure A-158 shows the `fwClassInit` command, which initializes all classes under Fabric Watch. This command should only be used after installing a Fabric Watch license, to initialize the licensed Fabric Watch classes.

```
sw:admin> fwClassInit
gbicRegister: re-register 0x0 0x10f6c260
fwClassInit: Fabric Watch initialized
```

Figure A-158: Example of initializing all classes under Fabric Watch

### **fwConfigure**

Figure A-159 shows the `fwConfigure` command, which displays and allows modification of the Fabric Watch configuration and status. Use this command to allow the admin account to display and modify threshold information and the Fabric Watch configuration. Switch elements monitored by Fabric Watch are divided into classes, which are further divided into areas. In addition, each area can include from 0 to 16 thresholds.

```

sw:admin> fwConfigure
1: Environment class
2: GBIC class
3: Port class
4: Fabric class
5: E-Port class
6: F/FL Port (Copper) class
7: F/FL Port (Optical) class
8: quit
Select a class => : (1..8) [8] 1
1: Temperature
2: Fan
3: Power Supply
4: return to previous page
Select an area => : (1..4) [4] 1
Index          ThresholdName      Status           CurVal
LastEvent      LastEventTime     LastVal
LastState
=====
1      envTemp001        enabled          33 C
      started          10:28:59 on 02/01/2000  0 C    Informative
2      envTemp002        enabled          34 C
      started          10:28:59 on 02/01/2000  0 C    Informative
3      envTemp003        enabled          36 C
      started          10:28:59 on 02/01/2000  0 C    Informative
4      envTemp004        enabled          35 C
      started          10:28:59 on 02/01/2000  0 C    Informative
5      envTemp005        enabled          36 C
      started          10:28:59 on 02/01/2000  0 C    Informative
1: refresh
2: disable a threshold
3: enable a threshold
4: advanced configuration
5: return to previous page
Select choice => : (1..5) [5]

```

Figure A-159: Example of displaying the Fabric Watch configuration and status

### **fwConfigReload**

Figure A-160 shows the `fwConfigReload` command, which enables you to reload the Fabric Watch configuration. This command should only be used after downloading a new Fabric Watch configuration file from a host.

```
sw:admin> fwConfigReload
fwConfigReload: Fabric Watch configuration reloaded
```

Figure A-160: Example of reloading the Fabric Watch configuration

### **fwSetToCustom**

Figure A-161 shows the `fwSetToCustom` command, which allows you to set boundary alarm levels to custom for all classes and areas for Fabric Watch. The `fwSetToCustom` command sends errors to the `SnmpTrap`.

```
sw:admin> fwSetToCustom
Committing configuration...done.
```

Figure A-161: `fwSetToCustom` command example

### **fwSetToDefault**

Figure A-162 shows the `fwSetToDefault` command, which allows you to set boundary and alarm level to default for all classes and areas for Fabric Watch. The `fwSetToDefault` command sends errors to the `errlog`.

```
sw:admin> fwSetToDefault
Committing configuration...done.
```

Figure A-162: `fwSetToDefault` command example

### **fwShow**

Figure A-163 shows the `fwShow` command, which displays the thresholds monitored by Fabric Watch. If no parameters are entered, a summary of all thresholds is displayed and printed. If a valid threshold name is entered as a parameter, detailed information pertaining only to that threshold is displayed and printed.

```

sw:root> fwShow
=====
Name                Label                Last Value
-----
envTemp001          Env Temperature 1    33 C
envTemp002          Env Temperature 2    33 C
envTemp003          Env Temperature 3    36 C
envTemp004          Env Temperature 4    35 C
envTemp005          Env Temperature 5    36 C
envFan001           Env Fan 1             5070 RPM
envFan002           Env Fan 2             3090 RPM
envFan003           Env Fan 3             3150 RPM
envFan004           Env Fan 4             5130 RPM
envPS002            Env Power Supply 2    0 (1 OK/0 FAULT

sw:admin> fwShow "envTemp001"
Env Temperature 1:
    Monitored for:      1283 (21 mins)
    Last checked:      10:50:21 on 02/01/2000
    Lower bound:        0 C
    Upper bound:        75 C
    Buffer Size:         10
    Value history:      33 C
    Disabled?          No
    Locked?            No

```

Figure A-163: Example of displaying the thresholds monitored by Fabric Watch

## Management Server Telnet Commands

Management Server commands let you retrieve information from the switches, and make fabric-wide changes to the management server database.

A Management Server is provided for more secure management of the SAN. The Management Server is a process that runs in the switches in a SAN and allows a SAN management application to retrieve information from the switches.

Table A-43 summarizes the commands.

**Table A-43: Management Server Command Descriptions**

Command	Description
msConfigure	Configures the Management Server
msPlatShow	Displays platform Management Server database
msPICapabilityShow	Displays platform Management Server capability
msPIClearDB	Clears the Management Server platform database fabric-wide
msPIMgmtActivate	Activates platform Management Services
msPIMgmtDeactivate	Deactivates platform Management Services

### msConfigure

Figure A-164 shows the msConfigure command. This command allows an administrator to configure various parameters associated with the access of Management Server. The Management Server allows a SAN management application to retrieve and administer the Fabric and Interconnect Elements such as switches. It is located at the Fibre Channel well-known address, FFFFFAh.

There is an Access Control List (ACL) associated with the Management Server. If the list is empty (default), the Management Server is accessible to all systems connected in-band to the Fabric. For a more secured access, an administrator may specify for the ACL, one or more WWNs associated with the Management Applications.

Consequently, the access to the Management Server will be restricted to those in the ACL. This command is interactive and provides the administrator with a menu of choices:

- 0 Done (with the administration)
- 1 Display the access list (ACL)
- 2 Add member based on its Port/Node WWN
- 3 Delete member based on its Port/Node WWN

If there is any change made (such as adding or deleting), the user will be prompted further if the user wishes to save the changed ACL to the FLASH. The saved ACL will be restored on future restart.

```
sw5:admin> msConfigure
0 Done
1 Display the access list
2 Add member based on its Port/Node WWN
3 Delete member based on its Port/Node WWN
select: (0..3) [1]

MS Access List consists of (5): {
20:01:00:60:69:00:60:10
20:02:00:60:69:00:60:10
20:03:00:60:69:00:60:10
20:02:00:60:69:00:60:03
20:02:00:60:69:00:60:15
}
0 Done
1 Display the access list
2 Add member based on its Port/Node WWN
3 Delete member based on its Port/Node WWN
select: (0..3) [1] 0
done...
sw5>
```

Figure A-164: msConfigure command example

## msPlatShow

Figure A-165 shows the msPlatShow command. This command allows an administrator to display the Management Server Platform Database. It shows the platform name of each platform object in the database and all the attributes associated with each object.

```
sw5:admin> msPlatShow
-----
Platform Name: [9] "first obj"
Platform Type: 5: GATEWAY
Number of Associated M.A.: 1
Associated Management Addresses:
    [35] "http://java.sun.com/products/plugin"
Number of Associated Node Names: 1
Associated Node Names:
    10:00:00:60:69:20:15:71
-----
Platform Name: [10] "second obj"
Platform Type: 7: HOST_BUS_ADAPTER
Number of Associated M.A.: 1
Associated Management Addresses:
    [30] "http://java.sun.com/products/1"
Number of Associated Node Names: 2
Associated Node Names:
    10:00:00:60:69:20:15:79
    10:00:00:60:69:20:15:75
sw5>
```

Figure A-165: msPlatShow command example

**msPICapabilityShow**

Figure A-166 shows the msPICapabilityShow command. This command allows an administrator to query a fabric for the Platform Database Management capability. Based on the result of this command, the system administrator can then decide whether or not to activate the platform database management service fabric-wide.

When this command is issued, information is gathered from every switch of the fabric and each switch's ability to handle the Platform database management is displayed.

```
sw5:admin> msPICapabilityShow
```

Switch WWN	Platform Service Capable	Capability	Name
10:00:00:60:69:20:15:71	Yes	0X0000000B	"swd156"
10:00:00:60:69:00:30:05	Yes	0X0000000B	"swd158"

Capability Bit Definitions:

- Bit 0: Basic Configuration Service Supported.
- Bit 1: Platform Management Service Supported.
- Bit 2: Topology Discovery Service Supported.
- Bit 3: Unzoned Name Server Service Supported.
- Bit 4: M.S. Fabric Zone Service Supported.
- Bit 5: Fabric Lock Service Supported.
- Others: Reserved.

Done.

Figure A-166: msPICapabilityShow command example

**msPIClearDB**

Figure A-167 shows the msPIClearDB command. This command allows an administrator to clear the entire Management Server Platform Database fabric-wide. Since this operation is nonrecoverable (once issued, the database will be erased), it should not be used unless it is intended to resolve a database conflict between two joining fabrics or to establish an entire new fabric with an empty database.

```
sw5:admin> msPIClearDB
Fabric-wise Platform DB Delete operation in progress...
sw5:admin>Done...
```

Figure A-167: msPIClearDB command example

### msPIMgmtActivate

Figure A-168 shows the msPIMgmtActivate command. This command allows an administrator to activate the Management Server Platform Database Management Service fabric-wide. It is highly recommended that the administrator run the msPICapabilityShow command before issuing this command. If any switch within the fabric is not capable of handling the Platform Management service, the msPIMgmtActivate command will be rejected.

When this command is issued, all the switches in the fabric will have the Platform database management service enabled. The activation is saved to the nonvolatile storage of each switch so that after the activation if any power boundary event occurred, the switch will start up with Platform Management service enabled. By default, the Platform Management service is disabled.

```
sw5:admin> msPIMgmtActivate
Request Fabric to activate Platform Management services....
Done.
```

Figure A-168: msPIMgmtActivate command example

### msPIMgmtDeactivate

Figure A-169 shows the msPIMgmtDeactivate command. This command allows an administrator to deactivate the Management Server Platform Database Management Service fabric-wide. This command will deactivate the Platform Database Management Service of each switch in the fabric and commit the changes to the nonvolatile storage of each switch. Once deactivated, even in the event of a power boundary, the switch will be started up with the Management Server Platform Database Management Service disabled.

```
sw5:admin> msPIMgmtDeactivate
Request Fabric to Deactivate Platform Management services....
Done.
```

Figure A-169: msPIMgmtDeactivate command example

## Grouping Telnet Commands

Grouping Telnet commands provide aggregate management support for a group of Fibre Channel SAN Switches running firmware version 2.4.x or higher, and interconnected with ISL cables. This section contains information and descriptions about the following Telnet commands:

- [islTopoCheck, page A-151](#)
- [islTopoShow, page A-152](#)
- [sgroupDelete, page A-154](#)
- [sgroupRename, page A-155](#)
- [sgroupSet, page A-156](#)
- [sgroupShow, page A-158](#)
- [sgroupSupportShow, page A-159](#)
- [sgroupSwReplace, page A-163](#)
- [switchStatusPolicySet, page A-164](#)
- [switchStatusPolicyShow, page A-167](#)
- [snmpMibCapSet, page A-169](#)

### **islTopoCheck**

[Figure A-170](#) shows the `islTopoCheck` command, which displays the ISL sgroup connections and status for this switch. This command is used to verify that the switch is properly cabled and configured.

Each port that is specified in the ISL definition, corresponding to an ISL sgroup in which this switch is a member, will be displayed.

A switch with properly configured ISL connections will report a status of OK for each of these ports.

The following example shows the results of `islTopoCheck` on a misconfigured switch. In a proper configuration, all of the switches would have valid domains and names, and each port status would be OK.

```

es_6:admin> islTopoCheck
ISL data for type: S32_6_1, sgroup: My_group
idx  domain  expected wwn      name
01   01      10:00:00:60:69:20:02:9f  jr_1003
02   02      10:00:00:60:69:10:a0:4e  es_6
03   -01     00:00:00:00:00:00:00:03  -UNKNOWN-
04   -01     00:00:00:00:00:00:00:04  -UNKNOWN-
05   -01     00:00:00:00:00:00:00:05  -UNKNOWN-
06   -01     00:00:00:00:00:00:00:06  -UNKNOWN-

Domain: 2, wwn: 10:00:00:60:69:10:a0:4e

isl  port    expected switch      port    actual switch  port    status
0    08 ->   jr_1003              : 00     jr_1003       : 00     OK
1    09 ->   jr_1003              : 01     jr_1003       : 01     OK
2    10 ->   jr_1003              : 02     jr_1003       : 03     Wrong port
3    11 ->   jr_1003              : 03     -UNKNOWN-     :-01     Bad status

```

Figure A-170: islTopoCheck command example

### islTopoShow

Figure A-171 shows the `islTopoShow` command which displays ISL sgroup topology and status. This command is available to all users. The `islTopoShow` command displays the current connections and status for every switch in all ISL sgroups of which the current switch is a member. The status for every port and switch combination in each active ISL group will be displayed.

This command has the following operand:

**sgroup:** If the name of a switch group or switch group type is specified in quotes then the command will show the ISL connection status for the specified sgroup or all sgroups of the specified type. The default behavior, if no input is provided, is to report the topology status for all ISL sgroups in which the current switch is a member.

The following example shows the results of `islTopoShow` on a misconfigured switch. In a proper configuration, all of the switches would have valid domains and names, and each ports status would be OK.

```

es_6:admin> islTopoShow

ISL data for type: S32_6_1, sgroup: My_group

idx   domain  expected wwn      name
01     01     10:00:00:60:69:20:02:9f  jr_1003
02     02     10:00:00:60:69:10:a0:4e  es_6
03     -01    00:00:00:00:00:00:00:03  -UNKNOWN-
04     -01    00:00:00:00:00:00:00:04  -UNKNOWN-
05     -01    00:00:00:00:00:00:00:05  -UNKNOWN-
06     -01    00:00:00:00:00:00:00:06  -UNKNOWN-

Switch idx: 1 Domain: 1, wwn: 10:00:00:60:69:20:02:9f

isl    port  expected switch    port    actual switch  port  status
0      00 -> es_6              :08     es_6          :08  OK
1      01 -> es_6              :09     es_6          :09  OK
2      02 -> es_6              :10     -UNKNOWN-    :-01  No record
3      03 -> es_6              :11     es_6          :10  Wrong port
4      04 -> -UNKNOWN-      :08     -UNKNOWN-    :-01  No record
5      05 -> -UNKNOWN-      :09     -UNKNOWN-    :-01  No record
6      06 -> -UNKNOWN-      :10     -UNKNOWN-    :-01  No record
7      07 -> -UNKNOWN-      :11     es_6          :13  Wrong switch
8      08 -> -UNKNOWN-      :08     -UNKNOWN-    -01  No record
9      09 -> -UNKNOWN-      :09     -UNKNOWN-    -01  No record
10     10 -> -UNKNOWN-      :10     -UNKNOWN-    :-01  No record
11     11 -> -UNKNOWN-      :11     -UNKNOWN-    :-01  No record
12     12 -> -UNKNOWN-      :08     -UNKNOWN-    :-01  No record
13     13 -> -UNKNOWN-      :09     -UNKNOWN-    :-01  No record
14     14 -> -UNKNOWN-      :10     -UNKNOWN-    :-01  No record
15     15 -> -UNKNOWN-      :11     -UNKNOWN-    :-01  No record

Switch idx: 2 Domain: 2, wwn: 10:00:00:60:69:10:a0:4e

isl    port  expected switch    port    actual switch  port  status
0      08 -> jr_1003          :00     jr_1003       :00  OK
1      09 -> jr_1003          :01     jr_1003       :01  OK
2      10 -> jr_1003          :02     jr_1003       :03  Wrong port
3      11 -> jr_1003          :03     -UNKNOWN-    :-01  No record
4      12 -> -UNKNOWN-      :12     -UNKNOWN-    :-01  No record
5      13 -> -UNKNOWN-      :13     jr_1003       :07  Wrong switch
6      14 -> -UNKNOWN-      :14     -UNKNOWN-    :-01  No record
7      15 -> -UNKNOWN-      :15     -UNKNOWN-    :-01  No record

```

Figure A-171: islTopoShow command example

## sgroupDelete

Figure A-172 shows the `sgroupDelete` command, which enables you to delete a switch group. If the parameter is not specified, the command will become an interactive session and the necessary parameters will be prompted.

This command makes the same change to all switches in the specified group. It executes on every switch in the group if, and only if, each switch in the group can perform the action.

This command has the following operands:

**NOTE:** If you are entering the information in an interactive session, do not type in quotation marks.

- **sgName:** Specify a character string in quotation marks containing the switch group name to be deleted (for example “MyGroup”). Entering a wrong name will cause this command to terminate without modifying any switch groups. The `sgroup` name is case sensitive.
- **force:** Specify the `force` parameter to delete the group even if one or more members of the group failed to execute the command. The entered string must be “force”.

```
sw:admin> sgroupDelete
Please Enter Group Name: [ ] MyGroup
About to DELETE the group with Group name “MyGroup”
ARE YOU SURE (yes, y, no, n): [no] y
Committing configuration...done.
```

Figure A-172: `sgroupDelete` command, interactive example

Figure A-173 shows an invalid group:

```
sw:admin> sgroupDelete “MyPrevGroup”
Group Name “MyPrevGroup” does not exist.
```

Figure A-173: `sgroupDelete`, invalid group

## **sgroupRename**

Figure A-174 shows the `sgroupRename` command, which enables you to rename a specified `sgroup` name to the given new name. The member list for the renamed group is not modified. If any parameter is not specified, the session will become an interactive session for which all the parameters will be prompted.

This command has the following operands:

**NOTE:** If you are entering the information in an interactive session, do not type in quotation marks.

- **oldName:** Specify a character string in quotation marks containing the `sgroup` name to be replaced, for example “MyPrevGroupName”.
- **newName:** Specify a character string in quotation marks containing the new `sgroup` name, for example “MyNewGroupName”.

Figure A-174 shows a noninteractive session using `sgroupRename`.

```

sw:admin> sgroupShow
Group Type          Group Name          Member WWN
=====
S32_6_1             MyPrevGroupName    10:00:00:60:69:00:00:20
                   10:00:00:60:69:20:15:81
                   10:00:00:60:69:10:02:18
                   10:00:00:60:69:20:15:71
                   10:00:00:60:69:00:30:05
                   10:00:00:60:69:00:60:11

sw:admin> sgroupRename "MyPrevGroupName", "MyNewGroupName"
Committing configuration...done.
sw:admin> sgroupShow
Group Type          Group Name          Member WWN
=====
S32_6_1             MyNewGroupName     10:00:00:60:69:00:00:20
                   10:00:00:60:69:20:15:81
                   10:00:00:60:69:10:02:18
                   10:00:00:60:69:20:15:71
                   10:00:00:60:69:00:30:05
                   10:00:00:60:69:00:60:11

```

Figure A-174: sgroupRename command example

### sgroupSet

Figure A-175 shows the sgroupSet command, which enables you to create a switch group. If any parameter is not specified, the session will become an interactive session for which all the parameters will be prompted.

This command has the following operands:

**NOTE:** If you are entering the information in an interactive session, do not type in quotation marks.

- **sgType:** Specify a character string in quotation marks containing the sgroup type, for example “S32\_6\_1”. The given type **MUST** be a valid type. If the type is not valid, this command will be rejected. Valid types are displayed when this command is run interactively.
- **sgName:** Specify a character string in quotation marks containing the sgroup name, for example “FirstGroup”. The given name must have from 1 to 32 characters, comprised of letters, digits or underscores. Spaces are not allowed.
- **sgMemberList:** Specify a character string in quotation marks containing the sgroup members, for example “1,2,3,4,5,6”. This list can be either the WWN format or Domain ID format. If given in Domain ID format, the list will be validated first to ensure that all the specified switch Domains are valid. If given in WWN format, a Warning message may appear if any WWN given is not in the current fabric.

WWN format:

“aa:bb:cc:dd:ee:ff:xx:yy,aa:bb:cc:dd:ee:ff:xx:zz,  
aa:bb:cc:dd:ee:ff:xx:ww,...,aa:bb:cc:dd:ee:ff:xx:qq”

Domain ID format:

“domain\_ID1,domain\_ID2,...,domain\_IDx”

To set a group called “My Group” of type “S32\_6\_1” using domain IDs 1 through 6, see [Figure A-175](#).

```
sw:admin> sgroupSet “S32_6_1”, “MyGroup”, “1,2,3,4,5,6”  
  
Committing configuration...done.
```

Figure A-175: sgroupSet command example

Figure A-176 shows the interactive form of sgroupSet.

```
sw:admin> sgroupSet
  Here are the valid sgroup types:
    S32_6_1

  Please Enter Group Type: [S32_6_1] S32_6_1
  Please Enter Group Name: [ ] MyGroup
  Enter member list by domain#? (yes, y, no, n): [yes] n
  For Group Member #1
  enter its WWN (in hex): [00:00:00:00:00:00:00] 10:00:00:60:69:00:00:20
  For Group Member #2
  enter its WWN (in hex): [00:00:00:00:00:00:00] 10:00:00:60:69:20:15:81
  For Group Member #3
  enter its WWN (in hex): [00:00:00:00:00:00:00] 10:00:00:60:69:10:02:18
  For Group Member #4
  enter its WWN (in hex): [00:00:00:00:00:00:00] 10:00:00:60:69:20:15:71
  For Group Member #5
  enter its WWN (in hex): [00:00:00:00:00:00:00] 10:00:00:60:69:00:30:05
  For Group Member #6
  enter its WWN (in hex): [00:00:00:00:00:00:00] 10:00:00:60:69:00:60:11
  Committing configuration...done.
```

Figure A-176: Interactive form of sgroupSet

## sgroupShow

Figure A-177 shows the sgroupShow command, which enables you to display switch group configuration information. If no parameter is specified, ALL sgroup definitions will be displayed. If a parameter is specified, ALL sgroups with sgType or sgName that contain the given parameter string will be displayed.

This command has the following operands:

**NOTE:** If you are entering the information in an interactive session, do not type in quotation marks.

- **sgType**: Specify a character string in quotation marks containing the sgroup type to be displayed, for example “S32\_6\_1”. This operand must be enclosed in quotation marks.
- **SgName**: Specify a character string in quotation marks containing the sgroup name to be displayed, for example “Group”. If no parameter is specified, ALL defined sgroups will be displayed. This operand must be enclosed in quotation marks.

To display all switch group configurations:

```
sw:admin> sgroupShow
```

Group Type	Group Name	Member WWN
S32_6_1	MyNewGroupName	10:00:00:60:69:00:00:20 10:00:00:60:69:10:62:ee 10:00:00:60:69:10:61:0e 10:00:00:60:69:10:60:f9 10:00:00:60:69:10:62:44 10:00:00:60:69:10:60:a0

```
sw:admin> sgroupShow "Group"
```

Group Type	Group Name	Member WWN
S32_6_1	MyNewGroupName	10:00:00:60:69:00:00:20 10:00:00:60:69:20:15:81 10:00:00:60:69:10:02:18 10:00:00:60:69:20:15:71 10:00:00:60:69:00:30:05 10:00:00:60:69:00:60:11

Figure A-177: sgroupShow command example

### **sgroupSupportShow**

[Figure A-178](#) shows the `sgroupSupportShow` command, which displays switch information for all switches within the specified group. This command can display a range of debugging information for all the switches in a switch group. If no `commandName` is

specified or **all** is specified in place of a command name, all the supported commands are displayed for the all the switches within a switch group. If a single command is specified, only the information for that command is displayed.

This command has the following operands:

**NOTE:** If you are entering the information in an interactive session, do not type in quotation marks.

- **sgroupName:** Specify the name of the switch group. This operand must be enclosed in quotation marks. This operand is required.
- **commandName:** Specify the name of the command to be displayed for the specified switch group. If no command is specified, or **all** is specified, all the supported commands are executed against all the switches within a switch group. Below is a list of command names that are supported in the order they are executed. These command names are not case-sensitive. This operand must be enclosed in quotation marks. This operand is optional.

- version**
- uptime**
- tempShow**
- psShow**
- licenseShow**
- diagShow**
- errDump**
- switchShow**
- portFlagsShow**
- portErrShow**
- mqShow**
- portSemShow**
- portShow**
- portRegShow**
- portRouteShow**
- fabricShow**
- topologyShow**
- qlShow**
- nsShow**

- nsAllShow
- cfgShow
- configShow
- faultShow
- traceShow
- portLogDump

[Figure A-178](#) shows how to display the temperature in all the switch elements of a SAN Integrated Switch.

```

sw5:admin>sgroupsupportshow "starbase", "tempshow"
Group Type      Group Name      Member WWN
=====
S32_6_1        starbase        10:00:00:60:69:10:57:91
                10:00:00:60:69:10:56:79
                10:00:00:60:69:10:58:89
                10:00:00:60:69:10:57:dd
                10:00:00:60:69:10:58:63
                10:00:00:60:69:10:58:3f

Please wait for remote data!
value = 0
star7:root>
=====
Information from Local Domain 7
=====
27  30  31  33  32  Centigrade
80  86  87  91  89  Fahrenheit
=====
Information from Domain 8
=====
28  29  32  33  33  Centigrade
82  84  89  91  91  Fahrenheit
=====
Information from Domain 9
=====
27  29  33  34  32  Centigrade
80  84  91  93  89  Fahrenheit
=====
Information from Domain 10
=====
26  30  31  34  31  Centigrade
78  86  87  93  87  Fahrenheit
=====
Information from Domain 11
=====
28  29  31  33  32  Centigrade
82  84  87  91  89  Fahrenheit
=====
Information from Domain 12
=====
28  31  34  35  33  Centigrade
82  87  93  95  91  Fahrenheit
=====
=====DONE=====

```

Figure A-178: sgroupSupportShow command example

## **sgroupSwReplace**

Figure A-179 shows the `sgroupSwReplace` command, which enables you to replace a member of a switch group.

This command replaces a current member, identified by its WWN (`oldWwn`) in group `sgName` with a new member identified by its WWN (`newWwn`). The order of members within the member list will not be changed by this operation.

If any parameter is not specified, the session will become an interactive session and all the parameters will be prompted.

This command makes the same change to all switches in the specified group. It will execute on every switch in the group if, and only if, each switch in the group can perform the action.

This command has the following operands:

**NOTE:** If you are entering the information in an interactive session, do not type in quotation marks.

- **sgName:** Specify the switch group name (for example, “NewGroup”) that contains the member you want to replace. The switch group name must be enclosed in quotation marks. This operand is optional.
- **oldWwn:** Specify the WWN of a switch group member (for example, “10:00:00:60:69:20:22:22”) that you want to replace. The WWN must be enclosed in quotation marks. This operand is optional.
- **newWwn:** Specify the WWN of the new member (for example, “10:00:00:60:69:20:55:55”). The WWN must be enclosed in quotation marks. This operand is optional.

The following example shows the noninteractive form of `sgroupSwReplace`. The `sgroupShow` command is used to illustrate the changes made with the `sgroupSwReplace` command.

```

sw:admin> sgroupShow
Group Type                Group Name                Member WWN
=====
S32_6_1                   NewGroup                  10:00:00:60:69:20:15:71
                           10:00:00:60:69:20:15:93
                           10:00:00:60:69:20:15:2a
                           10:00:00:60:69:20:18:32
                           10:00:00:60:69:20:22:22
                           10:00:00:60:69:20:64:31

value = 0
sw:admin> sgroupSwReplace "NewGroup", "10:00:00:60:69:20:22:22",
"10:00:00:60:69:20:55:55"
Committing configuration...done.
sw:admin> sgroupShow
Group Type                Group Name                Member WWN
=====
S32_6_1                   NewGroup                  10:00:00:60:69:20:15:71
                           10:00:00:60:69:20:15:93
                           10:00:00:60:69:20:15:2a
                           10:00:00:60:69:20:18:32
                           10:00:00:60:69:20:55:55
                           10:00:00:60:69:20:64:31

```

Figure A-179: sgroupShow, sgroupSwReplace command examples

### switchStatusPolicySet

Figure A-180 shows the `switchStatusPolicySet` command, which enables you to set the policy parameters that determine the overall switch status. Use this command to set the policy parameters for calculating the overall status of the switch enclosure. The policy parameter values determine how many failed or faulty units of each contributor are allowed before triggering a status change in the switch from `HEALTHY` to `MARGINAL` or `DOWN`.

The command will print the current parameters in a three-column table format. The first column specifies the contributor; the second column specifies the minimum number that contributes to the DOWN/FAILED status; the third column specifies the minimum number that contributes to the MARGINAL/WARNING status. This command then prompts the user to change the values for each policy parameter. The default values for the policy parameters are listed in [Table A-44](#).

**Table A-44: Default Values for switchStatusPolicySet Parameters**

Contributor	Default Value for DOWN	Default Value for MARGINAL
FaultyPorts	2	1
MissingGBICs	0	0
PowerSupplies	2	1
Temperatures	2	1
Fans	2	1
PortStatus	0	0
sgroup ISLStatus	2	1

Any single contributor can force the overall status of the switch to MARGINAL or DOWN.

This command enables you to set a threshold for each contributor, so that a certain number of failures are allowed before changing the status of the switch.

If the value of a policy parameter is set to 0, it means that this factor is not used to determine the status of the switch. If the range of values for a particular contributor are set to 0 for both MARGINAL and DOWN, that contributor is not used in the calculation of the overall switch status.

ISLStatus monitors ISLs that are part of a defined switch group. The status of other ISLs on the same switch but outside of the group definition will not be considered when calculating switch status. If no switch groups are defined on this switch, then these ISLStatus settings will have no effect on switch status.

The sgroup ISLStatus does not affect the status of the switch as quickly as the other contributors. It may take a few minutes for a switch group ISL status change to affect the state of the switch.

**NOTE:** When PortStatus monitoring is set to values of (0,0), port status changes are not logged to the event log and console. Similarly, GBIC removal does not generate a message to the event log and console if MissingGBICs is set to (0,0). By configuring these options, the user can more closely monitor for port status and removal of GBICs.

Notice that in the [Figure A-180](#), the only parameters modified are the number of FaultyPorts allowed before the status of the switch changes to MARGINAL and DOWN.

```

switch:admin> switchStatusPolicySet
  To change the overall switch status policy parameters
  The current overall switch status policy parameters:
    Down Marginal
  -----
  FaultyPorts      1  0
  MissingGBICs    0  1
  PowerSupplies   2  1
  Temperatures    2  1
  Fans             2  1
  PortStatus       0  0
  sgroup ISLStatus 2  1

Note that the value, 0, for a parameter, means that it is NOT used in
the calculation.

** In addition, if the range of settable values in the prompt is (0..0),
** the policy parameter is NOT applicable to the switch.
** Simply hit the Return key.

The minimum number of
FaultyPorts contributing to DOWN status: (0..8) [2]
FaultyPorts contributing to MARGINAL status: (0..8) [1]
MissingGBICs contributing to DOWN status: (0..8) [0]
MissingGBICs contributing to MARGINAL status: (0..8) [0] 1
Bad PowerSupplies contributing to DOWN status: (0..2) [2]
Bad PowerSupplies contributing to MARGINAL status: (0..2) [1]
Bad Temperatures contributing to DOWN status: (0..5) [2]
Bad Temperatures contributing to MARGINAL status: (0..5) [1]
Bad Fans contributing to DOWN status: (0..6) [2]
Bad Fans contributing to MARGINAL status: (0..6) [1]
Down PortStatus contributing to DOWN status: (0..8) [0]
Down PortStatus contributing to MARGINAL status: (0..8) [0]
Down ISLStatus contributing to DOWN status: (0..16) [2]
Down ISLStatus contributing to MARGINAL status: (0..16) [1]

Policy parameter set has been changed
... Committing configuration...done.

```

Figure A-180: switchStatusPolicySet

**switchStatusPolicyShow**

Figure A-181 shows the `switchStatusPolicyShow` command, which displays the policy parameters that determine the overall switch status. Use this command to view the current policy parameters set for the switch. These policy parameters determine the number of failed or nonoperational units allowed for each contributor before triggering a status change in the switch.

The command will print the current parameters in a three-column table format. The first column specifies the contributor; the second column specifies the minimum number that contributes to the DOWN/FAILED status; the third column specifies the minimum number that contributes to the MARGINAL/WARNING status. The default values for the policy parameters are as follows:

**Table A-45: Default Values for switchStatusPolicyShow Parameters**

Contributor	Default Value for DOWN	Default Value for MARGINAL
FaultyPorts	2	1
MissingGBICs	0	0
PowerSupplies	2	1
Temperatures	2	1
Fans	2	1
PortStatus	0	0
sgroup ISLStatus	2	1

The policy parameters determine the number of failed or nonoperational units for each contributor that trigger a status change in the switch. For example, if the `FaultyPorts` DOWN parameter is set to 3, and 3 ports fail in the switch, then the status of the switch changes to DOWN.

```

switch:admin> switchStatusPolicyShow
The current overall switch status policy parameters:
          Down   Marginal
-----
FaultyPorts    1     0
MissingGBICs   0     1
PowerSupplies  2     1
Temperatures   3     1
Fans           3     1
PortStatus     0     0
sgroup ISLStatus 2     1

```

Figure A-181: `switchStatusPolicyShow` command example

## switchStatusShow

Figure A-182 shows the `switchStatusShow` command, which prints the overall status of the switch (enclosure). The overall status is calculated based on the most severe status of all contributors:

- Internal Switch Status
- Faulty Ports
- Missing GBICs
- Power Supplies
- Fans
- Temperatures
- Port Status

The overall status may be in one of the followings:

- Healthy/OK—every contributor is healthy
- Marginal/Warning—one or more contributors are in this status
- Down/Failed—one or more contributors are in this status

If the overall status is not HEALTHY/OK, the contributing factors will be listed also.

See [switchStatusPolicyShow](#), page A-167 for the calculation of the overall status.

```
sw:admin> switchStatusShow
The overall switch status is Marginal/Warning
Contributing factors:
    * 1 missing power supply triggered the Marginal/Warning status
    * 2 bad fans, 4 good fans triggered the Marginal/Warning status
    * 1 missing GBIC triggered the Marginal/Warning status
    ... some time later after conditions have been corrected ...
sw44:admin> switchStatusShow
The overall switch status is HEALTHY/OK
```

Figure A-182: `switchStatusShow` command example

**snmpMibCapSet**

Figure A-183 shows the `snmpMibCapSet` command, which enables you to view and modify options for configuring SNMP MIB/Trap capability. This command enables a user to turn on or off certain MIBS and TRAPS. This command also enables a user to turn on or off group information and SSN in SW trap messages. It first displays current settings and then prompts the user to change the values for each parameter.

- FA-MIB—Specifying yes means the user can access FA MIB variables with an SNMP manager. The default value is yes.
- SW-TRAP—Specifying yes means the SNMP management application can receive SW traps from the switch. The default value is yes.
- FA-TRAP—Specifying yes means the SNMP management application can receive FA traps from the switch. The default value is yes.
- SW-EXTTRAP—Specifying yes means the user can receive group information such as Group Name, Group Type, and Member Position, and SSN in the SW traps. The default value is no.

```

swd55:admin> snmpmibcapset
The SNMP Mib/Trap Capability has been set to support
FE-MIB SW-MIB FA-MIB SW-TRAP FA-TRAP
FA-MIB (yes, y, no, n): [yes]
SW-TRAP (yes, y, no, n): [yes]
FA-TRAP (yes, y, no, n): [yes]
SW-EXTTRAP (yes, y, no, n): [no]
no change

```

Figure A-183: `snmpMibCapSet`



# Glossary

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

## **8b/10b encoding**

Encoding scheme that converts each 8-bit data byte into a 10-bit transmission character. Used to balance ones and zeros in high speed transports.

## **Address identifier**

Value used to identify source or destination of a frame.

## **AL\_PA**

Arbitrated Loop Physical Address. Unique 8-bit (1-byte) value assigned during loop initialization to each port in an arbitrated loop, used to identify a device in an arbitrated loop.

## **Alias server**

Fabric software facility that supports multicast group management.

## **ANSI**

American National Standards Institute. Governing body for Fibre Channel standards in the U.S.A.

## **API**

Application Programming Interface. Defined protocol that allows applications to interface with a set of services.

## **Arbitrated loop**

A Fibre Channel transport structured as a loop. Allows communication between ports without using a switch. Requires successful arbitration by a port before a circuit is established. Supports up to 126 devices and one fabric attachment.

## **ASIC**

Application-Specific Integrated Circuit.

## **ATM**

Asynchronous Transfer Mode. Transport for transmitting data over LANs or WANs that transmit fixed-length units of data. Provides any-to-any connectivity and allows nodes to transmit simultaneously.

## **Bandwidth**

The total transmission capacity of a link, cable, or system.

## **BB\_Credit**

Buffer-to-buffer credit. The number of frames that can be transmitted to a directly connected recipient or within an arbitrated loop. Determined by number of available receive buffers. See also [Buffer-to-buffer flow control](#), [EE\\_Credit](#).

## **BER**

Bit Error Rate. Rate at which bits are expected to be received in error. Expressed as ratio of error bits to total bits transmitted. See also [Error](#).

## **Bit synchronization**

The delivery of correctly clocked bits at the required BER. See also [BER](#).

**Broadcast**

Transmission of data from a single source to all devices in fabric, regardless of zoning. See also [Multicast](#), [Unicast](#).

**Buffer-to-buffer flow control**

Management of frame transmission rate between directly connected ports or within an arbitrated loop. See also [BB\\_Credit](#).

**Cascade**

Two or more interconnected Fibre Channel switches.

**Circuit**

Established communication path between ports. Consists of two virtual circuits that transmit in opposite directions. See also [Link](#).

**Class 1**

A connection-oriented service that provides a dedicated connection between two ports, with notification of delivery or non-delivery.

**Class 2**

A multiplex and connectionless frame switching service between two ports, with notification of delivery or non-delivery.

**Class 3**

A connectionless frame switching service between two ports, without notification of delivery or non-delivery. Can also be used to provide a multicast connection between originator and recipients, with notification of delivery or non-delivery.

**Class F**

A connectionless service for control traffic between switches, with notification of delivery or non-delivery between the E\_Ports.

**Class of service**

A set of specific delivery characteristics and attributes for frame delivery.

### **Comma**

Unique pattern (either 1100000 or 0011111) used in 8b/10b encoding to specify character alignment within a data stream. See also [K28.5](#).

### **Community (SNMP)**

Relationship between a group of SNMP managers and an SNMP agent, in which authentication, access control, and proxy characteristics are defined.

### **CRC**

Cyclic Redundancy Check. A check for transmission errors; included in every data frame.

### **Credit**

As applies to Fibre Channel, the number of receive buffers available for transmission of frames between ports. See also [BB\\_Credit](#) and [EE\\_Credit](#).

### **Cut-through**

Switching technique that allows selection of a transmission route for a frame as soon as destination address is received. See also [Route](#).

### **Data word**

Type of transmission word that occurs within frames. The frame header, data field, and CRC all consist of data words. See also [Frame](#), [Ordered set](#), [Transmission Word](#).

### **Defined configuration**

The complete set of all zone objects defined in the fabric; can include multiple zone configurations. See also [Enabled configuration](#), [Zone configuration](#).

### **Disparity**

The relationship of ones and zeros in an encoded character. Neutral disparity indicates an equal number of each, positive disparity a majority of ones, and negative disparity a majority of zeros.

### **DLS**

Dynamic Load Sharing. Dynamic distribution of traffic over available paths. Allows for redistribution when an Fx\_Port or E\_Port comes up or down.

### **Domain ID**

A unique number between 1 and 239 that identifies the switch to the fabric.

### **E\_D\_TOV**

Error Detect Time-out Value. Time allowed for round-trip transmission before recovery is initiated. Can also be defined as the minimum time an L\_Port waits for sequence completion before initiating recovery. See also [R\\_A\\_TOV](#).

### **E\_Port**

Expansion Port. A switch port that has the ability to connect to a similar port on another switch, allowing creation of an interswitch link. See also [ISL](#).

### **EE\_Credit**

End-to-end credit. The number of receive buffers allocated by recipient port to originating port. Used by Class 1 and 2 services to manage exchange of frames across intervening ports in fabric. See also [End-to-end flow control](#), [BB\\_Credit](#).

### **Enabled configuration**

The currently enabled zone configuration. Only one configuration can be enabled at a time. See also [Defined configuration](#), [Zone configuration](#).

### **ELS**

Extended Link Service.

### **End-to-end flow control**

Governs flow of Class 1 and 2 frames between N\_Ports. See also [Buffer-to-buffer flow control](#), [EE\\_Credit](#).

### **Error**

As applies to Fibre Channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal. See also [Loop failure](#).

### **Events**

In Fabric Watch, if conditions break out of acceptable ranges (boundaries), an event is considered to have occurred, and one or more alarms are generated, if configured for the relevant threshold. See also [Boundaries](#) and [Threshold](#).

### **Exchange**

As applies to Fibre Channel, a communication session between N\_Ports involving the transmission of one or more related sequences, in one or both directions. See also [Sequence](#).

### **F\_Port**

Fabric Port. A port that can transmit using fabric protocol and can interface over links. Can be used to connect N\_Ports to a switch. See also [FL\\_Port](#), [Fx\\_Port](#).

### **Fabric**

A Fibre Channel network of two or more switches. Also called a “switched fabric.” See also [SAN](#), [Cascade](#).

### **Fabric name**

Unique 64-bit identifier assigned to each separate fabric. Communicated during login and port discovery.

### **Fabric OS**

Operating system on Compaq Fibre Channel SAN switches.

### **Fabric Watch**

Product that allows monitoring and configuration of fabric and switch elements.

### **FC-AL-3**

The Fibre Channel Arbitrated Loop standard. Defined on top of FC-PH standards.

### **FC-FLA**

The Fibre Channel Fabric Loop Attach standard.

### **FCP**

Fibre Channel Protocol. Mapping of protocols onto Fibre Channel standard protocols. For example, SCSI FCP maps SCSI-3 onto Fibre Channel.

### **FC-PH-1, 2, 3**

The Fibre Channel Physical and Signaling Interface standards.

**FC-PI**

The Fibre Channel Physical Interface standard.

**FC-PLDA**

The Fibre Channel Private Loop Direct Attach standard. Applies to operation of peripheral devices on private loops.

**FC-SW-2**

The Fibre Channel Switch Fabric standard, second generation. Specifies tools and algorithms for interconnection and initialization of Fibre Channel switches.

**Fibre Channel transport**

Protocol service that supports communication between Fibre Channel service providers. See also [FSP](#).

**Fill word**

A word transmitted to keep a fibre active. Either an idle or ARB ordered set.

**FL\_Port**

Fabric Loop Port. A port that can transmit under both fabric protocol and loop protocol. Can be used to connect NL\_Ports to a switch. See also [F\\_Port](#), [Fx\\_Port](#).

**FLOGI**

Fabric Login. Process by which a node makes a logical connection to fabric. Used by ports to determine if fabric is present, and if so to exchange service parameters with the fabric. See also [PLOGI](#).

**Frame**

Fibre Channel structure used to transmit data. Consists of start-of-frame delimiter, header, any optional headers, data payload, cyclic redundancy check (CRC), and end-of-frame delimiter. There are two types: data frames and link control frames. Similar to the networking concept “packet”. See also [Sequence](#), [Data word](#).

**FRU**

Field Replaceable Unit. A component that can be replaced on site.

## **FS**

Fibre Channel Service. A service that is defined by Fibre Channel standards and exists at a well-known address. For example, Name Server is a Fibre Channel service. See also [FSP](#).

## **FSP**

Fibre Channel Service Protocol. The common protocol used for all fabric services, transparent to fabric type or topology. See also [FS](#).

## **FSPF**

Fabric Shortest Path First. Routing protocol for Fibre Channel switches.

## **Full-duplex**

Mode of communication that allows a port to simultaneously transmit and receive frames. See also [Half-duplex](#).

## **Fx\_Port**

Fabric port that can operate either as F\_Port or FL\_Port. See also [F\\_Port](#), [FL\\_Port](#).

## **G\_Port**

Generic Port. Port that can operate either as E\_Port or F\_Port. Ports are defined as G\_Ports when disconnected or have not assumed specific function within fabric.

## **Gateway**

IP address assignment that provides translation for incompatible networks. For example, ATM gateway can connect a Fibre Channel link to an ATM connection.

## **GBIC**

Gigabit Interface Converter. Removable serial transceiver module that allows gigabit physical-layer transport for Fibre Channel.

## **Gbps**

Gigabits (1,062,500,000 bits) per second.

## **GBps**

Gigabytes (1,062,500,000 bytes) per second.

### **Half-duplex**

Mode of communication that allows a port to either transmit or receive frames, but not both at once. The only exception is link control frames, which can be transmitted at any time. See also [Full-duplex](#).

### **Hard address**

The AL\_PA that an NL\_Port attempts to acquire during loop initialization.

### **HBA**

Host Bus Adapter. Interface card between a server or workstation bus and the Fibre Channel network. Similar to a network interface card.

### **Hub**

Fibre Channel wiring concentrator that collapses loop topology into physical star topology. Nodes are automatically added when active and removed when inactive.

### **Idle**

Continuous transmission of an ordered set when no data is being transmitted to maintain an active Fibre Channel link and synchronization. See also [Fill word](#).

### **Initiator**

Server or workstation that initiates communications with storage devices over a Fibre Channel network. See also [Target](#).

### **IOD**

In Order Delivery. A parameter that, when set, guarantees that frames are delivered in-order if possible, and dropped if not.

### **ISL**

Interswitch Link. Fibre Channel link from the E\_Port of one switch to E\_Port of another.

### **IU**

Information Unit. An individual set of information as defined by higher level process protocol definition, or upper-level protocol mapping.

## **JBOD**

Just a Bunch Of Disks. A number of disks connected in a single chassis to one or more controllers. See also [RAID](#).

## **K28.5**

Special 10-bit character used to indicate beginning of transmission words that perform Fibre Channel control and signaling functions. First seven bits are comma pattern. See also [Comma](#).

## **L\_Port**

Loop Port. Node or fabric port that can use loop protocol or fabric protocol. See also [Non-participating mode](#), [Participating mode](#).

## **Latency**

Time required to transmit a frame, from the time sent until time of arrival.

## **Link**

As applies to Fibre Channel, a physical connection between two ports, consisting of both transmit and receive fibres. See also [Circuit](#).

## **Link services**

Protocol for link-related actions.

## **LIP**

Loop Initialization Primitive. The signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node. See also [Loop initialization](#).

## **Loop failure**

Loss of signal within a loop for any period of time, or loss of synchronization for longer than the time-out value. See also [E\\_D\\_TOV](#).

## **Loop initialization**

Logical procedure used by L\_Ports to discover environment. Can be used to assign AL\_PA addresses, detect loop failure, or reset a node. See also [LIP](#).

**Loop\_ID**

Hex value representing one of 127 possible AL\_PA values in a loop.

**Looplet**

Set of devices connected in a loop to a port that is part of another loop.

**LPSM**

Loop Port State Machine. Logical entity that performs arbitrated loop protocols and defines behavior of L\_Ports when they require access to arbitrated loop.

**LWL**

Long wavelength fibre optic cable. Based on 1300 nm lasers supporting 1.0625 Gbps link speeds. Connectors are color-coded blue. See also [SWL](#).

**MIB**

Management Information Base. SNMP structure that provides configuration and device information to assist with device management.

**Multicast**

Transmission of data from a single source to a number of specified N\_Ports. See also [Broadcast](#), [Unicast](#).

**Multimode**

Fibre-optic cabling specification allowing up to 500 meters between devices.

**N\_Port**

Node Port. Port that can attach to a Fibre Channel port. See also [NL\\_Port](#), [Nx\\_Port](#).

**Name server**

Service of storing names, addresses, and attributes for up to 15 minutes, provided by a switch to other entities in fabric. Defined by Fibre Channel standards, and existing at a well-known address. Also called Simple Name Server, SNS, or directory service.

**NL\_Port**

Node Loop Port. An N\_Port that can use loop protocol. See also [N\\_Port](#), c.

## **Node**

Fibre Channel entity with one or more N\_Ports or NL\_Ports.

## **Node name**

Unique identifier for a node, communicated during login and port discovery.

## **Non-participating mode**

Mode in which L\_Port is inactive in loop and cannot arbitrate or send frames, but can retransmit received transmissions. Port enters mode if there are more than 127 devices in loop, and an AL\_PA cannot be acquired. See also [Participating mode](#).

## **Nx\_Port**

Node port that can operate as either an N\_Port or NL\_Port.

## **Ordered set**

A type of transmission word that occurs outside of frames, and is used to manage frame transport and differentiate Fibre Channel control information from data. See also [Data word](#), [Transmission Word](#).

## **Participating mode**

Mode in which an L\_Port in a loop has valid AL\_PA and can arbitrate, send frames, and retransmit received transmissions. See also [Non-participating mode](#).

## **Phantom device**

Device not physically in a loop but logically included by phantom address.

## **Phantom address**

AL\_PA value assigned to device not physically in loop. Also called phantom AL\_PA.

## **PLOGI**

Port Login. Port-to-port login process by which initiators establish sessions with targets. See also [FLOGI](#).

## **Point-to-point**

Two Fibre Channel devices connected by a direct link. See also [Topology](#).

**Port\_Name**

Unique FC identifier for port, communicated during login and port discovery.

**POST**

Power On Self Test. Series of self-tests run after a switch is restarted or reset.

**Private NL\_Port**

NL\_Port that does not log into the fabric and communicates only with private NL\_Ports in same loop.

**Private device**

Device that supports arbitrated loop protocol and understands 8-bit addresses, but cannot log into fabric.

**Private loop**

An arbitrated loop with no Fibre Channel attachment.

**Protocol**

A defined method and standards for communication.

**Public NL\_Port**

NL\_Port that logs into the fabric, can function within public or private loops, and can communicate with public or private NL\_Ports.

**Public device**

Device that supports arbitrated loop protocol, understands 8-bit addresses, and can log into fabric.

**Public loop**

An arbitrated loop attached to a switch.

**Quad**

A group of four adjacent ports that share a common pool of frame buffers. For example, port 0-3 belong to a quad, so do port 4-7.

### **QuickLoop**

Either the product that allows private devices within loops to communicate over the fabric with other devices, or the set of actual devices or looplets connected in a loop by QuickLoop technology.

### **R\_A\_TOV**

Resource Allocation Time-out Value. Maximum time a frame can be delayed in the fabric and still be delivered. See also [E\\_D\\_TOV](#).

### **RAID**

Redundant Array of Independent Disks. Collection of disk drives that appear as a single volume to the server, and are fault-tolerant through mirroring or parity checking. See also [JBOD](#).

### **Remote Switch Services**

Product that enables two Compaq Fibre Channel SAN Switches to connect over an ATM connection. Requires compatible Fibre Channel-to-ATM gateways. Can be up to 10 km distance between each switch and respective gateway.

### **Route**

As applies to fabric, a communication path between two switches. See also [FSPF](#).

### **RSCN**

Registered State Change Notification. Switch function that sends notification of fabric changes from the switch to specified nodes.

### **SAN**

Storage Area Network. Network of systems and storage devices that usually communicate using Fibre Channel protocols. See also [Fabric](#).

### **Sequence**

A Fibre Channel structure containing one or more frames transmitted in a unidirectional manner between N\_Ports. See also [Exchange](#), [Frame](#).

### **Single mode**

Fibre-optic cabling standard for distances of up to 10 kilometers between devices.

### **SNMP**

Simple Network Management Protocol. Internet management protocol that does not rely on underlying communication protocols and can therefore be made available over other protocols, such as UDP/IP. See also [Community \(SNMP\)](#).

### **SNS**

Simple Name Server. See [Name server](#).

### **Switch**

A combination of hardware and firmware that routes frames according to Fibre Channel protocol. Switches can have G\_Ports, E\_Ports, F\_Ports, and FL\_Ports.

### **Switch Domain\_ID**

Unique identifier for a switch, used in routing frames. Usually automatically assigned by the switch, but can be manually assigned by administrator.

### **Switch name**

Arbitrary name assigned to switch by administrator. See also [Switch Domain\\_ID](#).

### **SWL**

Short wavelength fiber-optic cable. Based on 850 nm lasers supporting 1.0625 Gbps link speeds. Connectors are color-coded black. See also [LWL](#).

### **Target**

Storage device that receives communications from a server or workstation over a Fibre Channel network. See also [Initiator](#).

### **Threshold**

In Fabric Watch: the set of information about each element. See also [Boundaries](#) and [Events](#).

### **Topology**

As applies to Fibre Channel, the structure of the Fibre Channel network and the resulting possible communication paths. There are three Fibre Channel topologies: point-to-point, fabric, and arbitrated loop.

### **Translative mode**

Mode in which public devices can communicate with private devices across fabric.

### **Transmission Character**

A 10-bit character encoded according to the rules of the 8b/10b algorithm. See also [8b/10b encoding](#), [Transmission Word](#).

### **Transmission Word**

Group of four transmission characters, totaling 40 bits. Two types: data words and ordered sets. See also [Data word](#), [Ordered set](#), [Transmission Character](#).

### **Trap**

Message sent by SNMP agent to inform SNMP management station of critical error. See also [SNMP](#).

### **Tunneling**

Technique for enabling source and destination hosts to communicate when on same type of network but connected by a different type of network.

### **U\_Port**

Universal Port. Switch port that can operate as G\_Port, E\_Port, F\_Port, or FL\_Port. A port is defined as a U\_Port if not connected or if it has not assumed a specific function in the fabric.

### **ULP**

Upper Layer Protocol. Protocol that runs on top of Fibre Channel. Typical upper layer protocols: SCSI, IP, HIPPI, IPI.

### **Unicast**

Transmission of data from a single source to single destination. See also [Broadcast](#), [Multicast](#).

### **Web Management Tools**

Product that provides a graphical interface for monitoring and managing individual switches or entire fabrics from standard workstations.

**Well-known address**

As applies to Fibre Channel, a logical address stored on the switch and defined by Fibre Channel standards as being assigned to a specific function.

**WWN**

World Wide Name. Identifier that is unique world-wide. Each entity in a fabric has a separate WWN.

**Zone**

Set of hosts and devices attached to same fabric and having access permission, including RSCNs and user data, to each other. Entities inside a zone are not visible to entities outside the same zone, even if the outside entities are in another zone. See also [Zoning](#).

**Zone configuration**

A specified set of zones. Enabling a zone configuration enables all zones in that configuration. See also [Defined configuration](#), [Enabled configuration](#).

**Zoning**

Product that allows partitioning of fabric into logical groupings of devices. See also [Zone](#).



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