

# **StorageWorks by Compaq**

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## **Fabric Watch User Guide**

Part Number: AA-RR7YA-TE

**First Edition January 2002**

**Product Version:**           Version 3.0

This document contains the following topics: the purpose of Fabric Watch software, how the software works, and the terms and components you need to use the software. This document also describes how to activate Fabric Watch using telnet commands or Web Tools and contains a description of the user interface that may be used to access Fabric Watch software, configure the thresholds, and interpret error messages.

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# About this Guide

This user guide provides information to help you:

- Activate the software using Telnet commands or Web Tools.
- Configure the software.
- Interpret error messages.
- Understand the function of the software.
- Contact technical support for additional assistance.

## Intended Audience

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

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

## Related Documentation

In addition to this guide, Compaq provides corresponding information:

- Fabric Operating System Reference Guide—AA-RQ6FA-TE
- MIB Reference Guide—AA-RQ6HA-TE
- Zoning User guide—AA-RQ6YA-TE
- Fabric Operating System Procedures User Guide—AA-RQ6EA-TE
- ISL Trunking User Guide—AA-RR82A-TE
- Web Tools User Guide—AA-RQ6GA-TE
- Quickloop User Guide—AA-RR7LA-TE
- Extended Fabric User Guide—AA-RR7QA-TE
- Advanced Performance Monitor User Guide—AA-RR7UA-TE

## Prerequisites

Before you install, configure, or use the Fabric Watch software, make sure you consider the items in the Document Conventions section that follows.

## Document Conventions

The conventions included in Table 1 apply in most cases.

**Table 1: Document Conventions**

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

## Symbols in Text

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



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

---



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

---

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

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

---

## Symbols on Equipment



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

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

---



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

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

---



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

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

---



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

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

---



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

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

---

## Rack Stability



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

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

## Getting Help

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

## Compaq Technical Support

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

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

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

Be sure to have the following information available before calling:

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

## **Compaq Website**

The Compaq website has the latest information on this product, as well as the latest drivers. Access the Compaq website at: <http://www.compaq.com/storage>. From this website, select the appropriate product or solution.

## **Compaq Authorized Reseller**

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



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# About the Fabric Watch Software

This chapter contains the following topics:

- Purpose of Fabric Watch Software on page 1-1
- How Fabric Watch Works on page 1-1
- Critical Fabric Watch Terms and Components on page 1-2

## Purpose of Fabric Watch Software

Fabric Watch software monitors the performance and status of Compaq StorageWorks Fibre Channel SAN Switches, and can alert 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)
- GBICs (for switches equipped with SMART GBICs or the Small Form Factor Pluggables, such as the Finisar SMART GBIC FTRJ-8519-3-2.5)

## 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 email the SAN manager or forward all error information to a proxy switch, depending on how the manager configures the alarm.

## Critical 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. These terms and components are described in the following sections:

- Element Categories on page 1-2
- Monitoring Tools on page 1-4
- Configurations on page 1-13

### 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, Copper F/FL\_Port)
- GBIC (includes the small form factor pluggables)
- Performance Monitor (Alpa, End-to-End, Filter)

### Areas

Areas are the behaviors that Fabric Watch software monitors. Table 1–1 lists all Fabric Watch classes, the areas within those classes, and a description of each area.

**Table 1–1: Fabric Watch Areas**

<b>Class</b>	<b>Area</b>	<b>Area Description</b>
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).
	GBIC change	Monitors insertion/removal of smart GBIC.
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 KBps.
	Transmit performance	Monitors transmit rate in KBps.
	State changes	Monitors state changes.

**Table 1–1: Fabric Watch Areas (Continued)**

<b>Class</b>	<b>Area</b>	<b>Area Description</b>
GBIC	Temperature	Monitors GBIC temperature in degrees Celsius (°C).
	Receiver power	Monitors GBIC receiver power in $\mu$ watts.
	Transmitter power	Monitors GBIC transmitter power in $\mu$ watts
	Current	Monitors GBIC current in milliamps.
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, and
- 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. Thresholds consist of the following types:

- Range Threshold on page 1-5
- Rising/Falling Threshold on page 1-6
- Change Monitor Threshold on page 1-7

## 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 1–1 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 generate an event if the event notification is set to range. This is because they cross the upper and lower boundaries respectively, and return to a value beyond the buffer zone.

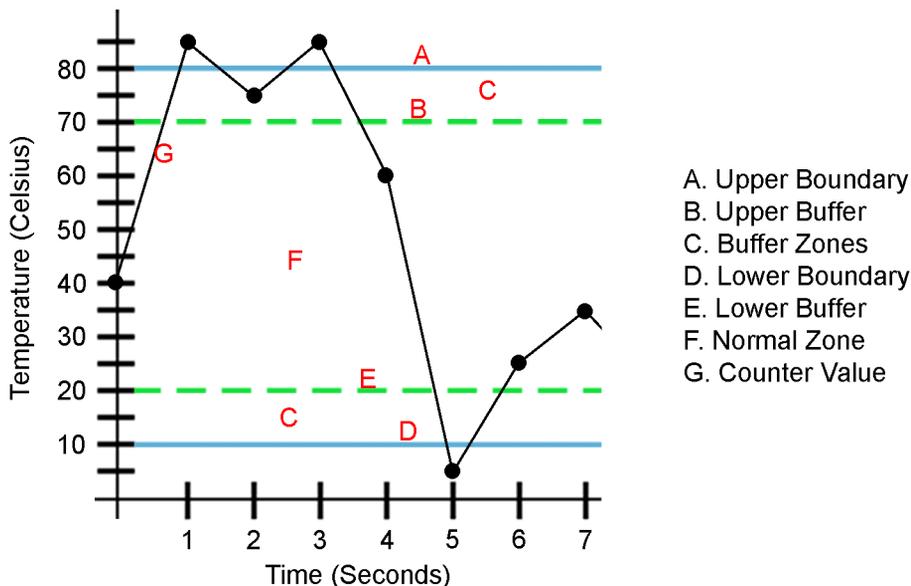
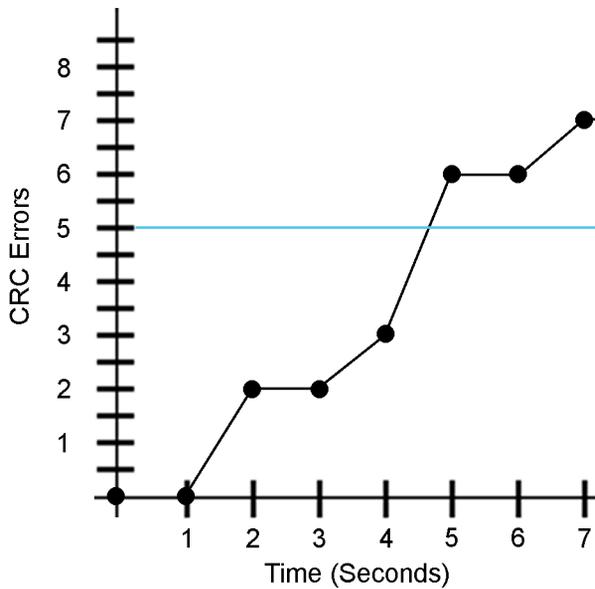


Figure 1-1: Range Threshold

### 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 1-2 presents a rising/falling threshold. An event registers at 5 seconds, when the counter value exceeds the boundary.



**Figure 1-2: 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. Abbreviations of the threshold class name (in lower case), are shown in Table 1-2.

**Table 1-2: Class Name Abbreviations**

Class Name	Threshold Class Name Abbreviation
Fabric	fabric
Environment	env
Port	port

**Table 1–2: Class Name Abbreviations (Continued)**

Class Name	Threshold Class Name Abbreviation
E_Port	eport
Optical F/FL_Port	fopport
Copper F/FL_Port	fcuport
GBIC	gbic
Alpa Performance Monitor	alpa
End-to-End Performance Monitor	ee
Filter Performance Monitor	filter

- Abbreviations for the area name are shown in Table 1–3.

**Table 1–3: Area Name Abbreviations**

Area Name	Area Name 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
Fabric login	FL

**Table 1–3: Area Name Abbreviations (Continued)**

Area Name	Area Name Abbreviation
Reconfigure	FR
GBIC change	GS
Segmentation	SC
Zoning change	ZC
Name server login	NL
Name server request	NR
Invalid CRCs	CRC
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.

**Example:** A state threshold of the fourth optical port would be represented by: `fopportState003`.

**NOTE:** Numbering for all Port and GBIC classes begin with index number 000 (as per the Fabric Operating System 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.

## 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 1–4 lists the boundaries that can define a threshold and what each boundary identifies.

**Table 1–4: Threshold Boundaries**

<b>Boundary</b>	<b>Definition</b>
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 <code>Fwconfigure</code> 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 1–1).

## Threshold Traits

Threshold traits may be configured 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 reconfigure all traits after you restart your switch. Table 1–5 lists and defines threshold traits.

**Table 1–5: Threshold Traits**

<b>Trait</b>	<b>Definition</b>
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:

- 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.
- 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 1–6 describes Fabric Watch event types.

**Table 1–6: Fabric Watch 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
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

**Table 1–6: Fabric Watch Event Types (Continued)**

Event Type	Explanation	Associated Behavior Mode
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

## Alarms

Fabric Watch software can notify SAN managers of events with any of five types of alarm. The five alarm types are:

- Switch Event Log Entry on page 1-12
- SNMP Trap on page 1-12
- Port Log Lock on page 1-13
- RapiTrap on page 1-13
- Email Alert on page 1-13

## 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

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

## Port Log Lock

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 is the only alarm that actively alerts SAN managers to events. Once RapiTrap is enabled, Fabric Watch forwards all event information to a designated proxy switch.

**NOTE:** 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 email address. Email Alert can send information about any error from any element, area, and class. The email specifies the threshold and describes the problem, much like an error message.

## Configurations

SAN managers can use configuration files and Fabric Watch-specific configuration files 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, see [Edit the Configuration File](#) on page 3-20.

## 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 vs. 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.

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## Activating Fabric Watch

This chapter provides you with information on how to:

- Activate Fabric Watch Using Telnet Commands on page 2–1
- Activate Fabric Watch with Web Tools on page 2–3

Fabric Watch software is optionally licensed software that resides on all Compaq StorageWorks Fibre Channel SAN Switches. You can activate this software with the proper license key. A license may have been installed in the switch at the factory. If not, contact your Compaq representative to obtain a license key.

Fabric Watch version 3.0 requires a Compaq StorageWorks Fibre Channel SAN switch running Fabric Operating System v.3.0. You can use telnet commands or Web Tools to install a Fabric Watch license.

### Activate Fabric Watch Using 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 (refer to *Fabric Operating System 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.

**Example:**

```
web68:admin> licenseShow
SR9ccyez9RTSAdm:
    Zoning license
RzRdyScR9S0Sezd:
    SES 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
R9cQ9RcbddiAdRAL:
    Security license
RQdbccdcy9SRecdR:
    Web 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**. The Web Tools software 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**.



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## Using Fabric Watch

This chapter contains the following topics:

- Overview of Fabric Watch Use on page 3-1
- User Interfaces on page 3-1
- How To Configure Fabric Watch Using Telnet on page 3-2
- How to Read Error Messages on page 3-21

### Overview of Fabric Watch Use

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 *Web Tools User Guide*.

### User Interfaces

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

- Web Tools
- Telnet
- SNMP-Based Enterprise Managers
- The 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.

**NOTE:** A configuration general profile is available on the CDROM.

## How To Configure Fabric Watch Using 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 describe 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.

**NOTE:** 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:**

```
web68:admin> fwConfigure

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

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

**Example:**

```
1 : Environment class
2 : GBIC class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Copper) class
7 : F/FL Port (Optical) class
8 : Alpa 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]
```

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:**

```

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]

```

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

**Example:**

```
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

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:**

```
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]
```

7. Enter the new boundary value.

**Example:**

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

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:**

```

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

## 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 3-3).
2. Select **change behavior type**. *Fabric Watch* displays a range of threshold indexes.

### Example:

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

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

**Example:**

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

## 4. Select a behavior type.

**Example:**

```
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

## 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 3-10).
2. Select **change behavior interval**.

### Example:

```
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] 2
  Select threshold index => : (1..3) [1]
```

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:

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

## 4. Enter a new behavior interval value.

**Example:**

```
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

## 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 3-3).

**Example:**

```
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:**

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

```
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:

```

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]

```

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

#### Example:

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

Index	ThresholdName	Status	CurVal	
	LastEvent	LastEventTime	LastVal	LastState
1	envTemp001	enabled	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]

```

## 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 3–1 lists the numerical values of each type of alarm.

**Table 3–1: Alarm Values**

Alarm	Matrix Value
None	0
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 3-3).
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:**

```
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]
```

3. Choose which alarms you want the event type to trigger (see Table 3–1). 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), an SNMP trap (matrix value: 2), and an email alert (matrix value: 16), enter 19 at the prompt.

**Example:**

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

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

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

**Example:**

```

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

## 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.

**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
```

## 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

The following is an example of a Fabric Watch error message:

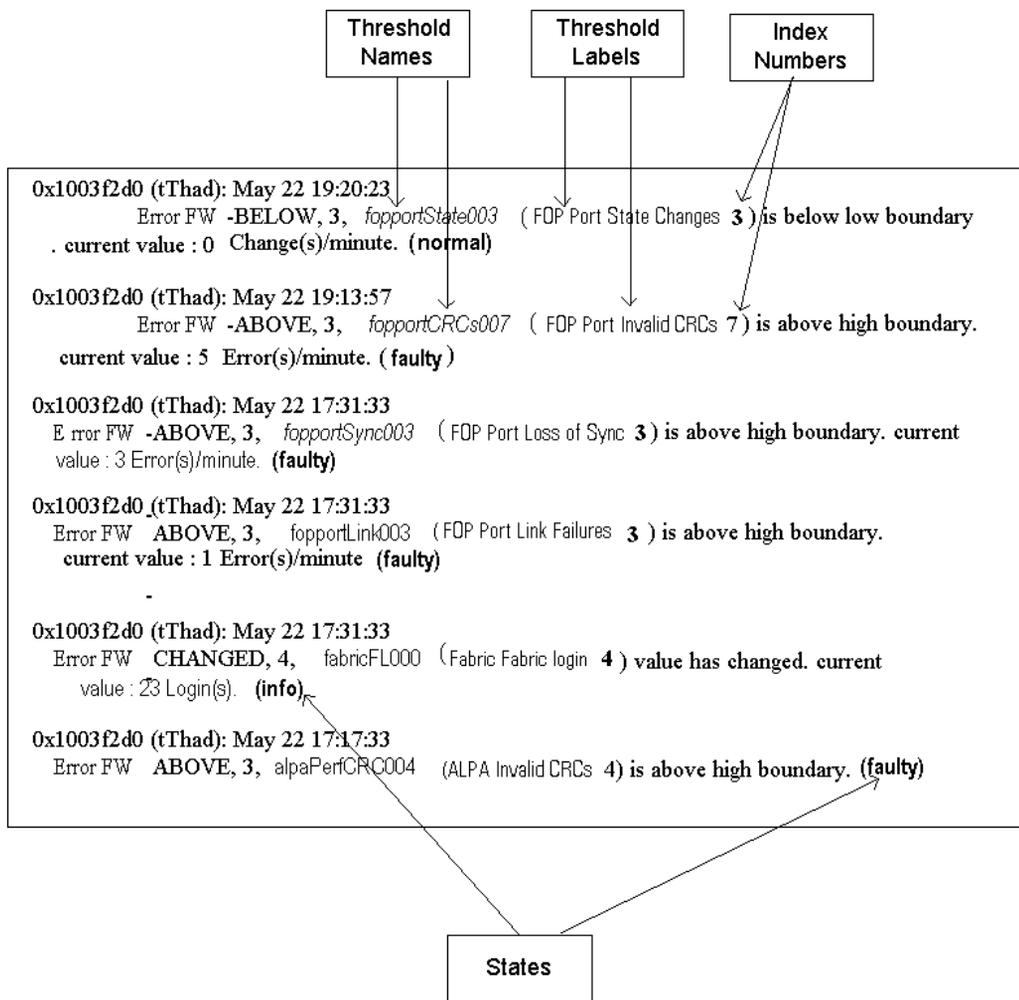
```
0x10257b80 (tThad): Oct 25 09:52:21
    WARNING FW-BELOW, 3, gbicCrnt004 (Gbic Current 4) is below low
    boundary. current value : 0 (1 OK/0 FAULTY). (faulty)
```

Table 3–2 lists the components of this example message.

**Table 3–2: Error 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	gbicCrnt004
Threshold label	Gbic Current 4
Element index number	004
Element state	faulty

Figure 3–1 identifies the components of Fabric Watch error messages.



**Figure 3–1: Components of a Typical Fabric Watch Error Log Message**

**NOTE:** Threshold name in error messages = class name + area name + element index.  
Example: FoppportLink003, fabricFL000, alpaPerfCRC004

**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 1-2 and Table 1-3 under Thresholds on page 1-4.



---

# Fabric Watch Telnet Commands

## Overview

This appendix describes the Fabric Watch telnet commands available for Fabric Watch:

- `fwClassInit` on page A-2—Initializes all classes under Fabric Watch.
- `fwConfigReload` on page A-2—Reloads the Fabric Watch configuration.
- `fwConfigure` on page A-3—Displays threshold information and lets the user configure threshold behaviors.
- `fwShow` on page A-4—Displays the thresholds that Fabric Watch monitors.
- `fwAlarmsFilterSet` on page A-7—Configures alarm filtering for Fabric Watch.
- `fwAlarmsFilterShow` on page A-8—Displays alarm filtering for Fabric Watch.
- `fwSetToDefault` on page A-8—Sets boundaries & alarms to default configurations.
- `fwSetToCustom` on page A-9—Sets boundaries & alarms to custom configurations.
- `fwMailCfg` on page A-10—Configures email alert.
- `fwHelp` on page A-11—Lists Fabric Watch-related commands and their functions.

You can access the 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**.

**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.

## 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...
gbicRegister: re-register 0x0 0x10dd49a0
fcRegister: re-register 0x0 0x10dd49a0
fwClassInit: Fabric Watch has been updated
```

### 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
```

### 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.

## Operands

None

## Example

```
eb68:admin> fwConfigure

1 : Environment class
2 : GBIC class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Copper) class
7 : F/FL Port (Optical) class
8 : Alpa Performance Monitor class
9 : End-to-End Performance Monitor class
10 : Filter Performance Monitor 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 Threshold Name operand is optional.

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

```
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 GBIC change 0           0 Change(s)
fabricGS001       Fabric GBIC 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

```
-----
```

**See Also**

```
fwClassInit
fwConfigReload
fwConfigure
```

## fwAlarmsFilterSet

### Synopsis

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

### Availability

Administrator

### Description

This command allows 'admin' to configure alarms.

### Operands

The alarm-on/off operand is optional:

- 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
```

### 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
```

### See Also

```
fwAlarmsFilterSet
```

## fwSetToDefault

### Synopsis

```
fwSetToDefault
```

### Availability

Administrator

## Description

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

## Operands

None

## Example

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

**NOTE:** This command sets the configuration to the default configuration that came with the switch.

## See Also

`fwSetToCustom`

# fwSetToCustom

## Synopsis

`fwSetToCustom`

## Availability

Administrator

## Description

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

## Operands

None

## Example

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

## See Also

`fwSetToDefault`

# fwMailCfg

## Synopsis

`fwMailCfg`

## Availability

Administrator

## Description

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

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

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

```
web68:admin> fwClassInit
fwClassInit: Fabric Watch is updating...
gbicRegister: re-register 0x0 0x10dd49a0
fcRegister: re-register 0x0 0x10dd49a0
fwClassInit: Fabric Watch has been updated
```

## See Also

fwConfigure  
ipAddrShow  
ipAddrSet

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

### Environment Class 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. This means 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.

### GBIC

#### Example 1:

```
0x10e630d0 (tThad): May 31 12:15:01
WARNING FW-EXCEEDED, 3, gbicRXP006 (Gbic RX power 6) exceeded
boundary. current value: 396 uWatts. (info)
```

This error log indicates that the GBIC 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, gbicTemp006 (Gbic Temperature 5) is above
high boundary. current value: 37 C. (faulty)
```

This error log indicates that the temperature of the GBIC in port 5 is above the high threshold boundary. This means the GBIC 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

**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

### 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 of 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 GBIC change 5) value has
changed. current value: 1 Change(s). (info)
```

This error log indicates that a change has occurred to the GBIC on Port 5. 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 nine fabric segmentation errors have occurred. This message is informational.



---

# Glossary

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

## **8b/10b Encoding**

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

## **Address Identifier**

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

## **AL\_PA**

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

## **Alias Address Identifier**

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

## **Alias AL\_PA**

An AL\_PA value recognized by an L\_Port in addition to the AL\_PA assigned to the port. See also *AL\_PA*.

## **Alias Server**

A fabric software facility that supports multicast group management.

## **API**

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

## **Arbitrated Loop**

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

**ASIC**

Application Specific Integrated Circuit.

**ATM**

Asynchronous Transfer Mode; a transport used for transmitting data over LANs or WANs that transmit fixed-length units of data. Provides any-to-any connectivity, and allows nodes to transmit simultaneously.

**AW\_TOV**

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

**Bandwidth**

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

**BB\_Credit**

Buffer-to-buffer credit; the number of frames that can be transmitted to a directly connected recipient or within an arbitrated loop. Determined by the number of receive buffers available. See also *Buffer-to-buffer Flow Control*, *EE\_Credit*.

**Beginning Run Disparity**

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

**BER**

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

**Block**

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

**Bridge**

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

**Broadcast**

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

**Buffer-to-buffer Flow Control**

Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop. See also *BB\_Credit*.

**Cascade**

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

**Chassis**

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

**Circuit**

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

**Class 1**

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

**Class 2**

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

**Class 3**

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

**Class 4**

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

**Class 6**

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

**Class F**

Connection-less service for control traffic between switches, with notification of delivery or nondelivery of data between the E\_Ports.

**Class of Service**

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

**CLS**

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

**Code Balance**

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

**Comma**

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

**Command Line**

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

**Community (SNMP)**

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

**Connection Initiator**

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

**Connection Recipient**

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

**CRC**

Cyclic Redundancy Check; a check for transmission errors included in every data frame.

**Credit**

As applies to Fibre Channel, the number of receive buffers available for transmission of frames between ports. See also *BB\_Credit*, *EE\_Credit*.

**CT\_HDR**

Common Transport Header. A header that conforms to the Fibre Channel Common Transport (FC\_CT) protocol.

**CT\_IU**

Common Transport Information Unit. An information unit that conforms to the Fibre Channel Common Transport (FC\_CT) protocol.

**Current Fill Word**

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

**Cut-through**

A switching technique that allows the route for a frame to be selected as soon as the destination address is received. See also *Route*.

**Data Word**

Type of transmission word that occurs within frames. The frame header, data field, and CRC all consist of data words. See also *Frame*, *Ordered set*, *Transmission Word*.

**Defined Zone Configuration**

The set of all zone objects defined in the fabric. May include multiple zone configurations. See also *Enabled Configuration*, *Zone Configuration*.

**Disparity**

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

**DLS**

Dynamic Load Sharing; dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx\_Port or E\_Port changes status.

**Domain ID**

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

**E\_D\_TOV**

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

**E\_Port**

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

**EE\_Credit**

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

**EIA Rack**

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

**Enabled Zone Configuration**

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

**End-to-end Flow Control**

Governs flow of class 1 and 2 frames between N\_Ports. See also *EE\_Credit*.

**Error**

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

**Exchange**

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

**F\_Port**

Fabric Port; a port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N\_Port to a switch. See also *FL\_Port*, *Fx\_Port*.

**Fabric Name**

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

**Fabric**

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

**FC-AL-3**

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

**FC-FLA**

The Fibre Channel Fabric Loop Attach standard defined by ANSI.

**FCIA**

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

**FCP**

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

**FC-PH-1, 2, 3**

The Fibre Channel Physical and Signalling Interface standards defined by ANSI.

**FC-PI**

The Fibre Channel Physical Interface standard defined by ANSI.

**FC-PLDA**

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

**FC-SW-2**

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

**Fibre Channel Transport**

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

**Fill Word**

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

**FL\_Port**

Fabric Loop Port; a port that is able to transmit under fabric protocol and also has arbitrated loop capabilities. Can be used to connect an NL\_Port to a switch. See also *F\_Port*, *Fx\_Port*.

**FLOGI**

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

**Frame**

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

**FS\_ACC**

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

**FS\_IU**

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

**FS\_REQ**

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

**FS\_RJT**

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

**FS**

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

**FSP**

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

**FSPF**

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

**Full Fabric**

The licensing that allows multiple E\_Ports on a switch, making it possible to create multiple ISL links.

**Full-duplex**

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

**Fx\_Port**

A fabric port that can operate as either an F\_Port or FL\_Port. See also *F\_Port*, *FL\_Port*.

**G\_Port**

Generic Port; a port that can operate as either an E\_Port or F\_Port. A port is defined as a G\_Port when it is not yet connected or has not yet assumed a specific function in the fabric.

**Gateway**

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

**GBIC**

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

**Gbps**

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

**GBps**

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

**Half-duplex**

A mode of communication that allows a port to either transmit or receive frames at any time, but not simultaneously (with the exception of link control frames, which can be transmitted at any time). See also *Full-duplex*.

**Hard Address**

The AL\_PA that an NL\_Port attempts to acquire during loop initialization.

**Hardware Translative Mode**

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

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

**HBA**

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

**Hub**

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

**Idle**

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

**IN\_ID**

Initial Identifier. The field in the CT\_HDR where the port ID of the client originator of a Fibre Channel Services request.

**Initiator**

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

**Integrated Fabric**

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

**IOD**

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

**IPA**

Initial Process Associator. An identifier associated with a process at an N\_Port.

**ISL**

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

**Isolated E\_Port**

An E\_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E\_D\_TOVs). See also *E\_Port*.

**IU**

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

**K28.5**

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

**L\_Port**

Loop Port; a node port (NL\_Port) or fabric port (FL\_Port) that has arbitrated loop capabilities. An L\_Port can be in one of two modes:

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

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

**Latency**

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

**Link Services**

A protocol for link-related actions.

**Link**

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

**LIP**

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

**LIS\_HOLD\_TIME**

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

**LM\_TOV**

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

**Login BB\_Credit**

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

**Loop Circuit**

A temporary bidirectional communication path established between L\_Ports.

**Loop Failure**

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

**Loop Initialization**

The logical procedure used by an L\_Port to discover its environment. Can be used to assign AL\_PA addresses, detect loop failure, or reset a node.

**Loop\_ID**

A hex value representing one of the 127 possible AL\_PA values in an arbitrated loop.

**Looplet**

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

**LPSM**

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

**LWL**

Long Wavelength; a type of fiber optic cabling that is based on 1300-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*.

**MIB**

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

**Monitoring State**

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

**Multicast**

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

**Multimode**

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

**N\_Port**

Node Port; a port on a node that can connect to a Fibre Channel port or to another N\_Port in a point-to-point connection. See also *NL\_Port*, *Nx\_Port*.

**NAA**

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

**Name Server**

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

**NL\_Port**

Node Loop Port; a node port that has arbitrated loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL\_Port. See also *N\_Port*, *Nx\_Port*.

**Node Name**

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

**Node**

A Fibre Channel device that contains an N\_Port or NL\_Port.

**Non-participating Mode**

A mode in which an L\_Port in a loop is inactive and cannot arbitrate or send frames, but can retransmit any received transmissions. This mode is entered if there are more than 127 devices in a loop and an AL\_PA cannot be acquired. See also *L\_Port*, *Participating Mode*.

**Nx\_Port**

A node port that can operate as either an N\_Port or NL\_Port.

**Open Originator**

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

**Open Recipient**

The L\_Port that receives the OPN ordered set from the open originator, and then enters the Open state.

**Open State**

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

**OPN**

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

**Ordered Set**

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

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

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

**Packet**

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

**Participating Mode**

A mode in which an L\_Port in a loop has a valid AL\_PA and can arbitrate, send frames, and retransmit received transmissions. See also *L\_Port, Non-participating Mode*.

**Path Selection**

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

**Phantom Address**

An AL\_PA value that is assigned to an device that is not physically in the loop. Also known as phantom AL\_PA.

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

**Phantom Device**

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

**PLOGI**

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

**Point-to-point**

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

**Port Cage**

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

**Port\_Name**

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

**POST**

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

**Private Device**

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

**Private Loop**

An arbitrated loop that does not include a participating FL\_Port.

**Private NL\_Port**

An NL\_Port that communicates only with other private NL\_Ports in the same loop and does not log into the fabric.

**Protocol**

A defined method and a set of standards for communication.

**Public NL\_Port**

An NL\_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL\_Ports.

**Public Device**

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

**Public Loop**

An arbitrated loop that includes a participating FL\_Port, and may contain both public and private NL\_Ports.

**QuickLoop**

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

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

**R\_A\_TOV**

Resource Allocation Time-out Value; the maximum time a frame can be delayed in the fabric and still be delivered. See also *E\_D\_TOV*, *RR\_TOV*.

**Route**

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

**Routing**

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

**RR\_TOV**

Resource Recovery Time-out Value; the minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator. See also *E\_D\_TOV*, *R\_A\_TOV*.

**RSCN**

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

**RX\_ID**

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

**SAN**

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

**Sequence**

A group of related frames transmitted in the same direction between two N\_Ports.

**Service Rate**

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

**Single Mode**

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

**SI**

Sequence Initiative.

**SNMP**

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

**SNMPv1**

The original SNMP protocol, now labeled v1.

**SNS**

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

**Switch Name**

The arbitrary name assigned to a switch.

**Switch Port**

A port on a switch. Switch ports can be E\_Ports, F\_Ports, or FL\_Ports.

**Switch**

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

**SWL**

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

**Target**

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

**Tenancy**

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

**Throughput**

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

**Topology**

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

- Point to point - A direct link between two communication ports.
- Switched fabric - Multiple N\_Ports linked to a switch by F\_Ports.
- Arbitrated loop - Multiple NL\_Ports connected in a loop.

**Transfer State**

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

**Translative Mode**

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

**Transmission Character**

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

**Transmission Word**

A group of four transmission characters.

**Trap (SNMP)**

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

**Tunneling**

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

**U\_Port**

Universal Port; a switch port that can operate as a G\_Port, E\_Port, F\_Port, or FL\_Port. A port is defined as a U\_Port when it is not connected or has not yet assumed a specific function in the fabric.

**UDP**

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

**ULP\_TOV**

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

**ULP**

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

**Unicast**

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

**Well-known Address**

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

**Workstation**

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

**WWN**

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

**Xmitted Close State**

The state in which an L\_Port cannot send messages, but can retransmit messages within the loop. A port in the XMITTED CLOSE state cannot attempt to arbitrate.

**Zone Configuration**

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

**Zone**

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

**Zoning**

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