StorageWorks by Compaq

Fabric Operating System Procedures User Guide

Part Number: AA-RQ6EA-TE

First Edition January 2002

Product Version: Version 3.0

This document provides information on the following topics: initial configuration procedures, basic configuration procedures, working with the management server, and gathering of status and error information on a switch.

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Printed in the U.S.A

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About this Guide

This User Guide provides information to help you:

- Perform initial configuration procedures including logging in and changing passwords.
- Administer and Configure Compaq StorageWorks Fibre Channel SAN switches.
- Gather status and error information on a switch.
- Contact technical support for additional assistance.

Intended Audience

This book is intended for use by System Administrators who are experienced with the following:

- *StorageWorks*™ Fibre Channel SAN switches by Compaq.
- Fabric Operating System V3.0 or later

Related Documentation

In addition to this guide, Compaq provides corresponding information:

- Fabric Operating System Reference Guide—AA-RQ6FA-TE
- MIB Reference Guide—AA-RQ6HA-TE
- Zoning User guide—AA-RQ6YA-TE
- Advanced Performance Monitor User Guide—AA-RR7UA-TE
- ISL Trunking User Guide—AA-RR82A-TE
- Web Tools User Guide—AA-RQ6GA-TE
- Quickloop User Guide—AA-RR7LA-TE
- Extended Fabric User Guide—AA-RR7QA-TE
- Fabric Watch User Guide—AA-RR7YA-TE

Prerequisites

Before you perform any of the administering or configuring of a switch, make sure you consider the items in the Document Conventions section that follows.

Document Conventions

The conventions included in Table 1 apply in most cases.

Table 1: Document Conventions

Element	Convention
Key names, menu items, buttons, and dialog box titles	**Bold**
File names and application names	*Italics*
User input, command names, system responses (output and messages)	`Monospace font` `COMMAND NAMES` are uppercase unless they are case sensitive
Variables	*`Monospace, italic font`*
Website addresses	Sans serif font (http://www.compaq.com)

Symbols in Text

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

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

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

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

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

Symbols on Equipment

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

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

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

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

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

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

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

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

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

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

Rack Stability

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

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

Getting Help

If you still have a question after reading this guide, contact service representatives or visit our website.

Compaq Technical Support

In North America, call Compaq technical support at 1-800-OK-COMPAQ, available 24 hours a day, 7 days a week.

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

Outside North America, call Compaq technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the Compaq website: http://www.compaq.com.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- 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. Access the Compaq website at: http://www.compaq.com/storage. From this website, select the appropriate product or solution.

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.

1

Setting the Initial Configuration

Introduction

This chapter provides information on initial configuration tasks for a switch.

Logging into a Switch

To log into a switch:

1. Open a telnet connection to the switch. The login prompt is displayed if the telnet connection successfully found the switch in the network.

   NOTE: The switch must be connected to your IP network through the RS-232 port to enable connection through telnet. Refer to the hardware manual of your switch for more information about connecting the switch to your IP network.

2. At the login prompt enter your user ID. For example:

   ```
   login: admin
   The password prompt is displayed if the user exists.
   ```

3. Enter the password for the user:

   ```
   password: xxxxxx
   The default password is password.
   ```

4. If the login was successful, a prompt is displayed showing the switch name and your user ID. For example:

```
switch55>admin:
```

Enabling Licensed Features

Licensed features such as Fabric Watch, QuickLoop, and Advanced Performance Monitor are already loaded onto the switch firmware, but must be enabled with a license key. Once you have purchased these features you are provided with a key to unlock the feature.

Enabling the License

To enable a licensed feature:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
licenseAdd "aaaBbbCcc"
```

where "aaaBbbCcc" is the license key for a particular feature.

NOTE: You must enter a license key for each feature to activate. License keys are case sensitive.

Displaying the Installed Feature Licenses

To display what features have been enabled on a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
licenseShow
```

This command displays the license keys that have been entered for the switch and the features enabled by those licenses.

Changing the Admin Password and User ID

For security reasons, the first time you log into the Fabric Operating System you are requested to change the admin user ID and system password.

To change the Admin user ID and password:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

   ```
   Password "admin"
   ```

   An interactive session is opened and you are prompted for configuration values.

3. At the New Username prompt, enter a new name for the admin user. You can change the name of the admin user without changing the password. Press **Enter** to leave the name as is.
4. At the Old Password prompt, enter the old password.
5. At the New Password prompt, enter the new password. The new password must be from 8 to 40 characters in length.
6. At the Re-enter New Password prompt, enter the new password exactly as entered to the previous prompt.
7. Press the **Enter** key to commit the configuration to the firmware.

Configuring the IP and Fibre Channel Address

The switch is shipped with a default IP address of `10.77.77.77`. To change the default IP Address and configure the Fibre Channel IP address of the switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

   ```
   ipAddrSet
   ```

   An interactive session is opened and you are prompted for configuration values. Press the **Enter** key without entering a value to skip over a prompt and leave the parameter value as is.

3. At the Ethernet IP Address prompt, enter the new IP address for the ethernet port on the switch. Press the **Enter** key to continue.
4. At the Ethernet Subnetmask prompt, enter the address of the subnetmask, if applicable. Press the **Enter** key to continue.
5. At the Fibre Channel IP address prompt, enter the Fibre Channel IP address for the switch. Press the **Enter** key to continue.
6. At the Fibre Channel Subnetmask prompt, enter the address of the subnetmask, if applicable. Press the **Enter** key to continue.
7. At the Gateway Address prompt, enter the IP address of the gateway system if applicable. Press the **Enter** key to continue. The configuration is then committed to the switch firmware.
8. You are then prompted whether to make the IP address changes active now or at the next reboot. Enter **`y`** at the prompt to have the IP address changes take effect immediately.

Displaying the Fabric-Wide Device Count

To verify that you have fabric-wide connectivity when you install a new switch, display the fabric-wide device count from the newly installed switch.

To display the fabric-wide device count from a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

   ```
   nsAllShow
   ```

   This command displays all the connected devices in the fabric.

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Basic Configuration Procedures

This chapter provides information on basic configuration tasks for a switch.

Setting the Telnet Timeout Value

To set a new telnet timeout value:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

   ```
   timeout x
   ```

   where *x* is the number of minutes before the telnet connection times out. If you specify 0 then the telnet connection never times out. Timeout is disabled by default.

Displaying the Firmware Version

To display the firmware version:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

   ```
   version
   ```

   This command displays the Kernel version, Fabric Operating System release number, and other information about the firmware.

Setting the Switch Date and Time

All switches maintain current date and time in non-volatile memory. Date and time are used for logging events. Switch operation does not depend on the date and time; a switch with an incorrect date and time value still functions properly.

To set the date and time of a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

   ```
   date "MMDDhhmmYY"
   ```

where:

MM is the month, valid values are 01-12.

DD is the date, valid values are 01-31.

hh is the hour, valid values are 00-23.

mm is minutes, valid values are 00-59.

YY is the year, valid values are 00-99.

NOTE: Year values greater than 69 are interpreted as 1970-1999, year values less than 70 are interpreted as 2000-2069. The date function does not support daylight saving time or time zones.

Displaying the System Configuration Settings

To display the system configuration settings:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
configShow
```

The system configuration settings are displayed.

NOTE: For more information on the system configuration settings, refer to the *Fabric Operating System Reference Guide*.

Backing Up the System Configuration Settings

The two supplied utilities RSHD.EXE and CAT.EXE, currently do not support uploads for Windows, only downloads. Therefore, FTP must be used on Windows workstations to backup the system configuration, and the FTP server must be running before an upload can occur.

To upload a backup copy of the configuration settings to a host computer:

1. Verify that the RSHD service (on a UNIX machine) or the FTP service (on a Windows machine) is running on the host workstation.
2. Login to the switch as the admin user.
3. At the command line enter the following command:

```
configUpload "hostIPaddr", "user", "path_filename","password"
```

where `hostIPaddr` is the IP address of the host computer, `user` is the User ID used to log into this computer, `path_filename` is the path location and filename of the configuration file, and `password` is the password for the user ID specified.

Restoring the System Configuration Settings

To restore the system configuration settings from a backup:

1. Verify that the RSHD service (UNIX) or the FTP service (Windows) is running on the host workstation.
2. Login to the switch as the admin user.
3. Shut down the switch by entering the following command:

   ```
   switchDisable
   ```

4. At the command line enter the following command:

   ```
   configDownload "hostIPaddr", "user", "path_filename","password"
   ```

   where "`hostIPaddr`" is the IP address of the host computer, "`user`" is the User ID used to log into this computer, "`path_filename`" is the path location and filename of the system configuration file, and "`password`" is the password for the user ID specified.

   NOTE: The password operand is only required if you are using FTP.

5. Reboot the switch by entering the following command:

   ```
   fastBoot
   ```

Upgrading or Restoring the Switch Firmware

To upgrade or restore the switch firmware:

1. Verify that the RSHD service (on a UNIX machine) or the FTP service (on a Windows machine) is running on the host workstation.

2. Login to the switch as the admin user.
3. At the command line enter the following command:

```
firmwareDownload "hostIPaddr", "user", "path_filename", "password"
```

where "hostIPaddr" is the IP address of the host computer,
"user" is the User ID used to log into this computer,
"path_filename" is the path location and filename of the new file, and
"password" is the password for the user ID specified.

NOTE: The password operand is only required if you are using FTP.

4. Reboot the switch by entering the following command:

```
fastBoot
```

Disabling a Switch

To disable a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
switchDisable
```

All Fibre Channel ports on the switch are taken offline, if the switch was part of a fabric, the remaining switches reconfigure.

Enabling a Switch

To enable a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
switchEnable
```

All Fibre Channel ports that passed the POST test are enabled. If the switch was part of a fabric, it rejoins the fabric.

Disabling a Port

To disable a port:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
portDisable portnumber
```

where `portnumber` is the number of the port you want to disable. If the port is connected to another switch the fabric may reconfigure. If the port is connected to one or more devices, these devices are no longer available to the fabric.

Enabling a Port

To enable a port:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
portEnable portnumber
```

where `portnumber` is the number of the port you want to enable. If the port is connected to another switch the fabric may reconfigure. If the port is connected to one or more devices, these devices become available to the fabric.

Changing a Switch Name

To change the name of a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
switchName "new_name"
```

where "new_name" is the new name for the switch. Switch names can be up to 19 characters long, must begin with a letter, and can contain letters, numbers, or the underscore character.

Setting the Switch Status Policy

There are seven parameters that determine the status of a switch:

- Number of faulty ports
- Missing optical transceivers
- Power supply status
- Temperature in enclosure
- Fan speed
- Port status
- sgroup ISL status

Each parameter can be adjusted so that a specific threshold must be reached before that parameter changes the overall status of a switch to MARGINAL or DOWN. only one parameter needs to pass the MARGINAL or DOWN threshold to change the overall status of the switch.

Viewing the Policy Threshold Values

To view the switch status policy threshold values:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
switchStatusPolicyShow
```

Configuring the Policy Threshold Values

To set the switch status policy threshold values:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
switchStatusPolicySet
```

The current switch status policy parameter values are displayed.

3. You are prompted to enter values for each parameters DOWN and MARGINAL threshold:
   - Enter the number of faulty ports required to change the switch status to DOWN and press the **Enter** key.
   - Enter the number of faulty ports required to change the switch status to MARGINAL and press the **Enter** key.
   - Enter the number of missing optical tranceivers required to change the switch status to DOWN and press the **Enter** key.
   - Enter the number of missing optical tranceivers required to change the switch status to MARGINAL and press the **Enter** key.
   - Enter the number of bad Power Supply warnings required to change the switch status to DOWN and press the **Enter** key.
   - Enter the number of bad Power Supply warnings required to change the switch status to MARGINAL and press the **Enter** key.
   - Enter the number of temperature warnings required to change the switch status to DOWN and press the **Enter** key.
   - Enter the number of temperature warnings required to change the switch status to MARGINAL and press the **Enter** key.
   - Enter the number of fan speed warnings required to change the switch status to DOWN and press the **Enter** key.
   - Enter the number of fan speed warnings required to change the switch status to MARGINAL and press the **Enter** key.
   - Enter the number of port down warnings required to change the switch status to DOWN and press the **Enter** key.
   - Enter the number of port down warnings required to change the switch status to MARGINAL and press the **Enter** key.
   - Enter the number of ISLstatus down warnings required to change the switch status to DOWN and press the **Enter** key.
   - Enter the number of ISLstatus down warnings required to change the switch status to MARGINAL and press the **Enter** key.

4. Verify the threshold settings you have configured for each parameter. Enter the following command to view your current switch status policy configuration:

```
switchStatusPolicyShow
```

NOTE: By setting the DOWN and MARGINAL value for a parameter to 0,0 that parameter is ignored in setting the overall status for the switch.

Track Changes Feature

Trackable changes are:

- Successful login
- Unsuccessful login
- Logout
- Config file change from task
- Track-changes on
- Track-changes off

Items in the error log created from the Track changes feature are labeled `Error TRACK`. For example:

```
Error 08
--------
0x102cf710 (tShell): May  2 16:12:10
    Error TRACK-LOGIN, 4, Successful login
```

Enabling Track Changes

To enable the track changes feature:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
trackChangesSet 1
```

A prompt is displayed verifying that the track changes feature is on. The output from the track changes feature is dumped to the error log for the switch. Use the `errdump` command or `errshow` command to view the error log.

Displaying whether Track Changes is Enabled

To display the status of the track changes feature:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
trackChangesShow
```

The status of the track changes feature is displayed as either on or off. This also displays whether the track changes feature is configured to send SNMP traps. For example:

```
switch:admin> trackchangesshow
Track changes status: ON
Track changes generate SNMP-TRAP: NO
```

Configuring a Static Route Between Two Ports

To configure a static route between two ports:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
uRouteConfig port, domain, outputport
```

where `port` is the port to be statically routed (can be an F_port or an E_port), `domain` is the domain ID of the specified target switch, and `outputport` is the output port where traffic is to be forwarded.

After this command is issued, and if `outputport` is a usable port, all frames coming in from a specified `port` addressed to the specified `domain` are routed through the specified `outputport`.

If the `outputport` is not usable, the routing assignment is not affected. When `outputport` becomes usable the static route assignment for the `port` is enforced.

NOTE: Using static routes can affect load sharing. If a large number of routes are statically configured to the same output port, the ability of the switch to achieve optimum load sharing may be impaired.

Configuring the In-order Delivery Option

In a stable fabric, frames are always delivered in order, even when the traffic between switches is shared among multiple paths. However, when topology changes occur in the fabric (for instance, a link goes down), traffic is rerouted around the failure. When topology changes occur, some frames may be delivered out of order.

The default behavior enables in-order delivery of frames during fabric topology changes. This assures in-order delivery, but slows down rerouting after a fabric topology change.

Forcing In-order Delivery of Frames

To force in-order delivery of frames during fabric topology changes:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
iodset
```

This command can cause a delay in the establishment of a new path when a topology change occurs, and should be used with care.

Disabling In-order Delivery of Frames

To disable In-Order Delivery of frames during fabric topology changes:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
iodreset
```

Displaying Help Information for a Telnet Command

To display help information about a telnet command:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
help command
```

where `command` is the command name you would like help with.

Configuring Compatibility

In order for Compaq StorageWorks Fibre Channel SAN Switches (SAN Switch 16-EL, SAN Switch 8-EL, SAN Switch 16, and SAN Switch 8) to be part of a fabric containing a Compaq StorageWorks Fibre Channel Switch, the VC Encoded Address Mode parameter must be enabled. The VC Encoded Address Mode parameter specifically enables compatibility between newer switches and the Compaq StorageWorks Fibre Channel Switch.

The VC Encoded Address Mode parameter must be enabled on each Compaq StorageWorks Fibre Channel SAN Switch in the fabric. Enable this parameter only if Compaq StorageWorks Fibre Channel Switches are in the Fabric.

To enable the VC Encoded Address Mode:

1. Login to the switch as the admin user.
2. At the command line enter the following commands:

```
switchDisable
configure
```

3. At the following prompt line enter Yes:

```
Fabric parameters (yes, y, no, n): [no] yes
```

4. Press the **Enter** key to skip through the Fabric Parameters until the `VC Encoded Address Mode` parameter is displayed. Enter 1 to enable the parameter:

```
VC Encoded Address Mode: (0..1) [0] 1
```

5. Press the **Enter** key to skip through the rest of the parameters or press Control-D. Verify that your changes were committed:

```
Committing configuration...done.
```

6. Reboot the switch by entering the following command:

```
fastboot
```

NOTE: Once a modification is made to the VC Encoded Address Mode parameter, either `fastboot` or `cfgEnable` is needed to re-install the zoning data base, even if there is already an enabled or effective Zoning data base.

Reading Hexadecimal Port Diagrams

Many of the commands return port diagrams in Hexadecimal format. For example:

```
switch:admin> bcastShow
Group   Member Ports   Member ISL Ports    Static ISL Ports
-------------------------------------------------------------
256      0x00012083      0x00002080            0x00000000
```

To read the hexadecimal port diagrams they must be converted into binary notation. Each hexadecimal value represents four binary values. Each hexadecimal value is converted into a group four binary values that represent four ports as shown in Table 2–1.

Table 2–1: Hexadecimal to Binary Conversion

Hex Value	Binary Value	Hex Value	Binary Value
0	0000	8	1111
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

Once the hexadecimal value is converted into a binary bit map, each bit represents a port, where a value of 1 means yes and a value of 0 means no. The bit map is read from right to left, that is, the least significant bit represents port 0.

For example, if the member port value is displayed in hex as:

```
0x00012083
```

This corresponds to a binary bit map of the member ports as follows:

```
0000 0000 0000 0001 0010 0000 1000 0011
```

This bit map displays the member ports as port 0, 1, 7, 13, and 16. Each switch has a hidden internal port (in the example above port 16) which is always a member of a broadcast group.

3

Working with the Management Server

This chapter provides information on working with the Management Server platform database.

The Management Server allows a Storage Area Network (SAN) management application to retrieve and administer the fabric and interconnect elements such as switches, servers, and storage devices. it is located at the Fibre Channel well-known address, FFFFFAh.

NOTE: Management Server Platform service is available only with Fabric Operating System V2.3 and later. If the Management Server Platform service is started on a fabric with any switches 2.2.x or earlier, the fabric will be segmented.

Configuring Access to the Management Server

An Access Control List (ACL) of WWN addresses determines which systems have access to the Management Server database. 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 WWNs in the ACL. These WWNs are usually associated with the management applications. If any WWNs are entered into the ACL then access to the Management Server is restricted to only those WWNs listed in the ACL.

Displaying the Access Control List

To display the Management Server ACL:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
msConfigure
```

3. At the prompt enter 1 to display the access list.

   A list of WWNs that have access to the Management Server are displayed. For example:

```
MS Access List consists of (3): {
 20:01:00:60:69:00:60:10
 20:02:00:60:69:00:60:10
 20:03:00:60:69:00:60:10
```

Adding a WWN to the Access Control List

To add a WWN to the ACL:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
msConfigure
```

3. At the prompt enter 2 to add a member based on its Port/Node WWN.
4. At the prompt enter the WWN of the member you would like to add to the ACL. For example:

```
20:02:00:60:69:00:60:03
```

   Once the action is complete the main menu is displayed.

5. At the prompt enter 1 to verify the WWN you entered was added to the ACL.
6. Once you have verified that the WWN was added correctly, enter 0 at the prompt to end the session.

7. The following prompt is displayed:

```
Update the FLASH?  (yes, y, no, n): [yes]
```

8. Press **Enter** to update the flash and end the session.

Deleting a WWN from the Access Control List

To delete a WWN from the ACL:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
msConfigure
```

3. At the prompt enter 3 to delete a member based on its Port/Node WWN.
4. At the prompt enter the WWN of the member you would like to delete from the ACL. For example:

```
20:02:00:60:69:00:60:03
```

   Once the action is complete the main menu is displayed.

5. At the prompt enter 1 to verify the WWN you entered was deleted from the ACL.
6. Once you have verified that the WWN was deleted correctly, enter **0** at the prompt to end the session.
7. The following prompt is displayed:

```
Update the FLASH?  (yes, y, no, n): [yes]
```

8. Press **Enter** to update the flash and end the session.

Displaying the Management Server Database

To view the contents of the Management Server Platform Database:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
msPlatShow
```

The contents of the Management Server Database are displayed. For example:

```
----------------------------------------------------------
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
```

Clearing the Management Server Database

To clear the Management Server Platform Database:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
msPlclearDB
The following message is displayed:
Fabric-wise Platform DB Delete operation in progress...
done ...
```

Displaying the Capability of a Fabric for Management Server Support

To display the capability of a fabric for Management Server support:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
msPlCapabilityShow
```

The name, WWN, and specific Management Server capability is displayed for each switch in the fabric.

```
switch:admin> msPlCapabilityShow
                                Platform
Switch WWN                 Service Capable   Capability  Name
=======================    ===============   ==========  =======
10:00:00:60:69:04:01:94          Yes         0x0000008f  "switch55"
10:00:00:60:69:10:53:48          Yes         0x0000000b  "switch53"
10:00:00:60:69:10:54:c8          Yes         0x0000000b  "switch52"
10:00:00:60:69:02:39:70          Yes         0x0000000b  "switch54"
10:00:00:60:69:20:10:52          Yes         0x0000000b  "switch43"
10:00:00:60:69:20:10:2b          No          0x00000009  "switch62"
10:00:00:60:69:10:53:3c          Yes         0x0000000b  "switch51"
10:00:00:60:69:04:11:17          Yes         0x0000008f  "switch57"

        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.
                Bit 6: Timer Service Supported.
                Bit 7: RSCN Small Payload Supported.
                Others: Reserved.
WARNING! Platform Management Service CAN NOT BE activated for this
Fabric!!!
Done.
```

3. Verify that all the switches in the fabric are capable of Management Server support.

NOTE: In the example above, the fabric does not support Platform Management Service because switch `switch62` is firmware version 2.2. For more information refer to the `msPlCapabilityShow` command in the *Fabric Operating System Reference Guide.*

Activating the Platform Management Service

To activate the Platform Management Service for a fabric:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
msPlMgmtActivate
```

The following prompt is displayed:

```
Committing configuration...done.
Request Fabric to activate Platform Management services....
Done.
```

Deactivating the Platform Management Service

To deactivate the Platform Management Service for a fabric:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
msPlMgmtDeactivate
```

3. At the following prompt type Y, and press **Enter**:

```
This will erase all Platform entries. Are you sure?  (yes, y, no,
n): [no] y
Committing configuration...done.
Request Fabric to Deactivate Platform Management services....
Done.
```

4

Displaying Error Logs and Status

This chapter provides information on displaying port and switch status information.

Displaying Software Statistics for a Port

Software statistics for a port include information such as port state, number of interrupts, number of link failures, number of loss of synchronization warnings, and number of loss of signal warnings.

To display the software statistics for a port:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
portShow portnumber
```

where `portnumber` is the number of the port you want to view. A table of software statistics for the port is displayed.

NOTE: For more information on the `portShow` command refer to the *Fabric Operating System Reference Guide*.

Displaying Hardware Statistics for a Port

Hardware statistics for a port include information such as number of frames received, number of frames sent, number of encoding errors received, and number of class 2 and 3 frames received.

To display the hardware statistics for a port:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
portStatsShow portnumber
```

where `portnumber` is the number of the port you want to view. A table of hardware statistics for the port is displayed.

NOTE: For more information on the `portStatsShow` command, refer to the *Fabric Operating System Reference Guide*.

Displaying a Summary of Port Errors

This command displays a summary of port errors for all the ports in a single switch.

To display a summary of port errors for a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
portErrshow
```

The display contains one output line per port. The following table explains the types of errors counted:

Table 4–1: Error Summary Description

Error Type	Description
frames tx	Frames transmitted.
frames rx	Frames received.
enc in	Encoding errors inside 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.
fbsy	Frames busied with F_BSY.

NOTE: For more information on the `portErrShow` command refer to the *Fabric Operating System Reference Guide*.

Displaying the Error Log of a Switch

There are two ways to display the error log of a switch:

- Display the error log one page at a time
- Display the error log all at once

To display the switch error log one page at a time:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
ErrShow
```

To display the switch error log all at once:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
ErrDump
```

Displaying the Switch Status

The switch status can be either Healthy/OK, Marginal/Warning, or Down. The overall status of a switch is determined by the status of several individual components within the switch. For more information on how the overall switch status is determined, refer to the `switchStatusPolicySet` command in the *Fabric Operating System Reference Guide*.

To display the overall status of a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
switchStatusShow
```

   The status of the switch should be Healthy/OK. If the status is Marginal/Warning or Down, the components contributing to this status are displayed.

Displaying Information About a Switch

To display switch information:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
switchShow
```

This command displays the following information for a switch:

- switchName—the switch's name
- switchType—The switch's model and firmware version numbers.
- switchState—The switch's state: Online, Offline, Testing, or Faulty.

- switchRole—The switch's role: Principal, Subordinate, or Disabled.
- switchDomain—The switch's Domain ID.
- switchId—The switch's embedded port D_ID.
- switchWwn—The switch's World Wide Name.
- switchBeacon —The switch's beaconing state: either ON or OFF.

This command also display the following information for ports on the specified switch:

- Module type—The GBIC type if a GBIC is present.
- Port speed—The speed of the Port (1G, 2G, N1, N2, or AN). The speed can be fixed, negotiated, or auto negotiated.
- Port state—The port status.
- Comment—Displays information about the port. May be blank or including WWN for F_port or E_port, Trunking state, upstream or downstream status.

For more information refer to the `switchShow` command in the *Fabric Operating System Reference Guide*.

Displaying the Uptime Of The Switch

To display the uptime for a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
uptime
```

This command displays the length of time the system has been in operation, the total cumulative amount of “up time” since the system was first powered-on, the date and time of the last reboot, and the reason for the last reboot.

The reason for the last switch reboot is also recorded in the error log.

Displaying the Fan Status

To display the fan status of a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
fanShow
```

The possible values for fan status are:

- `OK`–Fan is functioning correctly.
- `absent`–Fan is not present.
- `below minimum`–Fan is present but rotating too slowly or stopped.

Displaying Power Supply Status

To display the power supply status of a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
psShow
```

The possible values for power supply status are:

- `OK`–Power supply present and functioning correctly.
- `absent`–Power supply not present.
- `faulty`–Power supply present but faulty (no power cable, power switch turned off, fuse blown, or other internal error).

After the status line, a power supply identification line may be shown. If present, this line contains manufacture date, part numbers, serial numbers, and other identification information.

Displaying the Temperature Status

To display the temperature status of a switch:

1. Login to the switch as the admin user.
2. At the command line enter the following command:

```
tempShow
```

This command displays current temperature readings from each of the five temperature sensors located on the main printed circuit board of the switch. The sensors are located, approximately, one in each corner and one at the center of the PCB.

Running Diagnostic Tests on the Switch Hardware

There are several diagnostic tests you can run on a switch. These test are generally run during the POST, each time a switch is booted up.

- camtest
- centralMemoryTest
- cmemRetentionTest
- cmiTest
- crossPortTest
- portLoopbackTest
- sramRetentionTest
- turboRamTest
- statsTest
- spinSilk

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
An encoding scheme that converts each 8-bit byte into 10 bits. Used to balance ones and zeros in high-speed transports.

Address Identifier
A 24-bit or 8-bit value used to identify the source or destination of a frame.

AL_PA
Arbitrated Loop Physical Address; a unique 8-bit value assigned during loop initialization to a port in an arbitrated loop.

Alias Address Identifier
An address identifier recognized by a port in addition to its standard identifier. An alias address identifier may be shared by multiple ports.

Alias AL_PA
An AL_PA value recognized by an L_Port in addition to the AL_PA assigned to the port. See also *AL_PA*.

Alias Server
A fabric software facility that supports multicast group management.

API
Application Programming Interface; defined protocol that allows applications to interface with a set of services.

Arbitrated Loop
A shared 100 MBps Fibre Channel transport structured as a loop. Can support up to 126 devices and one fabric attachment. See also *Topology.*

ASIC
Application Specific Integrated Circuit.

ATM
Asynchronous Transfer Mode; a transport used 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.

AW_TOV
Arbitration Wait Time-out Value; the minimum time an arbitrating L_Port waits for a response before beginning loop initialization.

Bandwidth
The total transmission capacity of a cable, link, or system. Usually measured in bps (bits per second). May also refer to the range of transmission frequencies available to a network. See also *Throughput*.

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 the number of receive buffers available. See also *Buffer-to-buffer Flow Control*, *EE_Credit*.

Beginning Run Disparity
The disparity at the transmitter or receiver when the special character associated with an ordered set is encoded or decoded. See also *Disparity.*

BER
Bit Error Rate; the rate at which bits are expected to be received in error. Expressed as the ratio of error bits to total bits transmitted. See also *Error.*

Block
As applies to Fibre Channel, upper-level application data that is transferred in a single sequence.

Bridge
Hardware that connects incompatible networks by providing translation for both hardware and software. For example, an ATM gateway can connect a Fibre Channel link to an ATM connection.

Broadcast
The transmission of data from a single source to all devices in the fabric, regardless of zoning. See also *Multicast*, *Unicast*.

Buffer-to-buffer Flow Control
Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop. See also *BB_Credit*.

Cascade
Two or more interconnected Fibre Channel switches. The recommended number of interswitch links is seven. See also *Fabric*, *ISL*.

Chassis
The metal frame in which the switch and switch components are mounted.

Circuit
An established communication path between two ports. Consists of two virtual circuits capable of transmitting in opposite directions. See also *Link*.

Class 1
Service that provides a dedicated connection between two ports (also called connection-oriented service), with notification of delivery or nondelivery.

Class 2
Service that provides multiplex and connection-less frame switching service between two ports, with notification of delivery or nondelivery.

Class 3
Service that provides a connection-less frame switching service between two ports, without notification of delivery or nondelivery of data. Can also be used to provide a multicast connection between the originator and recipients, with notification of delivery or nondelivery.

Class 4
Connection-oriented service that provides a virtual circuit between two ports, with notification of delivery or nondelivery. Allows fractional parts of the bandwidth to be used in a virtual circuit.

Class 6
Connection-oriented service that provides a multicast connection between the multicast originator and recipients, with notification of delivery or nondelivery.

Class F
Connection-less service for control traffic between switches, with notification of delivery or nondelivery of data between the E_Ports.

Class of Service
A specified set of delivery characteristics and attributes for frame delivery.

CLS
Close Primitive Signal. The protocol used by a port in an arbitrated loop to close a circuit.

Code Balance
The ratio of one bit to the total number of transmitted bits.

Comma
A unique pattern (either 1100000 or 0011111) used in 8B/10B encoding to specify character alignment within a data stream. See also *K28.5*.

Command Line
Interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a GUI.

Community (SNMP)
A relationship between a group of SNMP managers and an SNMP agent, in which authentication, access control, and proxy characteristics are defined. See also *SNMP*.

Connection Initiator
A port that has originated a Class 1 dedicated connection and received a response from the recipient.

Connection Recipient
A port that has received a Class 1 dedicated connection request and transmitted a response to the originator.

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*, *EE_Credit*.

CT_HDR
Common Transport Header. A header that conforms to the Fibre Channel Common Transport (FC_CT) protocol.

CT_IU
Common Transport Information Unit. An information unit that conforms to the Fibre Channel Common Transport (FC_CT) protocol.

Current Fill Word
The fill word currently selected by the LPSM (loop port state machine). See also *Fill Word.*

Cut-through
A switching technique that allows the route for a frame to be selected as soon as the 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 Zone Configuration
The set of all zone objects defined in the fabric. May include multiple zone configurations. See also *Enabled Configuration*, *Zone Configuration*.

Disparity
The relationship of ones and zeros in an encoded character. “Neutral disparity” means an equal number of each, “positive disparity” means a majority of ones, and “negative disparity” means a majority of zeros.

DLS
Dynamic Load Sharing; dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx_Port or E_Port changes status.

Domain ID
As applies to SAN switches, a unique number between 1 and 239 that identifies the switch to the fabric and is used in routing frames. Usually automatically assigned by the switch, but can be manually assigned.

E_D_TOV
Error Detect Time-out Value; the minimum amount of time a target waits for a sequence to complete before initiating recovery. Can also be defined as the maximum time allowed for a round-trip transmission before an error condition is declared. See also *R_A_TOV*, *RR_TOV.*

E_Port
Expansion Port; a type of switch port that can be connected to an E_Port on another switch to create an ISL. See also *ISL*.

EE_Credit
End-to-end Credit; the number of receive buffers allocated by a recipient port to an originating port. Used by Class 1 and 2 services to manage the exchange of frames across the fabric between source and destination. See also *End-to-end Flow Control*, *BB_Credit*.

EIA Rack
A storage rack that meets the standards set by the Electronics Industry Association.

Enabled Zone Configuration
The currently enabled configuration of zones. Only one configuration can be enabled at a time. See also *Defined Configuration*, *Zone Configuration*.

End-to-end Flow Control
Governs flow of class 1 and 2 frames between N_Ports. See also *EE_Credit*.

Error
As applies to Fibre Channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal (link errors). See also *Loop Failure*.

Exchange
The highest level Fibre Channel mechanism used for communication between N_Ports. Composed of one or more related sequences, and can work in either one or both directions.

F_Port
Fabric Port; a port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N_Port to a switch. See also *FL_Port*, *Fx_Port*.

Fabric Name
The unique identifier assigned to a fabric and communicated during login and port discovery.

Fabric
A Fibre Channel network containing two or more switches in addition to hosts and devices. May also be referred to as a switched fabric. See also *Topology*, *SAN*, *Cascade*.

FC-AL-3
The Fibre Channel Arbitrated Loop standard defined by ANSI. Defined on top of the FC-PH standards.

FC-FLA
The Fibre Channel Fabric Loop Attach standard defined by ANSI.

FCIA
Fibre Channel Industry Association. An international organization of Fibre Channel industry professionals. Among other things, provides oversight of ANSI and industry developed standards

FCP
Fibre Channel Protocol; mapping of protocols onto the Fibre Channel standard protocols. For example, SCSI FCP maps SCSI-3 onto Fibre Channel.

FC-PH-1, 2, 3
The Fibre Channel Physical and Signalling Interface standards defined by ANSI.

FC-PI
The Fibre Channel Physical Interface standard defined by ANSI.

FC-PLDA
The Fibre Channel Private Loop Direct Attach standard defined by ANSI. Applies to the operation of peripheral devices on a private loop.

FC-SW-2
The second generation of the Fibre Channel Switch Fabric standard defined by ANSI. Specifies tools and algorithms for the interconnection and initialization of Fibre Channel switches in order to create a multi-switch Fibre Channel fabric.

Fibre Channel Transport
A protocol service that supports communication between Fibre Channel service providers. See also *FSP*.

Fill Word
An IDLE or ARB ordered set that is transmitted during breaks between data frames to keep the Fibre Channel link active.

FL_Port
Fabric Loop Port; a port that is able to transmit under fabric protocol and also has arbitrated loop capabilities. Can be used to connect an NL_Port to a switch. See also *F_Port*, *Fx_Port*.

FLOGI
Fabric Login; the process by which an N_Port determines whether a fabric is present, and if so, exchanges service parameters with it. See also *PLOGI*.

Frame
The Fibre Channel structure used to transmit data between ports. Consists of a start-of-frame delimiter, header, any optional headers, the data payload, a cyclic redundancy check (CRC), and an end-of-frame delimiter. There are two types of frames: Link control frames (transmission acknowledgements, etc.) and data frames.

FS_ACC
Fibre Channel Services Accept. The information unit used to indicate acceptance of a request for a Fibre Channel service.

FS_IU
Fibre Channel Services Information Unit. An information unit that has been defined by a specific Fibre Channel service.

FS_REQ
Fibre Channel Services Request. A request for a Fibre Channel services function, or notification of a fabric condition or event.

FS_RJT
Fibre Channel Services Reject. An indication that a request for Fibre Channel services could not be processed.

FS
Fibre Channel Service; a service that is defined by Fibre Channel standards and exists at a well-known address. For example, the Simple Name Server is a Fibre Channel service. See also *FSP*.

FSP
Fibre Channel Service Protocol; the common protocol for all fabric services, transparent to the fabric type or topology. See also *FS*.

FSPF
Fabric Shortest Path First; the routing protocol for Fibre Channel switches.

Full Fabric
The licensing that allows multiple E_Ports on a switch, making it possible to create multiple ISL links.

Full-duplex
A mode of communication that allows the same port to simultaneously transmit and receive frames. See also *Half-duplex*.

Fx_Port
A fabric port that can operate as either an F_Port or FL_Port. See also *F_Port*, *FL_Port*.

G_Port
Generic Port; a port that can operate as either an E_Port or F_Port. A port is defined as a G_Port when it is not yet connected or has not yet assumed a specific function in the fabric.

Gateway
A device such as a switch that connects different subnets together. A switch can be used as a gateway from the Ethernet to the Fibre Channel. Set the gateway address on one switch to the Fibre Channel IP address of another switch to enable the other switch to forward IP traffic to the ethernet port on the second switch.

GBIC
Gigabit Interface Converter; a removable serial transceiver module that allows gigabaud physical-level transport for Fibre Channel and gigabit ethernet. Also known as Optical Transceiver.

Gbps
Gigabits per second (1,062,500,000 bits/second).

GBps
GigaBytes per second (1,062,500,000 bytes/second).

Half-duplex
A mode of communication that allows a port to either transmit or receive frames at any time, but not simultaneously (with the exception of 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.

Hardware Translative Mode
A method for achieving address translation. The following two hardware translative modes are available to a QuickLoop enabled switch:

- Standard Translative Mode: Allows public devices to communicate with private devices that are directly connected to the fabric.
- QuickLoop Mode: Allows initiator devices to communicate with private or public devices that are not in the same loop.

HBA
Host Bus Adapter; the interface card between a server or workstation bus and the Fibre Channel network.

Hub
A Fibre Channel wiring concentrator that collapses a loop topology into a physical star topology. Nodes are automatically added to the loop when active and removed when inactive.

Idle
Continuous transmission of an ordered set over a Fibre Channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.

IN_ID
Initial Identifier. The field in the CT_HDR where the port ID of the client originator of a Fibre Channel Services request.

Initiator
A server or workstation on a Fibre Channel network that initiates communications with storage devices. See also *Target*.

Integrated Fabric
The fabric created by a Compaq StorageWorks Fibre Channel SAN Switch IS/32 or IS/64, or SAN Switches 16-EL/8-EL switches cabled together and configured to handle traffic as a seamless group.

IOD
In-order Delivery; a parameter that, when set, guarantees that frames are either delivered in order or dropped.

IPA
Initial Process Associator. An identifier associated with a process at an N_Port.

ISL
Interswitch Link; a Fibre Channel link from the E_Port of one switch to the E_Port of another. See also *E_Port*, *Cascade*.

Isolated E_Port
An E_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E_D_TOVs). See also *E_Port*.

IU
Information Unit; a set of information as defined by either upper-level process protocol definition or upper-level protocol mapping.

K28.5
A special 10-bit character used to indicate the beginning of a transmission word that performs Fibre Channel control and signaling functions. The first seven bits of the character are the comma pattern. See also *Comma*.

L_Port
Loop Port; a node port (NL_Port) or fabric port (FL_Port) that has arbitrated loop capabilities. An L_Port can be in one of two modes:

- *Fabric mode* Connected to a port that is not loop capable, and using fabric protocol.
- *Loop mode* In an arbitrated loop and using loop protocol. An L_Port in loop mode can also be in participating mode or non-participating mode.

See also *Non-participating Mode, Participating Mode*.

Latency
The period of time required to transmit a frame, from the time it is sent until it arrives.

Link Services
A protocol for link-related actions.

Link
As applies to Fibre Channel, a physical connection between two ports, consisting of both transmit and receive fibres. See also *Circuit*.

LIP
Loop Initialization Primitive; the signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node.

LIS_HOLD_TIME
Loop Initialization Sequence Hold Time. The maximum period of time for a node to forward a loop initialization sequence.

LM_TOV
Loop Master Time-out Value; the minimum time that the loop master waits for a loop initialization sequence to return.

Login BB_Credit
The number of receive buffers a receiving L_Port has available when a circuit is first established. Communicated through PLOGI, PDISC link services, or FLOGI.

Loop Circuit
A temporary bidirectional communication path established between L_Ports.

Loop Failure
Loss of signal within a loop for any period of time, or loss of synchronization for longer than the time-out value.

Loop Initialization
The logical procedure used by an L_Port to discover its environment. Can be used to assign AL_PA addresses, detect loop failure, or reset a node.

Loop_ID
A hex value representing one of the 127 possible AL_PA values in an arbitrated loop.

Looplet
A set of devices connected in a loop to a port that is a member of another loop.

LPSM
Loop Port State Machine; the logical entity that performs arbitrated loop protocols and defines the behavior of L_Ports when they require access to an arbitrated loop.

LWL
Long Wavelength; a type of fiber optic cabling that is based on 1300-mm lasers and supports link speeds of 1.0625 Gbps. May also refer to the type of GBIC or SFP. See also *SWL*.

Master Port
As relates to trunking, the port that determines the routing paths for all traffic flowing through the trunking group. One of the ports in the first ISL in the trunking group is designated as the master port for that group. See also *ISL Trunking*.

MIB
Management Information Base; an SNMP structure to help with device management, providing configuration and device information.

Monitoring State
The state in which a port is monitoring the flow of information for data relevant to the port.

Multicast
The transmission of data from a single source to multiple specified N_Ports (as opposed to all the ports on the network). See also *Broadcast*, *Unicast*.

Multimode
A fiber optic cabling specification that allows up to 500 meters between devices.

N_Port
Node Port; a port on a node that can connect to a Fibre Channel port or to another N_Port in a point-to-point connection. See also *NL_Port*, *Nx_Port*.

NAA
Network Address Authority. An identifier that indicates the format of a network address.

Name Server
Frequently used to indicate Simple Name Server. See also *SNS*.

NL_Port
Node Loop Port; a node port that has arbitrated loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL_Port. See also *N_Port*, *Nx_Port*.

Node Name
The unique identifier for a node, communicated during login and port discovery.

Node
A Fibre Channel device that contains an N_Port or NL_Port.

Non-participating Mode
A mode in which an L_Port in a loop is inactive and cannot arbitrate or send frames, but can retransmit any received transmissions. This mode is entered if there are more than 127 devices in a loop and an AL_PA cannot be acquired. See also *L_Port*, *Participating Mode*.

Nx_Port
A node port that can operate as either an N_Port or NL_Port.

Open Originator
The L_Port that wins arbitration in an arbitrated loop and sends an OPN ordered set to the destination port, then enters the Open state.

Open Recipient
The L_Port that receives the OPN ordered set from the open originator, and then enters the Open state.

Open State
The state in which a port can establish a circuit with another port. A port must be in the Open state before it can arbitrate.

OPN
Open Primitive Signal. The protocol used by a port that has won arbitration in an arbitrated loop to establish a circuit.

Ordered Set
A transmission word that uses 8B/10B mapping and begins with the K28.5 character. Ordered sets occur outside of frames, and include the following items:

- *Frame delimiters* Mark frame boundaries and describe frame contents.
- *Primitive signals* Indicate events.
- *Primitive sequences* Indicate or initiate port states.

Ordered sets are used to differentiate Fibre Channel control information from data frames and to manage the transport of frames.

Packet
A set of information transmitted across a network. See also *Frame*.

Participating Mode
A mode in which an L_Port in a loop has a valid AL_PA and can arbitrate, send frames, and retransmit received transmissions. See also *L_Port*, *Non-participating Mode*.

Path Selection
The selection of a transmission path through the fabric. The Compaq switches use the FSPF protocol.

Phantom Address
An AL_PA value that is assigned to an device that is not physically in the loop. Also known as phantom AL_PA.

A twenty-bit public address created for an 8-bit loop device to allow public devices to access it.

Phantom Device
A device that is not physically in an arbitrated loop, but is logically included through the use of a phantom address.

PLOGI
Port Login; the port-to-port login process by which initiators establish sessions with targets. See also *FLOGI*.

Point-to-point
A Fibre Channel topology that employs direct links between each pair of communicating entities. See also *Topology*.

Port Cage
The metal casing extending out of the optical port on the switch, and in which the SFP can be inserted.

Port_Name
The unique identifier assigned to a Fibre Channel port. Communicated during login and port discovery.

POST
Power On Self-Test; a series of tests run by a switch after it is turned on.

Private Device
A device that supports arbitrated loop protocol and can interpret 8-bit addresses, but cannot log into the fabric.

Private Loop
An arbitrated loop that does not include a participating FL_Port.

Private NL_Port
An NL_Port that communicates only with other private NL_Ports in the same loop and does not log into the fabric.

Protocol
A defined method and a set of standards for communication.

Public NL_Port
An NL_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL_Ports.

Public Device
A device that can log into the fabric and support 20-bit addresses (or has 20-bit phantom addresses created for it by the switch). See also *Phantom Addresses*

Public Loop
An arbitrated loop that includes a participating FL_Port, and may contain both public and private NL_Ports.

QuickLoop
A feature that makes it possible to allow private devices within loops to communicate with public and private devices across the fabric through the creation of a larger loop.

May also refer to the arbitrated loop created using this software. A QuickLoop can contain a number of devices or looplets; all devices in the same QuickLoop share a single AL_PA space.

R_A_TOV
Resource Allocation Time-out Value; the maximum time a frame can be delayed in the fabric and still be delivered. See also *E_D_TOV*, *RR_TOV*.

Route
As applies to a fabric, the communication path between two switches. May also apply to the specific path taken by an individual frame, from source to destination. See also *FSPF*.

Routing
The assignment of frames to specific switch ports, according to frame destination.

RR_TOV
Resource Recovery Time-out Value; the minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator. See also *E_D_TOV*, *R_A_TOV*.

RSCN
Registered State Change Notification; a switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

RX_ID
Responder Exchange Identifier. A 2-byte field in the frame header used by the responder of the Exchange to identify frames as being part of a particular exchange.

SAN
Storage Area Network; a network of systems and storage devices that communicate using Fibre Channel protocols. See also *Fabric*.

Sequence
A group of related frames transmitted in the same direction between two N_Ports.

Service Rate
The rate at which an entity can service requests. See also *Request Rate*.

Single Mode
The fiber optic cabling standard that corresponds to distances of up to 10 km between devices.

SI
Sequence Initiative.

SNMP
Simple Network Management Protocol. An internet management protocol that uses either IP for network-level functions and UDP for transport-level functions, or TCP/IP for both. Can be made available over other protocols, such as UDP/IP, because it does not rely on the underlying communication protocols. See also *Community (SNMP)*.

SNMPv1
The original SNMP protocol, now labeled v1.

SNS
Simple Name Server; a switch service that stores names, addresses, and attributes for up to 15 minutes, and provides them as required to other devices in the fabric. SNS is defined by Fibre Channel standards and exists at a well-known address. May also be referred to as directory service. See also *FS*.

Switch Name
The arbitrary name assigned to a switch.

Switch Port
A port on a switch. Switch ports can be E_Ports, F_Ports, or FL_Ports.

Switch
Hardware that routes frames according to Fibre Channel protocol and is controlled by software.

SWL
Short Wavelength; a type of fiber optic cabling that is based on 850-mm lasers and supports 1.0625-Gbps link speeds. May also refer to the type of GBIC or SFP. See also *LWL*.

Target
A storage device on a Fibre Channel network. See also *Initiator*.

Tenancy
The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.

Throughput
The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second). See also *Bandwidth*.

Topology
As applies to Fibre Channel, the configuration of the Fibre Channel network and the resulting communication paths allowed. There are three possible topologies:

- Point to point - A direct link between two communication ports.
- Switched fabric - Multiple N_Ports linked to a switch by F_Ports.
- Arbitrated loop - Multiple NL_Ports connected in a loop.

Transfer State
The state in which a port can establish circuits with multiple ports without reentering the arbitration cycle for each circuit. This state can only be accessed by an L_Port in the Open state.

Translative Mode
A mode in which private devices can communicate with public devices across the fabric.

Transmission Character
A 10-bit character encoded according to the rules of the 8B/10B algorithm.

Transmission Word
A group of four transmission characters.

Trap (SNMP)
The message sent by an SNMP agent to inform the SNMP management station of a critical error. See also *SNMP*.

Tunneling
A technique for enabling two networks to communicate when the source and destination hosts are both on the same type of network, but are connected by a different type of network.

U_Port
Universal Port; a switch port that can operate as a G_Port, E_Port, F_Port, or FL_Port. A port is defined as a U_Port when it is not connected or has not yet assumed a specific function in the fabric.

UDP
User Datagram Protocol; a protocol that runs on top of IP and provides port multiplexing for upper-level protocols.

ULP_TOV
Upper-level Time-out Value; the minimum time that a SCSI ULP process waits for SCSI status before initiating ULP recovery.

ULP
Upper-level Protocol; the protocol that runs on top of Fibre Channel. Typical upper-level protocols are SCSI, IP, HIPPI, and IPI.

Unicast
The transmission of data from a single source to a single destination. See also *Broadcast*, *Multicast*.

Well-known Address
As pertaining to Fibre Channel, a logical address defined by the Fibre Channel standards as assigned to a specific function, and stored on the switch.

Workstation
A computer used to access and manage the fabric. May also be referred to as a management station or host.

WWN
Worldwide Name; an identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

Xmitted Close State
The state in which an L_Port cannot send messages, but can retransmit messages within the loop. A port in the XMITTED CLOSE state cannot attempt to arbitrate.

Zone Configuration
A specified set of zones. Enabling a configuration enables all zones in that configuration. See also *Defined Configuration*, *Enabled Configuration*.

Zone
A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone. See also *Zoning*.

Zoning
A feature that runs on Fabric OS and allows partitioning of the fabric into logical groupings of devices. Devices in a zone can only access and be accessed by devices in the same zone. See also *Zone*.

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