

user guide

hp StorageWorks fabric watch version 3.0.x/4.0.x

Product Version: V3.0.x/V4.0.x

Second Edition (February 2003)

Part Number: AA-RTSGB-TE

This user guide discusses the purpose of Fabric Watch software, how the software works, and how to activate Fabric Watch with telnet commands and Web Tools. This user guide also covers using Fabric Watch and provides explanations of Fabric Watch error messages.



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Fabric Watch Version 3.0.x/4.0.x User Guide
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about this guide

This user guide provides information to help you:

- Understand how Fabric Watch works
- Learn the terms and components you must know to use the software
- Activate Fabric Watch with Telnet commands as well as with Web Tools
- Configure Fabric Watch thresholds
- Understand Fabric Watch error messages
- Contact technical support for additional assistance

“About this Guide” topics include:

- [Overview](#), page 8
- [Conventions](#), page 9
- [Rack Stability](#), page 12
- [Getting Help](#), page 13

Overview

This section covers the following topics:

- [Intended Audience](#)
- [Related Documentation](#)

Intended Audience

This book is intended for use by system administrators who are experienced with the following:

- *HP StorageWorks* Fibre Channel SAN switches
- Fabric Operating System V3.0.x or later

Related Documentation

For a list of related documents included with this product, see the Related Documents section of the Release Notes that came with your switch.

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

<http://www.compaq.com/storage/productindexdisk.html>

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

Conventions

Conventions consist of the following:

- [Document Conventions](#)
- [Text Symbols](#)
- [Equipment Symbols](#)

Document Conventions

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

Table 1: Document Conventions

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

Text Symbols

The following 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 death.



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

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

Equipment Symbols

The following equipment symbols may be found on hardware for which this guide pertains. They have the following meanings.



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 personal safety 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 personal safety 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 personal safety 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 safety or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

Rack Stability

Rack stability protects personnel and equipment.



WARNING: To reduce the risk of personal safety 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 an HP authorized service provider or access our website: <http://www.hp.com>.

HP Technical Support

Telephone numbers for worldwide technical support are listed on the following HP website: <http://www.hp.com/support/>. From this website, select the country of origin.

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

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

HP Storage Website

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

HP Authorized Reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518
- In Canada, call 1-800-263-5868
- Elsewhere, see the HP website for locations and telephone numbers: <http://www.hp.com>.

About Fabric Watch



This chapter discusses the following:

- [Overview](#) on page 16
- [How Fabric Watch Works](#) on page 17
- [Fabric Watch Terms and Components](#) on page 18
- [Monitoring Tools](#) on page 21

Overview

Fabric Watch software monitors the performance and status of StorageWorks SAN switches, and can alert storage area network (SAN) managers when problems arise. The real-time alerts from Fabric Watch software help SAN managers solve problems before they become costly failures. SAN managers can configure Fabric Watch software to monitor any of the following:

- Fabric events (such as topology reconfigurations and zone changes)
- Physical switch conditions (such as fans, power supplies, and temperature)
- Port behavior (such as state changes, errors, and performance)
- SFPs (for switches equipped with SMART SFPs)

How Fabric Watch Works

With Fabric Watch software, SAN managers can place limits, or *thresholds*, on the behavior of different switch and fabric elements. Fabric Watch then monitors these behavior variables, or *counters*, and issues an alarm when a counter crosses a threshold. An alarm may e-mail the SAN manager or forward all error information to a proxy switch; the response depends upon how the manager configures the alarm.

Fabric Watch Terms and Components

Fabric Watch software uses a number of terms and components to identify, classify, monitor, and handle fabric and switch activity.

Element Categories

Fabric Watch elements include any component of the fabric or switch that Fabric Watch software monitors. To monitor elements, Fabric Watch software categorizes them into *areas*, and groups areas into *classes*.

Classes

Classes (also known as *agents*) are high-level categories of elements. Fabric Watch software monitors elements that compose the following classes:

- Fabric
- Environment
- Port (includes E_Port, Optical F/FL_Port, and in V3.0.x only: Copper F/FL_Port)
- SFP
- Performance Monitor (Alpa, End-to-End, Filter)
- FRU (Fabric OS V4.0.x only; accessible separately from all other classes. See Appendix A for information on this class.)

Areas

Areas are the behaviors that Fabric Watch software monitors. [Table 2](#) lists all Fabric Watch classes, the areas within those classes, and a description of each area.

Table 2: Fabric Watch Areas

Class	Area	Area Description
Fabric	E_Port down	Monitors E_Port status.
	Fabric reconfiguration	Monitors changes to the fabric configuration.
	Segmentation changes	Monitors segmentation changes.
	Domain ID changes	Monitors forcible Domain ID changes.
	Zoning changes	Monitors changes to currently enabled zoning configurations.
	Fabric logins	Monitors the number of host device fabric logins (FLOGI).
	SFP change	Monitors insertion/removal of smart SFP.
Environmental	Temperature	Monitors switch temperature in degrees Celsius.
	Fan	Monitors switch fan speed in RPMs.
	Power supply	Monitors whether the power supply is functional or faulty.
Port	Link failure count (Link Loss)	Monitors the link failure rate of each port. Tracks the number of link failures per configured time interval.
	Loss of synchronization count	Monitors the number of synchronization loss errors per configured time interval.
	Loss of signal count	Monitors the number of signal loss errors per configured time interval.
	Primitive sequence protocol error	Monitors the number of protocol errors per configured time interval.
	Invalid transmission word	Monitors the number of invalid words transmitted (from a device to a port) per configured time interval.
	Invalid CRC count	Monitors the number of CRC errors per configured time interval.
	Receive performance	Monitors receive rate in KB/sec.
	Transmit performance	Monitors transmit rate in KB/sec.
	State changes	Monitors state changes.

Table 2: Fabric Watch Areas (Continued)

Class	Area	Area Description
SFP	Temperature	Monitors SFP temperature in degrees Celsius.
	Receiver power	Monitors SFP receiver power in microwatts.
	Transmitter power	Monitors SFP transmitter power in microwatts
	Current	Monitors SFP current in mamps.
Performance Monitor	Invalid CRCS	Monitors the number of CRC errors that occur (for ALPA or for a SiD-DiD pair) per configured time interval (in seconds).
	RX Performance	Monitors receive rate of a SiD-DiD pair in KB per second.
	TX Performance	Monitors transmit rate of a SiD-DiD pair in KB per second.
	Customer Define	Monitors the filter-based counter that the user defines.

Monitoring Tools

Fabric Watch uses a number of tools to:

- Monitor switch performance
- Monitor fabric performance
- Alert SAN managers to potential problems

Counters

Counters represent the value of a behavior variable. Counters can be cumulative or current. For instance, a counter may represent the total number of times that a given error occurred since Fabric Watch began logging occurrences of that error, or it may represent the current speed in RPMs of a fan. Fabric Watch compares counter values to threshold values to determine when events occur.

Thresholds

A threshold is a value or range of values to which Fabric Watch compares a behavior counter to determine if the behavior value is correct or warrants an alarm.

Range Threshold

A range threshold consists of a maximum and minimum boundary, and all values between the boundaries form a “normal” region. If a behavior counter exceeds (crosses) either boundary, that occurrence registers as an *event*. SAN managers can also configure Fabric Watch to register an event when a counter returns to a “normal” value.

Counters may oscillate around the upper or lower boundary of a range threshold, and as a result cause numerous events in a short period of time. To reduce the number of events, you can configure *buffers*, or ranges of values just below the upper boundary and just above the lower boundary. When a counter changes from a value that exceeds a threshold to a value that falls within the buffer zone, the counter does not register an event. An event will only register if the counter returns to a “normal” value beyond the buffer.

Figure 1 illustrates a range threshold with buffers. The values at 1 second, 3 seconds, and 5 seconds will generate events because they exceed boundaries. The value at 2 seconds will not generate an event because, though it crosses the

boundary, it remains in the buffer zone. The values at 4 seconds and 6 seconds will generate an event because they cross the upper boundary and lower boundary respectively, and return to a value beyond the buffer zone.

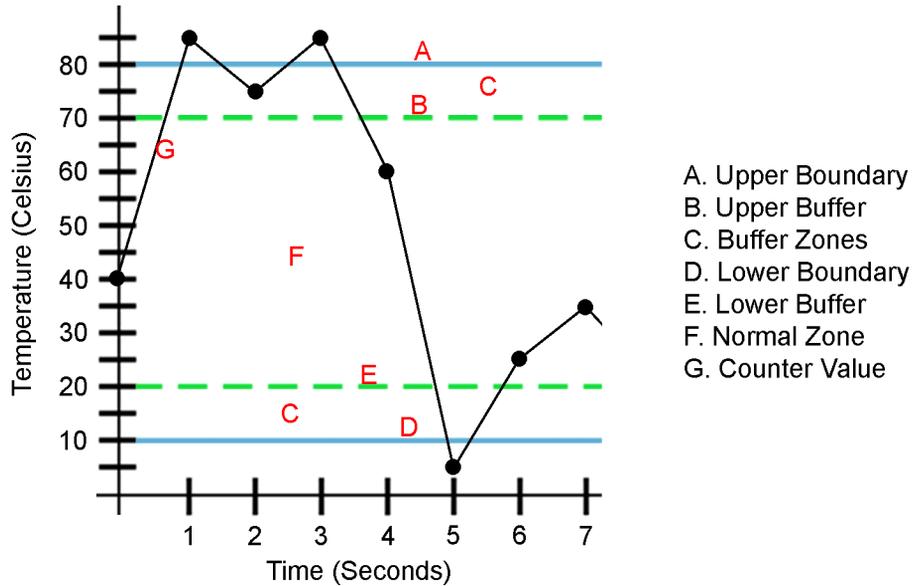


Figure 1: Range Threshold

Rising/Falling Threshold

A rising/falling threshold has only one boundary, not two like the range threshold. Where a range threshold has a “normal” state where a counter stays in between two boundaries, a rising/falling threshold is “normal” as long as the value of the counter does not exceed the value of the one boundary. [Figure 2](#) presents a rising/falling threshold. An event registers at 5 seconds, when the counter value exceeds the boundary.

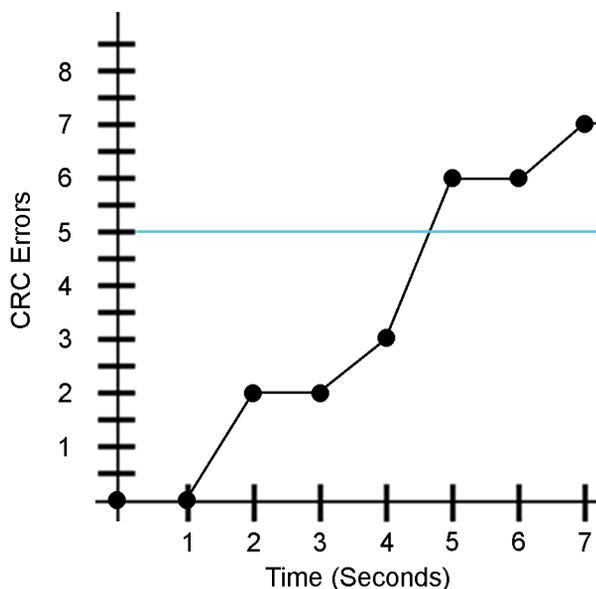


Figure 2: Rising/Falling Threshold

Change Monitor Threshold

A change monitor threshold consists of a number of distinct values, not a range of values. Whenever a behavior variable changes from one value to another, that change registers as an event.

Threshold Naming Conventions

You need to recognize threshold naming conventions so you can identify thresholds that appear in Fabric Watch error messages. All threshold names consist of the following three items, in the following order, with no separators:

1. Abbreviation of the threshold's class name, in lower case, as shown in [Table 3](#).

Table 3: Class Name Abbreviations

Class	Abbreviation
Fabric	fabric
Environment	env
Port	port

Table 3: Class Name Abbreviations (Continued)

Class	Abbreviation
E_Port	eport
Optical F/FL_Port	fopport
Copper F/FL_Port	fcuport
SFP	sfp
Alpa Performance Monitor	alpa
End-to-End Performance Monitor	ee
Filter Performance Monitor	filter

2. Abbreviation for the area name as shown in [Table 4](#).

Table 4: Area Name Abbreviations

Area	Abbreviation
Power supply	PS
Temperature (sensor)	Temp
Fan speed sensor	Fan
Receiver power	RXP
Transmitter power	TXP
Current	Crnt
Invalid CRCs	CRCs
Link Failures	Link
Protocol Errors	ProtoErr
RX Performance	RXPerf
Loss of Signal	Signal
State Changes	State
Loss of Sync	Sync
TX Performance	TXPerf
Invalid Words	Words
Domain ID	DI
E-port down	ED

Table 4: Area Name Abbreviations (Continued)

Area	Abbreviation
Fabric login	FL
fabric reconfigure	FR
SFP state change	SS
segmentation change	SC
zoning change	ZC
name server login	NL
name server request	NR
invalid CRCs	CRC
TX performance	TX
RX performance	RX
filter frame counter	PT

- Index number for the element involved. The index number consists of three digits, and corresponds to where the element appears in respect to others in a series. For instance, if the element in question is the third temperature sensor on a switch, its number would be 003.

Note: Numbering for all Port and SFP classes begins with index number 000 (as per the Fabric OS port numbering convention), but environment class index numbers begin with 001. Therefore, the first element in a series of ports will be 000, but the first element in a series of thermometers will be 001. For the Fabric class, the index number is always 000. The threshold name is case-sensitive.

For example: fopportState003 represents a state threshold of the fourth port (which contains an optical SFP).

Threshold Boundaries

Boundaries are the characteristics that define a threshold. Boundaries are area-based; when you configure a boundary, that boundary applies to every element in an area. Boundaries are non-volatile; you do not need to reconfigure your boundaries when you restart your switch. [Table 5](#) lists the boundaries that can define a threshold and what each boundary identifies.

Table 5: Threshold Boundaries

Boundary	Definition
Unit string	Unit of measurement that Fabric Watch alarms will use to display the value of a particular counter. You can change the unit string to an arbitrary value with the Fwconfigure command.
Time base	Basic unit of time in which events are recorded.
Low boundary	Lowest limit at which the monitored value of an element will not register as an event.
High boundary	Highest limit at which the monitored valued of an element will not register as an event.
Buffer size	Size of a threshold buffer. The buffer size determines the distance between the upper buffer and the upper boundary, and the distance between the lower buffer and the lower boundary. The buffer size establishes the buffer zones (see Figure 1 on page 22).

Threshold Traits

You configure threshold traits to determine whether and when an event registers against a given threshold. Threshold traits determine the behavior of a threshold. These traits are element-based, so you must configure traits for each individual element. Threshold traits are volatile, so you must reconfigure all traits after you restart your switch. [Table 6](#) lists and explains threshold traits.

Table 6: Threshold Traits

Trait	Definition
Status	Configures a threshold as enabled or disabled. Thresholds are enabled by default.
Behavior type	Configures a threshold as continuous or triggered. Thresholds are triggered by default.
Behavior interval	Configures the minimum time interval (in seconds) between two instances of the same type of alarm. The default interval is 1 second.

Behavior Types

The behavior type (or *mode*) of a variable determines the conditions under which Fabric Watch software registers an event. You can configure an area to respond to triggered or continuous behavior.

Triggered Behavior

In triggered behavior mode, Fabric Watch only registers an event when a variable exceeds a threshold. To trigger another event, the variable must cross the threshold again. For example, if the temperature of a switch exceeds its threshold while in triggered behavior mode, Fabric Watch will only register one event (such as an Above event or a Below event) until the temperature falls within the threshold, then exceeds the threshold again.

Continuous Behavior

In continuous behavior mode, Fabric Watch registers an event when a variable exceeds a threshold and continues to register an event every designated time interval until the variable falls within the threshold again. SAN managers designate the time interval, or *behavior interval*.

Events

Whenever a counter exceeds a threshold, Fabric Watch software identifies that occurrence as an *event*. You can configure Fabric Watch so that events trigger alarms that notify you that the event took place. Fabric Watch software recognizes six types of events. [Table 7](#) describes Fabric Watch event types.

Table 7: Event Types

Event Type	Explanation	Associated Behavior Mode
Started	Element monitoring is in a started condition. A started event is not referenced. No alarms are available.	triggered/continuous
Below	A counter is below the lower boundary.	triggered/continuous
Above	A counter is above the upper boundary.	triggered/continuous

Table 7: Event Types (Continued)

Event Type	Explanation	Associated Behavior Mode
Exceeded	A counter is below the lower boundary or above the upper boundary.	triggered/continuous
Changed	A counter value has changed. A changed event is not referenced to any threshold boundary level. Changed events will be reported in reference to the behavioral interval time setting.	triggered/continuous
In-between	A counter falls below the upper boundary minus the buffer, or rises above the lower boundary plus the buffer. Must be preceded by an above or below event. If the buffer is set to zero, this event is suppressed.	triggered/continuous

Alarms

Fabric Watch software can notify SAN managers of events with a number of types of alarm. The alarm types are as follows.

Switch Event Log Entry

The switch event log holds up to 256 entries. You can configure Fabric Watch software to forward event log entries to the SYSLOGD facility. This alarm stores event information for SAN managers, but does not actively alert SAN managers to events.

SNMP Trap

An SNMP trap forwards the following information to an SNMP management station:

- Name of the element involved in the event
- Class, area, and index of the threshold
- Type of event

- Value of the element that exceeded the threshold
- State of the element
- Source of the trap

This alarm stores event information for SAN managers, but does not actively alert SAN managers to events.

Port Log Lock (Fabric OS V3.0.x only)

The port log locks to retain detailed information about an event. This alarm stores event information for SAN managers, but does not actively alert SAN managers to events.

RapiTrap

RapiTrap actively alerts SAN managers to events. Once you enable RapiTrap, Fabric Watch forwards all event information to a designated proxy switch. (The host API automatically configures the proxy switch based on firmware version.) The switch then forwards the information to a server and alerts the SAN manager to event activity.

Email Alert

Email Alert sends information about a switch event to a specified e-mail address. Email Alert can send information about any error from any element, area, and class. The e-mail specifies the threshold and describes the event, much like an error message. You must use the `fwMailCfg` command to configure email alerts.

Severity States

Severity states appear in error messages to indicate the urgency of each alarm. [Table 8](#) lists the various severity states. Only states 3 and 4 will appear in user messages. All other states are MIB-related.

Table 8: Severity States

Severity Level	Traps
0	send no event traps
1	critical
2	error

Table 8: Severity States (Continued)

Severity Level	Traps
3	warning
4	informational
5	debug

Configurations

SAN managers can use configuration files and Fabric Watch-specific configuration files (called *Profiles*) to customize Fabric Watch and store customized instructions.

The Configuration File

The configuration file of a switch includes all Fabric Watch configuration information. You can edit a configuration file in a text editor to manually configure Fabric Watch thresholds and alarms. For more information, see “[Edit the Configuration File](#)” on page 77.

Fabric Watch Configurations

Fabric watch configurations (also known as *Profiles*) are preset subsets of configuration files that cater to particular types of networks. You can download a fabric watch configuration to your switch and then configure Fabric Watch software to run from the subset or from your standard configuration file.

Default versus Custom

Fabric Watch includes a default value for each element that you can configure. These default values constitute the default configuration. You cannot alter the default values. Fabric Watch maintains a second, custom configuration that you can customize. To use custom values, configure your custom values and set Fabric Watch to use the custom configuration.

Note: If a default value matches a custom value, you can save memory if you enter no custom value at all and configure Fabric Watch to use the default value.

Activating Fabric Watch

2

This chapter provides the following information:

- [Activate Fabric Watch with Telnet Commands](#) on page 32
- [Activate Fabric Watch with Web Tools](#) on page 34

Fabric Watch software is optionally licensed software that resides on all HP switches, and that you can activate with the proper license. A license may have been installed in the switch at the factory. If not, contact your switch supplier to obtain a license key.

Fabric Watch V3.0.x requires a StorageWorks 2 Gb SAN switch or above running HP Fabric OS V3.0.x. Fabric Watch V4.0.x requires a StorageWorks SAN Switch 2/32 or a StorageWorks Core switch or above running HP Fabric OS V4.0.x. You can use telnet commands or Web Tools to install a Fabric Watch license.

Activate Fabric Watch with Telnet Commands

To activate Fabric Watch using telnet commands, perform the following steps:

1. Log onto the switch via telnet with an account that has administrative privileges. *HP StorageWorks Fabric Operating System Procedures Version 3.0.x/4.0.x User Guide* for details.
2. Type `licenseShow` at the telnet command line to determine whether a Fabric Watch license is already installed on the switch. A list displays all the licenses currently installed on the switch. For example, the following is an example of a Fabric Watch V3.0.x license list:

Example (Fabric Watch V3.0.x):

```
web68:admin> licenseShow
SR9ccyez9RTSAdm:
    Zoning license
cdQybQyyRdeRzcK:
    QuickLoop license
bRRbecRQzccSScfZ:
    Fabric license
Scc9ebQdbTddAfG:
    Remote Switch license
yQcS9bbQyzRdTAr:
    Extended Fabric license
R9cQ9RcbddUAdRAX:
    Fabric Watch license
R9cQ9RcbddWAdRAZ:
    Performance Monitor license
R9cQ9RcbddaAdRAd:
    Trunking license
RQdbccdcy9SRecdR:
    Web license
```

Example (Fabric Watch V4.0.x):

```
Ulys61:admin> licenseShow
b99bddcezdrAAce3:
  Web license
  Zoning license
  QuickLoop license
  Fabric license
  Remote Switch license
  Remote Fabric license
  Extended Fabric license
  Entry Fabric license
  Fabric Watch license
  Performance Monitor license
  Trunking license
```

If the Fabric Watch license is not included in the list or is incorrect, continue with [step 3](#).

3. Enter the following on the command line:

```
licenseAdd "key"
```

where *key* is the license key provided to you, surrounded by double quotes. The license key is case-sensitive and must be entered exactly as given.

4. Enter the `licenseShow` telnet command to verify that you successfully installed the license. If the license does not appear, repeat [step 3](#).

Activate Fabric Watch with Web Tools

To activate Fabric Watch using Web Tools, perform the following steps:

1. Launch your web browser, enter the switch name or IP address in the Location/Address field (for example: <http://111.222.33.1>), and press **Enter**.
Web Tools launches, displaying the Fabric View.
2. Click the **Admin** button on the relevant switch panel.
The logon window appears.
3. Enter a logon name and password with administrative privileges and press **Enter**.
The **Administration View** window appears.
4. Select the **License Admin** tab, enter the license key in the *License Key:* field, and click **Add License**.

Using Fabric Watch

3

This chapter provides the following information:

- [Overview](#) on page 36
- [User Interfaces](#) on page 37
- [How to Configure Fabric Watch with Telnet](#) on page 39
- [How to Read Error Messages](#) on page 79

Overview

You can use several user interfaces to configure Fabric Watch software. The sections that follow describe the various interfaces and explain how to configure various elements of Fabric Watch using the telnet interface. For more information on Web Tools, refer to the *HP StorageWorks Web Tools Version 3.0.x/4.0.x User Guide*.

User Interfaces

HP Fabric OS software provides the following interfaces that you can use to monitor and manipulate Fabric Watch:

- Web Tools
- Telnet
- SNMP-Based Enterprise Managers
- Configuration File

Web Tools

With Web Tools you can:

- View fabric and switch events with the fabric-wide Event View.
- View and modify threshold and alarm configurations with the Fabric Watch view.
- Upload and download the configuration file with the **Config Admin** tab.

Telnet

With a telnet session you can:

- Query fabric and switch events with the `fwShow` command.
- Query and modify threshold and alarm configurations (whether default or customized) with the `fwConfigure` command.
- Upload and download the configuration file with the `configUpload` and `configDownload` command.

SNMP-Based Enterprise Managers

With SNMP-based enterprise managers you can:

- Query the MIB variable for individual fabric and switch elements.
- Query and modify threshold and alarm configurations.
- Receive generated SNMP traps when threshold conditions are met.

The Configuration File

You can upload a configuration file, make any changes in a text editor, and then download the file to all switches in a fabric to ensure a uniform configuration file throughout the fabric, with uniform Fabric Watch configurations. You can upload and download the configuration file via a telnet session or with Web Tools.

How to Configure Fabric Watch with Telnet

When you install the license to activate Fabric Watch, the software runs based on default settings. You cannot alter the default settings; instead, you assign custom settings and configure Fabric Watch to use those settings. To use Fabric Watch, you must

- Choose elements that you want to monitor.
- Place limits on the acceptable behavior of those elements (configure threshold boundaries).
- Choose the circumstances under which Fabric Watch identifies the behavior of an element as errant (configure behavior types).
- Turn Fabric Watch on (configure status).
- Choose if and how Fabric Watch alerts you to errant behavior (configure alarms).

The following sections discuss how to use telnet commands to configure and use Fabric Watch software.

Configure Threshold Boundaries

Configure threshold boundaries to establish what behaviors will trigger events. (Remember, you can only change custom settings.) To configure threshold boundaries, perform the following steps:

1. Open a telnet session to your switch.
2. Enter the `fwConfigure` command. A list of Fabric Watch classes appears.

Example (Fabric Watch V3.0.x):

```
web68:admin> fwConfigure

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Copper) class
7 : F/FL Port (Optical) class
8 : Alpa Performance Monitor class
9 : End-to-End Performance Monitor class
10 : Filter Performance Monitor class
11 : quit
Select a class => : (1..11) [11]
```

Example (Fabric Watch V4.0.x):

```
Ulys61:admin> fwConfigure

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Quit
Select a class => : (1..10) [10]
```

3. Select the class of the threshold that you want to configure. A list of the areas in that class appears.

Example (Fabric Watch V3.0.x):

```
1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Copper) class
7 : F/FL Port (Optical) class
8 : Alpha Performance Monitor class
9 : End-to-End Performance Monitor class
10 : Filter Performance Monitor class
11 : quit
Select a class => : (1..11) [11] 1
```

```
1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4]
```

Example (Fabric Watch V4.0.x):

```
1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Quit
Select a class => : (1..10) [10] 1

1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4]
```

4. Select the area of the threshold that you want to configure. A status display of that area and a list of configuration options appear.

Example (Fabric Watch V3.0.x):

```

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	disabled	36 C
	inBetween	13:12:29 on 09/21/2001	36 C Normal
2	envTemp002	enabled	38 C
	inBetween	13:12:29 on 09/21/2001	38 C Normal
3	envTemp003	enabled	32 C
	inBetween	13:12:29 on 09/21/2001	32 C Normal

```

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5]

```

Example (Fabric Watch V4.0.x):

```
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	LastValLastState
2	envTemp002	enabled	43 C
	inBetween	Mon Jan 14 09:56:06 2002	42 C Normal
3	envTemp003	enabled	43 C
	inBetween	Mon Jan 14 09:56:06 2002	41 C Normal
5	envTemp005	enabled	28 C
	inBetween	Mon Jan 14 09:56:06 2002	28 C Normal
6	envTemp006	enabled	28 C
	inBetween	Mon Jan 14 09:56:06 2002	28 C Normal

```
1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5]
```

5. Select **advanced configuration** to view configurable boundaries.

Example (Fabric Watch V3.0.x):

```
1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5] 4
```

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Triggered	2
3	envTemp003	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	75	80
BufSize	10	10

Threshold alarm level is set at : Default

```
Errlog-1, SnmpTrap-2, PortLogLock-4
RapiTrap-8, EmailAlert-16
Valid alarm matrix is 31
```

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	3
Above	3	3
InBetween	3	3

Example (Fabric Watch V4.0.x):

```

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5] 4

```

Index	ThresholdName	BehaviorType	BehaviorInt
2	envTemp002	Triggered	1
3	envTemp003	Triggered	1
5	envTemp005	Triggered	1
6	envTemp006	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	78	20
BufSize	10	1

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8

EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	0

Below	3	17
Above	3	17
InBetween	3	17

- 1 : change behavior type
 - 2 : change behavior interval
 - 3 : change threshold boundary level
 - 4 : change custom unit
 - 5 : change custom time base
 - 6 : change custom low
 - 7 : change custom high
 - 8 : change custom buffer
 - 9 : apply threshold boundary changes
 - 10 : cancel threshold boundary changes
 - 11: change threshold alarm level
 - 12: change changed alarm
 - 13:change exceeded alarm
 - 14: change below alarm
 - 15: change above alarm
 - 16: change inBetween alarm
 - 17: apply threshold alarm changes
 - 18: cancel threshold alarm changes
 - 19: return to previous page
- Select choice => : (1..19) [19]

6. Select the boundary that you want to change. Fabric Watch presents a range of new values to choose from. (In the example below, options 4 through 8 represent the boundaries that you can configure.)

Example (Fabric Watch V3.0.x):

```

1 : change behavior type           11: change threshold alarm
                                   level
2 : change behavior interval       12: change changed alarm
3 : change threshold boundary level 13: change exceeded alarm
4 : change custom unit            14: change below alarm
5 : change custom time base       15: change above alarm
6 : change custom low            16: change inBetween alarm
7 : change custom high           17: apply threshold alarm
                                   changes
8 : change custom buffer         18: cancel threshold alarm
                                   changes
9 : apply threshold boundary changes 19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 7
Enter high threshold => : (-999999999..999999999) [80]

```

Example (Fabric Watch V4.0.x):

```

1 : change behavior type           11: change threshold alarm
                                   level
2 : change behavior interval       12: change changed alarm
3 : change threshold boundary level 13: change exceeded alarm
4 : change custom unit            14: change below alarm
5 : change custom time base       15: change above alarm
6 : change custom low            16: change inBetween alarm
7 : change custom high           17: apply threshold alarm
                                   changes
8 : change custom buffer         18: cancel threshold alarm
                                   changes
9 : apply threshold boundary changes 19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 7
Enter high threshold => : (-999999999..999999999) [20]

```

7. Enter the new boundary value.

Example (Fabric Watch V3.0.x):

Enter high threshold => : (-999999999..999999999) [80] 75

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Triggered	2
3	envTemp003	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	75	75
BufSize	10	10

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, PortLogLock-4

RapiTrap-8, EmailAlert-16

Valid alarm matrix is 31

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	3
Above	3	3
InBetween	3	3

Example (Fabric Watch V4.0.x):

```
Enter high threshold => : (-999999999..999999999) [20] 21
```

Index	ThresholdName	BehaviorType	BehaviorInt
2	envTemp002	Triggered	1
3	envTemp003	Triggered	1
5	envTemp005	Triggered	1
6	envTemp006	Triggered	1

```
Threshold boundary level is set at : Default
```

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	78	21
BufSize	10	1

8. Repeat [step 6](#) and [step 7](#) until you have configured each boundary that you want to change.
9. Select **apply threshold boundary changes** to configure Fabric Watch to use the boundary settings that you customized. Remember, you cannot change default settings, you can only configure custom settings, then configure Fabric Watch to use those custom settings.

Example (Fabric Watch V3.0.x):

```

1 : change behavior type           11: change threshold alarm
                                   level
2 : change behavior interval       12: change changed alarm
3 : change threshold boundary level 13: change exceeded alarm
4 : change custom unit             14: change below alarm
5 : change custom time base        15: change above alarm
6 : change custom low              16: change inBetween alarm
7 : change custom high             17: apply threshold alarm
                                   changes
8 : change custom buffer           18: cancel threshold alarm
                                   changes
9 : apply threshold boundary changes 19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 9
Committing configuration...done.

```

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Triggered	2
3	envTemp003	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	75	75
BufSize	10	10

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, PortLogLock-4

RapiTrap-8, EmailAlert-16

Valid alarm matrix is 31

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	3
Above	3	3
InBetween	3	3

Example (Fabric Watch V4.0.x):

```

1 : change behavior type           11: change threshold alarm
                                     level
2 : change behavior interval       12: change changed alarm
3 : change threshold boundary level 13: change exceeded alarm
4 : change custom unit             14: change below alarm
5 : change custom time base        15: change above alarm
6 : change custom low              16: change inBetween alarm
7 : change custom high             17: apply threshold alarm
                                     changes
8 : change custom buffer           18: cancel threshold alarm
                                     changes
9 : apply threshold boundary changes 19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 9

```

Index	ThresholdName	BehaviorType	BehaviorInt
2	envTemp002	Triggered	1
3	envTemp003	Triggered	1
5	envTemp005	Triggered	1
6	envTemp006	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	78	21
BufSize	10	1

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8

```
EmailAlert-16
```

```
Valid alarm matrix is 27
```

	Default	Custom
Changed	0	0
Exceeded	0	0
Below	3	17
Above	3	17
InBetween	3	17

```

1  : change behavior type                11: change threshold alarm
                                         level
2  : change behavior interval            12: change changed alarm
3  : change threshold boundary level     13: change exceeded alarm
4  : change custom unit                  14: change below alarm
5  : change custom time base             15: change above alarm
6  : change custom low                   16: change inBetween alarm
7  : change custom high                  17: apply threshold alarm
                                         changes
8  : change custom buffer                18: cancel threshold alarm
                                         changes
9  : apply threshold boundary changes    19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19]
```

Configure Behavior Types with Threshold Traits

Configure behavior types to determine the circumstances under which an event registers and an alarm sounds. To configure behavior types with threshold traits, perform the following steps:

1. Run Fabric Watch and navigate to the advanced configuration menu (see [“Configure Threshold Boundaries”](#) on page 3–39).
2. Select **change behavior type**. Fabric Watch displays a range of threshold indexes.

Example (Fabric Watch V3.0.x):

```

1 : change behavior type           11 change threshold alarm
                                   level
2 : change behavior interval       12: change changed alarm
3 : change threshold boundary level 13: change exceeded alarm
4 : change custom unit             14: change below alarm
5 : change custom time base        15: change above alarm
6 : change custom low              16: change inBetween alarm
7 : change custom high             17: apply threshold alarm
                                   changes
8 : change custom buffer           18: cancel threshold alarm
                                   changes
9 : apply threshold boundary changes19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 1
Select threshold index => : (1..3) [1]

```

Example (Fabric Watch V4.0.x):

```

1 : change behavior type           11: change threshold alarm
                                   level
2 : change behavior interval       12: change changed alarm
3 : change threshold boundary level 13: change exceeded alarm
4 : change custom unit             14: change below alarm
5 : change custom time base        15: change above alarm
6 : change custom low              16: change inBetween alarm
7 : change custom high             17: apply threshold alarm
                                   changes
8 : change custom buffer           18: cancel threshold alarm
                                   changes
9 : apply threshold boundary changes19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 1
Select threshold index => : (2..6) [2]

```

3. Select the index number of the threshold that you want to configure.

Example (Fabric Watch V3.0.x):

```
Select threshold index => : (1..3) [1] 2
1 : triggered
2 : continuous
Enter behavior type => : (1..2) [1]
```

Example (Fabric Watch V4.0.x):

```
Select threshold index => : (2..6) [2] 2
1 : triggered
2 : continuous
Enter behavior type => : (1..2) [1]
```

4. Select a behavior type.

Example (Fabric Watch V3.0.x):

```
1 : triggered
2 : continuous
Enter behavior type => : (1..2) [1] 1
```

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Triggered	2
3	envTemp003	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	75	75
BufSize	10	10

Threshold alarm level is set at : Default

```
Errlog-1, SnmpTrap-2, PortLogLock-4
RapiTrap-8, EmailAlert-16
Valid alarm matrix is 31
```

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	3
Above	3	3
InBetween	3	3

Example (Fabric Watch V4.0.x):

```
1 : triggered
2 : continuous
Enter behavior type => : (1..2) [1] 2
```

Index	ThresholdName	BehaviorType	BehaviorInt
2	envTemp002	Continuous	1
3	envTemp003	Triggered	1
5	envTemp005	Triggered	1
6	envTemp006	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	78	21
BufSize	10	1

Threshold alarm level is set at : Default

```
Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16
```

```
Valid alarm matrix is 27
```

	Default	Custom
Changed	0	0
Exceeded	0	0
Below	3	17
Above	3	17
InBetween	3	17

Configure Behavior Intervals with Threshold Traits

Configure behavior intervals to determine how frequently a continuous event registers. To configure behavior intervals with threshold traits, perform the following steps:

1. Run Fabric Watch and navigate to the advanced configuration menu (see [“Configure Behavior Types with Threshold Traits”](#) on page 55).
2. Select **change behavior interval**.

Example (Fabric Watch V3.0.x):

```
1 : change behavior type 11:change threshold alarm
level
2 : change behavior interval 12:change changed alarm
3 : change threshold boundary level 13:change exceeded alarm
4 : change custom unit 14:change below alarm
5 : change custom time base 15:change above alarm
6 : change custom low 16:change inBetween alarm
7 : change custom high 17:apply threshold alarm
changes
8 : change custom buffer 18:cancel threshold alarm
changes
9 : apply threshold boundary changes19:return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 2
Select threshold index => : (1..3) [1]
```

Example (Fabric Watch V4.0.x):

```

1 : change behavior type           11:change threshold alarm
                                   level
2 : change behavior interval       12:change changed alarm
3 : change threshold boundary level 13 :change exceeded alarm
4 : change custom unit             14:change below alarm
5 : change custom time base        15:change above alarm
6 : change custom low              16:change inBetween alarm
7 : change custom high             17:apply threshold alarm
                                   changes
8 : change custom buffer           18:cancel threshold alarm
                                   changes
9 : apply threshold boundary changes19:return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 2
Select threshold index => : (2..6) [2]

```

3. Select the index number of the threshold that you want to configure. Fabric Watch presents a range of new values to choose from.

Example (Fabric Watch V3.0.x):

```

Select threshold index => : (1..3) [1] 2
Enter behavior interval in seconds => : (1..1000) [2]

```

Example (Fabric Watch V4.0.x):

```

Select threshold index => : (2..6) [2] 2
Enter behavior interval in seconds => : (1..1000) [1]

```

4. Enter a new behavior interval value.

Example (Fabric Watch V3.0.x):

Enter behavior interval in seconds => : (1..1000) [2] 1

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Triggered	1
3	envTemp003	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	75	75
BufSize	10	10

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, PortLogLock-4

RapiTrap-8, EmailAlert-16

Valid alarm matrix is 31

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	3
Above	3	3
InBetween	3	3

Example (Fabric Watch V4.0.x):

Enter behavior interval in seconds => : (1..1000) [1] 2

Index	ThresholdName	BehaviorType	BehaviorInt
2	envTemp002	Continuous	2
3	envTemp003	Triggered	1
5	envTemp005	Triggered	1
6	envTemp006	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	78	21
BufSize	10	1

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	0
Below	3	17
Above	3	17
InBetween	3	17

Configure Status

Configure status to enable or disable thresholds. If you disable a threshold, Fabric Watch stops monitoring the related element. To configure status to enable or disable thresholds, perform the following steps:

1. Run Fabric Watch and navigate to the **select an area** menu (see “[Configure Threshold Boundaries](#)” on page 39).

Example (Fabric Watch V3.0.x):

```
1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4]
```

Example (Fabric Watch V4.0.x):

```
1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4]
```

2. Select an area. Fabric Watch displays a list of available thresholds in that area.

Example (Fabric Watch V3.0.x):

```
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	disabled	36 C
Normal	inBetween	13:12:29 on 09/21/2001	36 C
2	envTemp002	enabled	38 C
Normal	inBetween	13:12:29 on 09/21/2001	38 C
3	envTemp003	enabled	32 C
Normal	inBetween	13:12:29 on 09/21/2001	32 C

```
1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5]
```

Example (Fabric Watch V4.0.x):

```

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		
LastVallLastState			
2	envTemp002	enabled	43 C
Normal	inBetween	Mon Jan 14 09:56:06 2002	42 C
3	envTemp003	enabled	42 C
Normal	inBetween	Mon Jan 14 09:56:06 2002	41 C
5	envTemp005	enabled	28 C
Normal	inBetween	Mon Jan 14 09:56:06 2002	28 C
6	envTemp006	enabled	28 C
Normal	inBetween	Mon Jan 14 09:56:06 2002	28 C

```

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5]

```

3. Select **disable a threshold** or **enable a threshold**.

Example (Fabric Watch V3.0.x):

```
1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5] 3
Select threshold index => : (1..3) [1]
```

Example (Fabric Watch V4.0.x):

```
1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5] 2
Select threshold index => : (2..6) [2]
```

4. Select a threshold index. Fabric Watch enables or disables the threshold that you select.

Example (Fabric Watch V3.0.x):

Select threshold index => : (1..3) [1] 1

Index	ThresholdName	Status	CurVal
LastState	LastEvent	LastEventTime	LastVal
1	envTemp001	enabled	36 C
Normal	inBetween	13:12:29 on 09/21/2001	36 C
2	envTemp002	enabled	38 C
Normal	inBetween	13:12:29 on 09/21/2001	38 C
3	envTemp003	enabled	32 C
Normal	inBetween	13:12:29 on 09/21/2001	32 C

1 : refresh

2 : disable a threshold

3 : enable a threshold

4 : advanced configuration

5 : return to previous page

Select choice => : (1..5) [5]

Example (Fabric Watch V4.0.x):

```
Select threshold index => : (2..6) [2] 2
```

Index	ThresholdName	Status	CurVal
LastEvent	LasteventTime		
LastVal	LastState		
2	envTemp002	disabled	43 C
Normal	inBetween	Mon Jan 14 09:56:06 2002	42 C
3	envTemp003	enabled	42 C
Normal	inBetween	Mon Jan 14 09:56:06 2002	41 C
5	envTemp005	enabled	28 C
Normal	inBetween	Mon Jan 14 09:56:06 2002	28 C
6	envTemp006	enabled	28 C
Normal	inBetween	Mon Jan 14 09:56:06 2002	28 C

```
1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5]
```

Configure Alarms

Configure alarms to determine how Fabric Watch responds to each event.

When you configure alarms, you change the custom alarm configuration. Once you change the configuration, you must configure Fabric Watch to use the custom configuration.

To configure alarms, you must choose what alarms each event type will trigger. Fabric Watch uses a binary matrix to assign a numerical value to each alarm. To assign alarms to an event type, choose the alarms you want, add the numerical values of the alarms, and use the total value to map the alarms to the event. [Table 9](#) lists the numerical values of each type of alarm.

Table 9: Alarm Values

V4.0.x Alarm	Matrix Value
None	0
Error Log Entry	1
SNMP Trap	2
RapiTrap	8
Email Alert	16

V3.0.x Alarm	Matrix Value
None	0
Error Log Entry	1
SNMP Trap	2
Port Lock	4
RapiTrap	8
Email Alert	16

To configure alarms, perform the following steps:

1. Run Fabric Watch and navigate to the advanced configuration menu (see [“Configure Threshold Boundaries”](#) on page 39).
2. Select the event type that will trigger the alarm(s) that you choose. (In the following example, options 12 through 16 represent the different behaviors that can trigger an alarm.)

Example (Fabric Watch V3.0.x):

```
1 : change behavior type           11: change threshold alarm
                                     level
2 : change behavior interval       12: change changed alarm
3 : change threshold boundary level 13: change exceeded alarm
4 : change custom unit            14: change below alarm
5 : change custom time base       15: change above alarm
6 : change custom low            16: change inBetween alarm
7 : change custom high           17: apply threshold alarm
                                     changes
8 : change custom buffer          18: cancel threshold alarm
                                     changes
9 : apply threshold boundary changes 19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 13
```

```
Errlog-1, SnmpTrap-2, PortLogLock-4
```

```
RapiTrap-8, EmailAlert-16
```

```
Valid alarm matrix is 31
```

```
Enter exceeded alarm matrix => : (0..31) [17]
```

Example (Fabric Watch V4.0.x):

```

1 : change behavior type           11: change threshold alarm
                                   level
2 : change behavior interval       12: change changed alarm
3 : change threshold boundary level 13: change exceeded alarm
4 : change custom unit            14: change below alarm
5 : change custom time base       15: change above alarm
6 : change custom low             16: change inBetween alarm
7 : change custom high            17: apply threshold alarm
                                   changes
8 : change custom buffer          18: cancel threshold alarm
                                   changes
9 : apply threshold boundary changes 19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 13

```

```

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

```

```
Valid alarm matrix is 27
```

```
Enter exceeded alarm matrix => : (0..27) [0]
```

Choose which alarms you want the event type to trigger (see [Table 9](#) on page 69). Locate the matrix values for each alarm. Add the matrix values and enter the sum at the telnet prompt. For example, if you want an event to trigger a log entry (matrix value: 1), and an Email Alert (matrix value: 16), enter 17 at the prompt.

Example (Fabric Watch V3.0.x):

```
Enter exceeded alarm matrix => : (0..31) [19] 17
```

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Triggered	1
3	envTemp003	Triggered	1

```
Threshold boundary level is set at : Default
```

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	75	75
BufSize	10	10

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, PortLogLock-4

RapiTrap-8, EmailAlert-16

Valid alarm matrix is 31

	Default	Custom
Changed	0	0
Exceeded	0	19
Below	3	3
Above	3	3
InBetween	3	3

Example (Fabric Watch V4.0.x):

Enter exceeded alarm matrix => : (0..27) [10] 17

Index	ThresholdName	BehaviorType	BehaviorInt
2	envTemp002	Continuous	2
3	envTemp003	Triggered	1
5	envTemp005	Triggered	1
6	envTemp006	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	78	21
BufSize	10	1

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	17
Above	3	17
InBetween	3	17

3. Select **apply threshold alarm changes** to configure Fabric Watch to use the alarm settings that you customized.

Example (Fabric Watch V3.0.x):

```

1 : change behavior type                11: change threshold alarm
                                         level
2 : change behavior interval            12: change changed alarm
3 : change threshold boundary level     13: change exceeded alarm
4 : change custom unit                  14: change below alarm
5 : change custom time base             15: change above alarm
6 : change custom low                   16: change inBetween alarm
7 : change custom high                  17: apply threshold alarm
                                         changes
8 : change custom buffer                18: cancel threshold alarm
                                         changes
9 : apply threshold boundary changes    19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 17

```

Index	ThresholdName	BehaviorType	BehaviorInt
2	envTemp002	Triggered	2
4	envTemp004	Triggered	1
5	envTemp005	Triggered	1
7	envTemp007	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	78	75
BufSize	10	10

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	3
Above	3	3
InBetween	3	3

Example (Fabric Watch V4.0.x):

```

1 : change behavior type           11: change threshold alarm
                                   level
2 : change behavior interval       12: change changed alarm
3 : change threshold boundary level 13: change exceeded alarm
4 : change custom unit             14: change below alarm
5 : change custom time base        15: change above alarm
6 : change custom low              16: change inBetween alarm
7 : change custom high             17: apply threshold alarm
                                   changes
8 : change custom buffer           18: cancel threshold alarm
                                   changes
9 : apply threshold boundary changes 19: return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 17

```

Index	ThresholdName	BehaviorType	BehaviorInt
2	envTemp002	Continuous	2
3	envTemp003	Triggered	1
5	envTemp005	Triggered	1
6	envTemp006	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	78	21
BufSize	10	1

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8

```
EmailAlert-16
```

```
Valid alarm matrix is 27
```

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	17
Above	3	17
InBetween	3	17

Edit the Configuration File

To edit the configuration file, upload the file to a host, then edit the file in a text editor and download the file to your switch. Perform the following steps to edit the file:

1. Use the `configUpload` command to upload your configuration file to a host. Use the following command names and operands to upload the configuration file:

```
configUpload "<server>", "<user-name>", "<filename>", "<password>"
```

Example:

```
sw5:admin> configUpload "citadel", "jdoe", "config.txt", "passwd"
upload complete
```

2. Edit the configuration file in a text editor.
3. Use the `configDownload` command to download your configuration file to your switch.

Example:

```
sw5:admin> configDownload "citadel", "jdoe", "config.txt"
Committing configuration...done.
download complete
```

4. Use the `fwConfigReload` command to load the new configuration.

Example:

```
sw5:admin> fwConfigReload
fwConfigReload: Fabric Watch configuration reloaded
```

Download a Fabric Watch Configuration

You can download available profiles from the following site:

<http://thenew.hp.com/country/us/eng/prodserv/storage.html>

How to Read Error Messages

To accurately read an error message, identify the following components of the message:

- Error identifier
- Date and time that the error occurred
- Type of event
- Threshold name
- Threshold label
- Element index number
- Element state

Example:

```
0x10257b80 (tThad): Oct 25 09:52:21
    WARNING FW-BELOW, 3, sfpCrnt004 (Sfp Current 4) is below low
    boundary. current value : 0 (1 OK/0 FAULTY). (faulty)
```

[Table 10](#) lists the components of this example message.

Table 10: Message Components

Component	Example
Error identifier	0x10257b80
Date and time	Oct 25 09:52:21
Type of event	WARNING FW-BELOW (a Below event)
Threshold name	sfpCrnt004
Threshold label	Sfp Current 4
Element index number	004
Element state	faulty

Note: Threshold name in error messages = class name + area name + element index.

Example:

```
class name = env,  
area name = Fan,  
element index = 001-003  
threshold name is envFan001 - envFan003
```

For a complete list of class and area abbreviations, see [Table 2](#) and [Table 3](#) under [Thresholds](#) on page 21.

Fabric Watch Telnet Commands



This appendix defines the Fabric Watch telnet commands.

Overview

You can access telnet commands through the shell *admin* account when you install the license key. To use a telnet command, log into the relevant switch with administrative privileges, enter the command along with any required operands, and press **Enter**. [Table 11](#) summarizes the Fabric Watch telnet commands.

Note: You can access Fabric Watch software simultaneously from different connections with telnet, SNMP, and Web Tools, or by modifying and uploading the Fabric Watch configuration file to the switch. If `committing configuration...` appears during a telnet session, then the configuration may have recently been modified from another connection.

Table 11: Telnet Commands

Command	Description	Page
<code>fwClassInit</code>	Initializes all classes under Fabric Watch.	83
<code>fwConfigReload</code>	Reloads the Fabric Watch configuration.	84
<code>fwConfigure</code>	Displays threshold information and lets the user configure threshold behaviors.	85
<code>fwShow</code>	Displays the thresholds that Fabric Watch monitors.	87
<code>fwAlarmsFilterSet</code>	Configures alarm filtering for Fabric Watch.	92
<code>fwAlarmsFilterShow</code>	Displays alarm filtering for Fabric Watch.	94
<code>fwSetToDefault</code>	Sets boundaries and alarms to default configurations.	95
<code>fwSetToCustom</code>	Sets boundaries and alarms to custom configurations.	96
<code>fwMailCfg</code>	Configures Email Alert.	97
<code>fwFruCfg</code>	Configures FRU elements.	100
<code>fwHelp</code>	Lists Fabric Watch-related commands and their functions.	103

fwClassInit

Synopsis

```
fwClassInit
```

Availability

Administrator

Description

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.

Operands

None

Example

```
web68:admin> fwClassInit
fwClassInit: Fabric Watch is updating...
fwClassInit: Fabric Watch has been updated
swd83:admin> fwClassInit
```

See Also

```
fwConfigReload
fwConfigure
fwShow
```

fwConfigReload

Synopsis

```
fwConfigReload
```

Availability

Administrator

Description

Use to reload the Fabric Watch configuration. This command should only be used after you download a new Fabric Watch configuration file from a host.

Operands

None

Example

```
web68:admin> fwConfigReload
fwConfigReload: Fabric Watch configuration reloaded
swd83:admin> fwConfigReload
fwConfigReload: Fabric Watch configuration reloaded
```

See Also

```
configUpload
configDownload
fwClassInit
fwConfigure
fwShow
```

fwConfigure

Synopsis

```
fwConfigure
```

Availability

Administrator

Description

This command allows 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. For a complete list of Fabric Watch classes and areas, see [Table 2 “Fabric Watch Areas”](#) on page 19.

Operands

None

Example

```
eb68:admin> fwConfigure

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Copper) class
7 : F/FL Port (Optical) class
8 : Alpa Performance Monitor class
9 : End-to-End Performance Monitor class
10 : Filter Performance Monitor class
11 : quit
Select a class => : (1..11) [11]
swd83:admin> fwConfigure
```

```
1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Copper) class
7 : F/FL Port (Optical) class
8 : Alpa performance monitor class
9 : EE performance monitor class
10 : filter performance nominator class
11 : quit
Select a class => : (1..11) [11]
```

See Also

```
fwConfigReload
fwConfigure
fwShow
```

fwShow

Synopsis

fwShow

Availability

Administrator

Description

This command displays the thresholds that Fabric Watch monitors. If no parameters are entered, a summary of all thresholds is displayed. If a valid threshold name is entered as a parameter, detailed information pertaining only to that threshold is displayed and printed.

Operands

The following operand is optional: Threshold Name

If you do not provide a threshold name, fwShow prints all available thresholds. You may specify a particular threshold by giving a full name or a partial name with a wild card. The threshold name operand is case-sensitive.

Example

V3.0.x Example

```
web68:admin> fwShow
=====
Name                Label                Last value
-----
envFan001           Env Fan 1            9480 RPM

Type <CR> to continue, Q<CR> to stop:
envFan002           Env Fan 2            9510 RPM
envFan003           Env Fan 3            9750 RPM
envFan004           Env Fan 4            9510 RPM
envPS001            Env Power Supply 1   0 (1 OK/0 FAULTY)
envPS002            Env Power Supply 2   1 (1 OK/0 FAULTY)
envTemp001          Env Temperature 1    36 C
envTemp002          Env Temperature 2    37 C
envTemp003          Env Temperature 3    31 C
eportCRCs000        E Port Invalid CRCs 0 0 Error(s)/min
eportLink000        E Port Link Failures 0 0 Error(s)/min
eportProtoErr000    E Port Protocol Errors 0 0 Error(s)/min
eportRXPerf000      E Port RX Performance 0 0 KB/s
eportSignal000      E Port Loss of Signal 0 0 Error(s)/min
eportState000       E Port State Changes 0 0 Change(s)/min
eportSync000        E Port Loss of Sync 0 0 Error(s)/min
eportTXPerf000      E Port TX Performance 0 0 KB/s
eportWords000       E Port Invalid Words 0 0 Error(s)/min
fabricDI000         Fabric Domain ID     0 DID Change(s)
fabricED000         Fabric E-port down   0 Down(s)
fabricFL000         Fabric Fabric login   0 Login(s)
fabricFQ000         Fabric Fabric<->QL   0 Change(s)
fabricFR000         Fabric Reconfigure    19 Reconfig(s)
fabricGS000         Fabric SFP change 0  0 Change(s)
```

```
fabricGS001      Fabric SFP change 1          0 Change(s)
web66:admin> fwShow "env*"
```

```
=====
Name              Label                      Last value
-----
envFan001         Env Fan 1                  0 RPM
envFan002         Env Fan 2                  9690 RPM
envFan003         Env Fan 3                  9420 RPM
envFan004         Env Fan 4                  9300 RPM
envPS001          Env Power Supply 1        1 (1 OK/0 FAULTY)
envPS002          Env Power Supply 2        0 (1 OK/0 FAULTY)
envTemp001        Env Temperature 1         41 C
envTemp002        Env Temperature 2         30 C
envTemp003        Env Temperature 3         32 C
```

V4.0.x Example

```
swd83:admin> fwShow

1 : Show class thresholds
2 : Detail threshold information
3 : Quit
Select an item => : (1..3) [3] 1
1 : Environment class
    2 : SFP class
    3 : Port class
    4 : Fabric class
    5 : E-Port class
    6 : F/FL Port (Copper) class
    7 : F/FL Port (Optical) class
    8 : Alpa Performance Monitor class
    9 : End-to-End Performance Monitor class
   10 : Filter Performance Monitor class
   11 : quit
Select an item => : (1..12) [12] 1
=====
Name                Label                Last value
-----
envFan002            Env Fan 2            3013 RPM
envFan003            Env Fan 3            2960 RPM
envPS001             Env Power Supply 1   1 (1 OK/0 FAULTY)
envPS003             Env Power Supply 3   1 (1 OK/0 FAULTY)
envTemp004           Env Temperature 4    0 C/sec
envTemp005           Env Temperature 5    0 C/sec
1 : Show class thresholds
2 : Detail threshold information
3 : Quit
Select an item => : (1..3) [3]
swd83:admin>
```

See Also

fwClassInit
fwConfigReload
fwConfigure

fwAlarmsFilterSet

Synopsis

```
fwAlarmsFilterSet [alarm-on/off]
```

Availability

Administrator

Description

This command allows *admin* to configure alarms.

Operands

The following operand is optional:

alarm-on/off: 1 for turning on alarms, 0 for turning off alarms (does not apply to the environmental class). If not specified, 0 by default.

Example

```
web68:admin> fwAlarmsFilterSet 1
Committing configuration...done.
FW: Alarms are enabled
```

```
web68:admin> fwAlarmsFilterSet
Committing configuration...done.
FW: Alarms are disabled
sw:admin> fwAlarmsFilterSet
Committing configuration...done.
FW: Alarms are disabled
```

```
sw:admin> fwAlarmsFilterSet 1
Committing configuration...done.
FW: Alarms are enabled
```

See Also

fwAlarmsFilterShow

fwAlarmsFilterShow

Synopsis

```
fwAlarmsFilterShow
```

Availability

All users

Description

This command allows all users to show alarm filtering status for Fabric Watch.

Operands

None

Example

```
sw:admin> fwAlarmsFilterShow
FW: Alarms are enabled
sw:admin> fwAlarmsFilterShow
FW: Alarms are disabled
sw:admin> fwAlarmsFilterShow
FW: Alarms are enabled
sw:admin> fwAlarmsFilterShow
FW: Alarms are disabled
```

See Also

```
fwAlarmsFilterSet
```

fwSetToDefault

Synopsis

```
fwSetToDefault
```

Availability

Administrator

Description

This command allows *admin* to set boundary and alarm level to default for all classes and areas for Fabric Watch.

Operands

None

Example

```
sw:admin> fwSetToDefault
Committing configuration...done.
sw:admin> fwSetToDefault
Committing configuration...done.
```

See Also

```
fwSetToCustom
```

fwSetToCustom

Synopsis

```
fwSetToCustom
```

Availability

Administrator

Description

This command allows *admin* to set boundary and alarm level to custom for all classes and areas for Fabric Watch.

Operands

None

Example

```
sw:admin> fwSetToCustom
Committing configuration...done.
sw:admin> fwSetToCustom
Committing configuration...done.
```

See Also

```
fwSetToDefault
```

fwMailCfg

Synopsis

```
fwMailCfg
```

Availability

Administrator

Description

This command allows *admin* to display and change the configuration and status of the Fabric Watch Email Alert in the switch.

Switch elements monitored by Fabric Watch are divided into Classes and Email Alert is based on the classes. Each class can configure one mail address as the alert message's receiver.

V4.0.x only: For Email Alert to function correctly, add CP0 and CP1 IP address and host name to DNS. Telnet command `ipAddrShow` can be used to see this information.

Operands

None

Example

```
sw:admin> fwMailCfg

1 : Show Mail Configuration Information 2 : Disable
EmailAlert 3 : Enable EmailAlert 4 : Send Test Mail 5 : Set
Mail Address for EmailAlert 6 : quit Select an item => :
(1..6) [6] 1
```

Config Show Menu

```
-----
0 : Environment class
1 : SFP class
2 : Port class
3 : Fabric class
4 : E-Port class
5 : F/FL Port (Copper) class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : End-to-End Performance Monitor class
9 : Filter Performance Monitor class
10 : quit
Select an item => : (0..10) [10] 0
```

```
Fabric OS                2001-10-02                1
```

```
Administrative Commands                fwMailCfg(1m)
```

mail configuration information

```
-----
Email Alert = disable
Mail Server = 0.0.0.0
Domain Name = mail.com
Mail Signature = switch
```

```
Mail Recipient's) = jonDoe@bogus.com
```

```
-----  
1 : Show Mail Configuration Information 2 : Disable  
EmailAlert 3 : Enable EmailAlert 4 : Send Test Mail 5 : Set  
Mail Address for EmailAlert 6 : quit Select an item => :  
(1..6) [6] 5
```

Mail Config Menu

```
-----  
0 : Environment class  
1 : SFP class  
2 : Port class  
3 : Fabric class  
4 : E-Port class  
5 : F/FL Port (Copper) class  
6 : F/FL Port (Optical) class  
7 : Alpa Performance Monitor class  
8 : End-to-End Performance Monitor class  
9 : Filter Performance Monitor class  
10 : quit  
Select an iitem => : (0..10) [10] 0  
Enter Domain Name : [mail.com] hollywood.com  
Mail To: {jonDoe@bogus.com} tomHan@hollywood.com  
Committing configuration...done.
```

```
MailAlert Configuration is Successful !
```

See Also

```
fwConfigure  
ipAddrShow  
ipAddrSet
```

fwFruCfg (Fabric OS V4.0.x only)

Synopsis

fwFruCfg

Availability

All users

Description

This command allows *admin* to configure FRU states and actions. Based on these configurations, Fabric Watch generates action when state changes. To configure Email Alert use fwMailCfg.

Operands

None

Example

```
sw:admin> fwFruCfg
```

```

1 : Slot
2 : Power Supply
3 : Blower
4 : WWN
5 : Configure All
6 : Quit

```

```
Select an item => : (1..6) [6] 1
```

Id	Label	Status	State	Action	Alarm	
					Freq	TimeBase
1	Slot #1	enabled	48	17	5	Minute
2	Slot #2	enabled	8	16	1	Minute
3	Slot #3	enabled	16	16	1	Minute
4	Slot #4	enabled	48	17	5	Minute
5	Slot #5	enabled	16	16	1	Minute
6	Slot #6	enabled	48	17	5	Minute

```

1 :change fru alarm state      5 :change fru status
2 :change fru alarm level     6 :apply fru configuration
3 :change alarm frequency     7 :ancel fru configuration changes
4 : change fru timebase       8 :return to previous page

```

```
Select choice => : (1..8) [8] 1
```

```
Enter Id Number : (1..4) [4] 1
```

```

Absent-1, Inserted-2, Ready-4
Up-8, On-16, Off-32, Faulty-64

```

Fabric OS 2002-01-08 1

Administrative Commands fwFruCfg(1m)

Enter fru alarm state => : (1..127) [48] 32

Id	Label	Status	State	Action	Alarm	
					Freq	TimeBase
=====						
1	Slot #1	enabled	32	17	5	Minute
2	Slot #2	enabled	8	16	1	Minute
3	Slot #3	enabled	16	16	1	Minute
4	Slot #4	enabled	48	17	5	Minute
5	Slot #5	enabled	16	16	1	Minute
6	Slot #6	enabled	48	17	5	Minute

- 1 :change fru alarm state 5 :change fru status
- 2 :change fru alarm level 6 :apply fru configuration
- 3 :change alarm frequency 7 :cancel fru configuration changes
- 4 :change fru timebase 8 : return to previous page

See Also

fwMailCfg
fwConfigure

fwHelp

Synopsis

```
fwHelp
```

Availability

All users

Description

This command displays and describes Fabric Watch-related telnet commands.

Operands

None

Example

```
web66:admin> fwHelp
```

```
fwAlarmsFilterSet   Configure alarms filtering for Fabric Watch
fwAlarmsFilterShow Show alarms filtering for Fabric Watch
fwClassInit         Initialize all Fabric Watch classes
fwConfigure         Configure Fabric Watch
fwConfigReload      Reload Fabric Watch configuration
fwSetToCustom       Set boundary & alarm level to custom
fwSetToDefault      Set boundary & alarm level to default
fwShow              Show thresholds monitored by Fabric Watch
fwMailCfg           Email Alert by Fabric Watch
```

See Also

```
fwConfigure
```


Example Error Messages



This appendix provides the following information:

- [Environment Error Messages](#) on page 106
- [SFP Error Messages](#) on page 107
- [Fabric Port Error Messages](#) on page 108
- [Fabric E-Port Error Messages](#) on page 109
- [Fabric Copper Port Error Messages \(V3.0.x only\)](#) on page 110
- [Fabric Optical Port Error Messages](#) on page 111
- [Fabric Error Messages](#) on page 112

This appendix lists sample Fabric Watch error messages and explains the significance of each message.

Environment Error Messages

Example 1:

```
0x10e67e30 (tThad): May 30 07:54:09
WARNING FW-BELOW, 3, envFan002 (Env Fan 2) is below low
boundary. current value: 3030 RPM. (faulty)
```

This error log indicates that the number of RPMs of fan 2 has fallen below the low threshold boundary, therefore the fan is in a faulty state.

Example 2:

```
0x10e65950 (tThad): May 22 17:00:1
WARNING FW-BELOW, 3, envPS002 (Env Power Supply 2) is below low
boundary. Current value: 0 (1 OK/0 FAULTY). (faulty)
```

This error log indicates that Power Supply 2 is in a faulty state, and possibly is missing.

SFP Error Messages

Example 1:

```
0x10e630d0 (tThad): May 31 12:15:01
WARNING FW-EXCEEDED, 3, sfpRXP006 (Sfp RX power 6) exceeded
boundary. current value: 396 uWatts. (info)
```

This error log indicates that the SFP receiver on port 6 has exceeded its boundary. This is an informational message.

Example 2:

```
0x10e630d0 (tThad): May 31 11:52:24
WARNING FW-ABOVE, 3, sfpTemp006 (Sfp Temperature 5) is above
high boundary. current value: 37 C. (faulty)
```

This error log indicates that the temperature of the SFP in port 5 is above the high threshold boundary, therefore the SFP is in a faulty state.

Fabric Port Error Messages

Example 1:

```
0x10e63880 (tThad): Jul 5 08:10:37
WARNING FW-BELOW, 3, portRXPerf000 (Port RX Performance 0) is
below low boundary. current value: 25000 KB/s. (info)
```

This error log indicates that the receive data rate of port 0 has fallen below the threshold, and the receive data rate is 25,000 KB/s. The message is informational.

Example 2:

```
0x10e63880 (tThad): Jul 5 08:08:13
WARNING FW-ABOVE, 3, portRXPerf015 (Port RX Performance 15) is
above high boundary. current value: 71576 KB/s. (info)
```

This error log indicates that the high receive rate of port 15 has crossed the high boundary, and the current receive rate is 71,576 KB/s. This message is informational.

Fabric E-Port Error Messages

Example 1:

```
0x10e63880 (tThad): Jul 3 08:36:06
```

```
WARNING FW-ABOVE, 3, eportWords008 (E Port Invalid Words 8) is  
above the high boundary. current value: 1 Error(s)/minute.  
(faulty)
```

This error log indicates that E_Port 8 has detected an invalid word, creating a number of errors within a minute that crosses the upper boundary. Therefore, E_Port 8 is in a faulty state.

Example 2:

```
0x10e63880 (tThad): Jul 3 08:36:06
```

```
WARNING FW-ABOVE, 3, eportLink008 (E Port Link Failures 8) is  
above high boundary. current value: 1 Error(s)/minute. (faulty)
```

This error log indicates that E_Port 8 has had a link failure that creates a number of errors per minute that greater than the high boundary. Therefore, E_Port 8 is in a faulty state.

Example 3:

```
0x10e63880 (tThad): Jul 3 08:33:49
```

```
WARNING FW-ABOVE, 3, eportCRCs008 (E Port Invalid CRCs 8) is  
above high boundary. current value: 1 Error(s)/minute. (faulty)
```

This error log indicates that E_Port 8 has detected one CRC error, which creates a number of errors per minute that lies above the upper boundary. Therefore, E_Port 8 is in a faulty state.

Fabric Copper Port Error Messages (V3.0.x only)

Example 1:

```
0x10e67e30 (tThad): May 30 10:15:05
WARNING FW-BELOW, 3, fcuportState014 (FCU Port State Changes
14) is below low boundary. current value: 0 Change(s)/minute.
(normal)
```

This error log indicates that the number of state changes per minute for fabric copper port 14 falls below the low threshold boundary. However, this port is still operating normally.

Example 2:

```
0x10e67e30 (tThad): May 30 10:14:26
WARNING FW-BELOW, 3, fcuportSignal011 (FCU Port Loss of Signal
11) is below low boundary.
current value: 0 Error(s)/second. (normal)
```

This error log indicates that fabric copper port 11 has experienced a loss of signal, and the number of errors per second has fallen below the low boundary. However, the port is still operating normally.

Fabric Optical Port Error Messages

Example 1:

```
0x1003f2d0 (tThad): May 22 17:31:33
WARNING FW-ABOVE, 3, fopportSync002 (FOP Port Loss of Sync 2)
is above high boundary. current value: 4 Error(s)/minute.
(faulty)
```

This error log indicates that fabric (optical) port 2 has experienced 4 losses of sync per minute, which exceeds the upper threshold boundary. Therefore, this port is in a faulty state.

Example 2:

```
0x1003f2d0 (tThad): May 22 17:31:33
WARNING FW-ABOVE, 3, fopportLink003 (FOP Port Link Failures 3)
is above high boundary. current value: 1 Error(s)/minute.
(faulty)
```

This error log indicates that fabric (optical) port 3 has experienced 3 link failures in one minute, which exceeds the upper threshold boundary. Therefore, this port is in a faulty state.

Example 3:

```
0x101d4c60 (tThad): Jul 10 15:17:38
WARNING FW-INBETWEEN, 3, fopportRXPerf003 (FOP Port RX
Performance 3) is between high & low boundaries. current value:
44030 KB/s. (info)
```

This error log indicates that the receive performance data rate of fabric (optical) port 3 is between high and low threshold boundaries. This message is informational.

Fabric Error Messages

Example 1:

```
0x10e63880 (tThad): Jul 3 08:35:51
WARNING FW-CHANGED, 4, fabricDI000 (Fabric Domain ID) value has
changed. current value: 2 DID Change(s). (info)
```

This error reports that the switch has detected a domain id has change in the fabric. There has been two domain id changes and the state of the message is informational.

Example 2:

```
0x10e63880 (tThad): Jul 3 08:33:43
WARNING FW-CHANGED, 4, fabricFR000 (Fabric Reconfigure) value
has changed. current value: 2 Reconfig(s). (info)
```

This error log indicates that the fabric has been reconfigured twice. This message is informational.

Example 3:

```
0x1003f2d0 (tThad): May 22 17:31:33
WARNING FW-CHANGED, 4, fabricFL000 (Fabric login) value has
changed. current value: 23 Login(s). (info)
```

This error log indicates that a fabric login has occurred and the current value is 23 logins. This message is informational.

Example 4:

```
0x10e63880 (tThad): Jul 3 08:14:27
WARNING FW-CHANGED, 4, fabricZC000 (Fabric Zoning change) value
has changed. current value: 3 Zone Change(s). (info)
```

This error log indicates that there have been three zoning changes. This message is informational.

Example 5:

```
0x10e67e30 (tThad): May 30 16:26:35
WARNING FW-CHANGED, 4, fabricGS005 (Fabric SFP change 5) value
has changed. current value: 1 Change(s). (info)
```

This error log indicates that a SFP was removed from the fabric. This message is informational.

Example 6:

```
0x10e63880 (tThad): Jul 5 07:39:26
```

```
WARNING FW-CHANGED, 4, fabricSC000 (Fabric Segmentation) value  
has changed. current value: 9 Segmentation(s). (info)
```

This error log indicates that 9 fabric segmentation errors have occurred. This message is informational.

Fabric Watch and Smart SFP



This appendix provides the following information:

- [Overview](#) on page 116
- [Application in Fabric Watch](#) on page 117

Overview

Digital Diagnostic SFPs, or “Smart SFPs,” provide additional intelligence to SFP products. Digital Diagnostic features provide the following benefits:

- predictive failure analysis
 - Detects signs of component aging before failure occurs
 - Detects “out of specification” conditions
- fault isolation
 - Analyzes quickly the root cause of link problems

Application in Fabric Watch

Fabric Watch monitors the following Smart SFP-related thresholds:

- temperature
- supply voltage (V3.0.x only)
- bias current
- transmit power
- received power

Use the `fwConfigure` command (as described in this document) or the `sfpsShow` command to access Smart SFP-related Fabric Watch features.

Temperature

Smart SFP uses Fabric Watch to monitor internally measured transceiver temperature. The temperature reading is valid between -40 degrees Celsius and 125 degrees Celsius. Temperature accuracy is better than +/- 3 degrees Celsius over specified operating temperature and voltage.

Supply Voltage

Smart SFP uses Fabric Watch to monitor internally measured transceiver supply voltage, ranging from 0 to 6.55 volts. Voltage accuracy is better than +/- 3% of full scale, or ~200mV over specified operating temperature and voltage.

Bias Current

Smart SFP uses Fabric Watch to monitor transmit (TX) bias current, ranging from 0 to 65.535 mA. Bias current accuracy is better than +/- 3% of full scale, or ~2mA over specified operating temperature and voltage.

Coupled Transmit Power

Smart SFP uses Fabric Watch to monitor measured TX output power in mW, ranging from 0 to 6.5535 mW. Transmit output power accuracy is better than 3db over specified temperature and voltage.

Received Power

Smart SFP uses Fabric Watch to monitor measured received (RX) optical power in mW. The RX power value can represent average received power or OMA, depending upon the Fabric Watch configuration. The measurable received power value ranges from 0 to 6.5535 mW.

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

16-port card

The Fibre Channel port card provided with the StorageWorks Core switch. Contains 16 Fibre Channel ports and the corresponding LEDs indicating port status and speed.

See also port card.

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.

Access Control List

Enables an organization to bind a specific WWN to a specific switch port or set of ports, preventing a port in another physical location from assuming the identity of a real WWN. May also refer to a list of the Read/Write access of a particular community string.

See also device connection controls.

Account Level Switches

Refers to switches that have four login accounts into the operating system (in descending order): root, factory, admin, and user.

See also root account, factory account, admin account, and user account.

Address Identifier

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

Admin Account

A login account intended for use by the customer to control switch operation.

See also account level switches.

AL_PA

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

Alias

An alternate name for an element or group of elements in the fabric. Aliases can be used to simplify the entry of port numbers and WWNs when creating zones.

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.

See also alias.

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.

ANSI

American National Standards Institute. The 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 shared 100 or 200 MBps Fibre Channel transport structured as a loop. Can support up to 126 devices and one fabric attachment.

See also topology.

Arbitrating State

The state in which a port has become the loop master. This state is only available from the Open state.

Area Number

A number assigned to each potential port location in the StorageWorks Core switch. Used to distinguish StorageWorks Core switch ports that have the same port number but are on different port Blades.

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.

Auto-negotiate Speed

Process that allows two devices at either end of a link segment to negotiate common features, speed (e.g., 1 or 2 Gbps) and functions.

Autosense

Process during which a network device automatically senses the speed of another device.

AW_TOV

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

Backup FCS Switch

Backup fabric configuration server switch. The switch or switches assigned as backup in case the primary FCS switch fails.

See also FCS switch, primary FCS switch.

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.

Beacon

When all the port LEDs on a switch are set to flash from one side of the switch to the other, to enable identification of an individual switch in a large fabric. A switch can be set to beacon by telnet command or through Web Tools.

Beaconing

The state of the switches LEDs when the switch is set to Beacon.

See also Beacon.

Beginning Running 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.

BISR

Built-In Self Repair. Refers to the range of algorithms and circuit techniques to replace fault elements in a VLSI circuit with redundant fault-free ones.

See also BIST, CMBISR.

BIST

Built-In Self Test. The technique of designing circuits with additional logic which can be used to test proper operation of the primary (functional) logic.

See also BISR, CMBISR.

Bit Synchronization

See BER.

Blade

See 16-port card.

Blind-mate Connector

A two-way connector used in some switches to provide a connection between the motherboard and the power supply.

Block

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

Blower Assembly

A fan that prevents a switch (or individual elements within a switch) from overheating.

Boot Flash

Flash memory that stores the boot code and boot parameters. The processor executes its first instructions from boot flash. Data is cached in RAM.

Boot Monitor

Code used to initialize the CP (control processor) environment after powering on. Identifies the amount of memory available and how to access it, and retrieves information about system buses.

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. StorageWorks 1 Gb SAN switches (running Fabric OS V2) and later can be cascaded up to 239 switches, with a recommended maximum of seven interswitch links (no path longer than eight switches).

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 non-delivery.

Class 2

Service that provides multiplex and connectionless frame switching service between two ports, with notification of delivery or non-delivery.

Class 3

Service that provides a connectionless frame switching service between two ports, without notification of delivery or non-delivery of data. This service can also be used to provide a multicast connection between the originator and recipients, with notification of delivery or non-delivery.

Class F

Connectionless service for control traffic between switches, with notification of delivery or non-delivery of data between the E_Ports.

Class of Service

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

CLI

Command line interface. Interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a Graphic User Interface (GUI).

CLS

Close Primitive Signal. Only in an Arbitrated Loop; sent by an L_Port that is currently communicating on the loop, to close communication to an other L_Port.

CMBISR

Central Memory Built-In Self Repair. Test and repair bad cells in the central memory. If a "fail" is reported, inform Tech Support and replace the board.

See also BIST, BISR.

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.

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.

Compact Flash

Flash memory that stores the run-time operating system and is used like hard disk storage. Not visible within the processor's memory space. Data is stored in file system format.

Configuration

How a system is set up. May refer to hardware or software.

- **Hardware:** The number, type, and arrangement of components that make up a system or network.
- **Software:** The set of parameters that guide switch operation. May include general system parameters, IP address information, domain ID, and other information. Modifiable by any login with administrative privileges.

May also refer to a set of zones.

See also zone configuration.

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.

Control Panel

Refers to the left-side panel of Web Tools, which accesses fabric-wide functions such as Zoning and Events.

Core Switch

A switch whose main task is to interconnect other switches.

See also SAN switch.

CP Card

Control Processor Card. The central processing unit of the StorageWorks Core switch, which contains two CP Card slots to provide redundancy. Provides Ethernet, serial, and modem ports with the corresponding LEDs.

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.

See also fill word, LPSM.

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.

DB-9 connector

A 9-pin version of the RS-232C port interface. May be either the male or female interface.

See also RS-232 port.

dBm

Logarithmic unit of power used in electronics. Indicates signal strength in decibels above the reference level, which is 1 milliwatt for dBm. An increase of 10 dBm or represents a 10-fold increase in power.

DCE port

A data communications equipment port capable of interfacing between a DTE (data terminal equipment) port and a transmission circuit. DTE devices with an RS-232 (or EIA-232) port interface transmit on pin 3, and receive on pin 2.

See also DTE port, RS-232 port.

Defined Zone Configuration

The set of all zone objects defined in the fabric. May include multiple zone configurations.

See also enabled zone configuration, zone configuration.

Device Connection Controls

Enables organizations to bind an individual device port to a set of one or more switch ports. Device ports are specified by a WWN and typically represent HBAs (servers).

See also access control lists.

Device

A disk, a RAID, or an HBA.

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 HP StorageWorks 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.

DTE port

A data terminal equipment port capable of interfacing to a transmission circuit through a connection to a DCE (data communications equipment) port. DTE devices with an RS-232 (or EIA-232) port interface transmit on pin 3, and receive on pin 2 in a 9-pin connector (reversed in 25-pin connectors).

See also DCE port, RS-232 port.

DWDM

Dense Wavelength Multiplexing. A means to concurrently transmit more than one stream of data through a single fiber by modulating each stream of data onto a different wavelength of light.

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.

ELWL

Extra Long Wave Length. Laser light with a periodic length greater than 1300 nm (e.g., 1420 or 1550). ELWL lasers are used to transmit Fibre Channel data over distances greater than 10 Km.

Also known as XLWL.

Enabled Zone Configuration

The currently enabled zone configuration. Only one configuration can be enabled at a time.

See also defined zone configuration, zone configuration.

End-to-end Flow Control

Governs flow of class 1 and 2 frames between N_Ports.

See also EE_Credit.

Entry Fabric

Basic HP license that allows one E_Port per switch. Not supported by StorageWorks Core switches.

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.

ESD

Electrostatic Discharge.

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.

Extended Fabric

An HP product that runs on Fabric OS and allows creation of a Fibre Channel fabric interconnected over distances of up to 100 kilometers.

Extended Fabric is a means of allowing the implementation and management of SANs over extended distances. This is achieved by adjusting the Buffer-to-Buffer Credits to guaranteed allocation of buffers to specific ports.

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

A Fibre Channel network containing two or more interconnected switches in addition to hosts and devices. May also be referred to as a switched fabric.

See also topology, SAN, cascade.

Fabric Access

An HP product that consists of a set of APIs that allow third party applications to interface with Fabric OS.

Fabric Access allows the application to control the fabric directly for functions such as discovery, access (zoning), management, performance, and switch control. Consists of a host-based library that interfaces the application to switches in the fabric over an out-of-band TCP/IP connection or in-band using an IP-capable Host Bus Adapter (HBA).

Fabric Assist

An HP feature that enables private and public hosts to access public targets anywhere on the fabric, provided they are in the same Fabric Assist zone. This feature is available only when both QuickLoop and Zoning are installed on the switch.

Fabric Assist is a means of allowing private hosts to communicate with public targets across a switched fabric. Fabric Assist also allows private hosts to communicate with private targets that are not resident on the same switch across a switched fabric.

See also QuickLoop.

Fabric Configuration Server

One or more designated HP switches that store and manage the configuration parameters for all other switches in the fabric. These switches are designated by WWN, and the list of designated switches is known fabric-wide.

Fabric Manager

An HP product that works in conjunction with Web Tools to provide a graphical user interface for managing switch groups (such as the SAN Switch Integrated/32) as a single unit, instead of as separate switches. Fabric Manager is installed on and run from a computer workstation.

Fabric Name

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

Fabric OS

The proprietary operating system on HP StorageWorks switches.

Fabric Watch

An HP product that runs on Fabric OS and allows monitoring and configuration of fabric and switch elements.

Allows the SAN manager to monitor key fabric and switch elements, making it easy to quickly identify and escalate potential problems. It monitors each element for out-of-boundary values or counters and provides notification when defined boundaries are exceeded. The SAN manager can configure which elements, such as error, status, and performance counters, are monitored within an HP switch.

See also Fabric Manager.

Factory Account

A login used during manufacturing to initialize and test a switch and is not intended for customer use.

See also account level switches.

Failover

The act that causes control to pass from one redundant unit to another. In the StorageWorks Core switch one may failover from the currently Active Control Processor (CP) to the Standby CP.

FAN

Fabric access notification. Retains the AL_PA and fabric address when loop re-initializes (if the switch supports FAN).

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 Signaling 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.

FCS switch

Fabric configuration server switch. One or more designated HP switches that store and manage the configuration parameters for all switches in the fabric. FCS switches are designated by WWN, and the list of designated switches is communicated fabric-wide.

See also backup FCS switch, primary FCS switch.

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.

FIFO

First In, First Out. May also refer to a data buffer that follows the first in, first out rule.

Fill Word

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

Firmware Download

Loading firmware down from a server into a switch.

Firmware

The basic operating system provided with the hardware.

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.

Flash Partition

Two redundant usable areas, called “partitions,” into which firmware can be downloaded in the StorageWorks Core switch.

Flash

Programmable NVRAM memory that maintains its contents.

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.

See also Data Word.

FRU

Field Replaceable Unit. A component that can be replaced on site.

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 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.

FSPF

Fabric Shortest Path First. HP routing protocol for Fibre Channel switches.

FSP

Fibre Channel Service Protocol. The common protocol for all fabric services, transparent to the fabric type or topology.

See also FS.

Full Fabric

The HP license 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

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

GBIC

Gigabit interface converter. A removable serial transceiver module that allows gigabaud physical-level transport for Fibre Channel and gigabit Ethernet. Typically refers only to the SC-form factor transceivers.

See also SFP.

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.

High Availability

An attribute of equipment that identifies it as being capable of conducting customer operations well in excess of 99% of the time. Typically High Availability is identified by the number of nines in that percentage. “Five Nines” means the equipment is rated as being capable of conducting customer operations 99.999% of the time without failure.

Host

A computer that accesses storage devices over the fabric. May also be referred to as a server.

See also workstation.

Hot Pluggable

A FRU capability that indicates it may be extracted or installed while customer data is otherwise flowing in the chassis.

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.

IBTA

The InfiniBand Trade Association (IBTA). The IBTA is an industry consortium of more than 200 companies working together to develop a new common I/O specification designed to bring greater scalability and performance to server I/O. InfiniBand defines a new channel based, switched-fabric technology for server-to-server and server-to-I/O interconnection that is expected to improve scalability and performance over existing PCI Bus technologies.

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.

InfiniBand

See IBTA.

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 SAN Switch Integrated/32 and SAN Switch Integrated/64, consisting of six SAN Switch 16-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.

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.

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, ISL trunking.

ISL Trunking

An HP feature that enables distribution of traffic over the combined bandwidth of up to four ISLs (between adjacent switches), while preserving in-order delivery. A set of trunked ISLs is called a trunking group; each port employed in a trunking group is called a trunking port.

See also Master Port.

IU

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

JBOD

Just a Bunch Of Disks. Indicates a number of disks connected in a single chassis to one or more controllers.

See also RAID.

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.

Kernel Flash

Flash memory that stores the bootable kernel code and is visible within the processor's memory space. Data is stored as raw bits.

Key Pair

In public key cryptography, a pair of keys consisting of an entity's public and private key. The public key can be publicized, but the private key must be kept secret.

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. Together, latency and bandwidth define the speed and capacity of a link or system.

LED

Light Emitting Diode. Used on HP switches to indicate the status of various switch elements.

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 fibers.

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.

See also BB_Credit.

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.

See also error.

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-nm 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.

Media

See transceiver.

MIB

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

Modem Serial Port

The upper serial port on the CP Card of the StorageWorks Core switch. Can be used to connect the CP Card to a modem with a standard 9-pin modem cable. Consists of a DB-9 connector wired as a RS-232 device, and can be connected by serial cable to a DCE device. A Hayes-compatible modem or Hayes-emulation is required. The device name is ttyS1.

See also DB-9 connector, DCE port, terminal serial port.

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 for 1 Gb, or 300 meters between devices for 2 Gb.

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.

Native Address Identifier

A unique, 64-bit address is assigned to each port, and is referred to as its World-Wide Name (WWN). If a port connects to an arbitrated loop, it will also be assigned a dynamic 8-bit address, referred to as its arbitrated loop physical address, or AL_PA. If it connects to a fabric, it will be assigned a dynamic 24-bit address, referred to as its Native Address Identifier.

Negotiate

See auto-negotiate speed and autosense.

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.

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. HP StorageWorks switches use the FSPF protocol.

Performance Monitor

Comprehensive HP tool for monitoring the performance of networked storage resources.

Performance Monitoring

An HP product that provides error and performance information to the administrator and end user for use in storage management.

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.

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 Card

A Fibre Channel card that contains optical or copper port interfaces, and acts like a switch module.

See also 16-port card.

Port Module

A collection of ports in a switch.

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.

Primary FCS Switch

Primary fabric configuration server switch. The switch that actively manages the configuration parameters for all switches in the fabric.

See also backup FCS switch, FCS switch.

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.

PSU

Power Supply Unit.

Public Device

A device that supports arbitrated loop protocol, can interpret 8-bit addresses, and can log into the fabric.

Public Loop

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

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.

Quad

A group of four adjacent ports that share a common pool of frame buffers.

QuickLoop

An HP StorageWorks product 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.

A means of allowing private hosts to communicate with private targets across a switched fabric.

The QuickLoop/Fabric Assist feature also allows:

- Private hosts to communicate with public targets across a switched fabric
- Private hosts to communicate with private targets that are not resident on the same switch across a switched fabric

See also Fabric Access, fabric assist, and translative mode.

QuickLoop Zoning

Protects devices from disruption by unrelated devices during critical processes; for example, during a tape backup session.

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.

R_RDY

Receiver ready. A primitive signal indicating that the port is ready to receive a frame.

RAID

Redundant Array of Independent Disks. A 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 Fabric

A fabric that spans across WANs by using protocol translation (a process also known as tunneling) such as Fibre Channel over ATM or Fibre Channel over IP.

Remote Switch

Bridges two switches into a SAN as large as 3000KM or more through protocol encapsulation in ATM networks via the Computer Network Technologies (CNT) UltraNet Open Systems Gateway.

Request Rate

The rate at which requests arrive at a servicing entity.

See also service rate.

RLS Probing

Read link status of the AL_PAs.

Root Account

A login used for debugging purposes by HP engineers and is not intended for customer use.

See also account level switches.

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.

RS-232 port

A port that conforms to a set of Electrical Industries Association (EIA) standards. Used to connect DTE and DCE devices for communication between computers, terminals, and modems.

See also DCE port, DTE port.

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.

SAN Switch

A switch whose main task is to connect nodes into the fabric.

See also core switch.

SCSI

Small Computer Systems Interface. A parallel bus architecture and protocol for transmitting large data blocks to a distance of 15 - 25 meters.

SDRAM

Synchronous Dynamic Random Access Memory. The main memory for the switch. Used for volatile storage during switch operation.

See also flash.

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.

SFF

Small Form Factor.

SFP Cable

The latest innovation in high-speed copper cabling for Fibre Channel and InfiniBand. It incorporates the SFP module directly onto the cable assembly, eliminating the need for a separate SFP copper module and an HSSDC2 cable assembly.

SFP

Small form factor pluggable. A transceiver used on 2 Gbps switches that replaces the GBIC. Refers to the LC-form factor transceiver.

See also GBIC.

SID/DID

Source identifier/Destination identifier. S_ID is a 3-byte field in the frame header that is used to indicate the address identifier of the N_Port from which the frame was sent.

Single Mode

The fiber optic cabling standard that, when used in conjunction with a 1300 nm laser light, can transfer data up to 10 km between devices. When used in conjunction with a 1550 nm laser light, single mode cabling can transfer data over 10 km.

See also multimode, LWL, ELWL, and XLWL.

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, 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.

StorageWorks SAN switch

The brand name for the HP family of switches.

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-nm lasers and supports 1.0625-Gbps link speeds. May also refer to the type of GBIC or SFP.

See also LWL.

Tachyon

A chip developed by Hewlett-Packard, and used in various devices. This chip has FC-0 through FC-2 on one chip.

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.

Terminal Serial Port

May also be referred to as the console port. The lower serial port on the CP Card of the StorageWorks Core switch. This port sends switch information messages and can receive commands. Can be used to connect the CP Card to a computer terminal. Has an RS-232 connector wired as a DTE device, and can be connected by serial cable to a DCE device. The connector pins two and three are swapped so that a straight-through cable can be used to connect to a terminal. The device name is ttyS0.

See also DCE port, modem serial port.

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.

Transceiver

Device that converts one form of signaling to another for transmission and reception; in fiber optics, it refers to optical and electrical.

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.

See also data word.

Trap (SNMP)

The message sent by an SNMP agent to inform the SNMP management station of a critical error.

See also SNMP.

Trunking

See ISL Trunking.

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.

user account

A login intended for use by the customer to monitor, but not control, switch operation.

See also account level switches.

VC

Virtual circuit. A one-way path between N_Ports that allows fractional bandwidth.

Web Tools

An HP product that runs on Fabric OS and provides a graphical interface to allow monitoring and management of individual switches or entire fabrics from a standard workstation running a browser.

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

World-Wide Name. An identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

XLWL

Xtra Long Wave Length. Laser light with a periodic length greater than 1300 nm (e.g., 1420 or 1550). XLWL lasers are used to transmit Fibre Channel data over distances greater than 10 Km.

Also known as ELWL.

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

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.

Zone Alias

A name assigned to a device or group of devices in a zone. Aliases can greatly simplify the zone administrative process.

See also alias.

Zone Configuration

A specified set of zones. Enabling a configuration enables all zones in that configuration.

See also defined zone configuration, enabled zone configuration.

Zone Member

A port, node, WWN, or alias, which is part of a zone.

Zone Schemes

The level of zoning granularity selected. For example, zoning may be done by switch/port, WWN, AL_PA, or a mixture.

See also zone configuration.

Zone Set

See zone configuration.

Zoning

An HP product 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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