



Brocade Advanced Performance Monitor

User's Guide Version 3.1.0/4.1.0

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Brocade Communications Systems, Incorporated

Corporate Headquarters

1745 Technology Drive
San Jose, CA 95110
T: (408) 487-8000
F: (408) 487-8101
Email: info@brocade.com

Asia-Pacific Headquarters

Shiroyama JT Trust Tower 36th Floor
4-3-1 Toranomon, Minato-ku
Tokyo, Japan 105-6036
T: +81 35402 5300
F: +81 35402 5399
Email: apac-info@brocade.com

European Headquarters

29, route de l' Aeroport
Case Postale 105
CH-1211 Geneva 15,
Switzerland
T: +41 22 799 56 40
F: +41 22 799 56 41
Email: europa-info@brocade.com

Latin America Headquarters

5201 Blue Lagoon Drive
Miami, FL 33126
T: (305) 716-4165
Email: latinam-sales@brocade.com

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Preface

About This Manual

This manual provides comprehensive information to help you administer your SilkWorm switch and storage area network (SAN). This manual was developed to help technical experts operate, maintain, and troubleshoot SAN products. A list of additional SAN resource reference materials is also included. The sections that follow provide:

- A summary of updates to this document.
- The intended audience for this document.
- Information to help you use Brocade documentation.
- Information on additional SAN resources.
- How to get Technical Support.

What's New in This Book

The following changes have been made since this book was last released (part number 53-0000514-01):

- Information that was added:
 - *Managing Performance Monitor with Telnet Commands* - Chapter 2
- Information that was modified:
 - The preface is new boilerplate.
 - The book has been reorganized
 - Chapter 1 includes a section called License Activation.
- Information that was removed:
 - The glossary has been removed and will be replaced by a master glossary.

Intended Audience

This document is intended for use by systems administrators and technicians experienced with networking, Fibre Channel, and SAN technologies.

Manual Conventions

This section lists text formatting conventions and important notices formats used in this document.

Formatting

The following table describes the formatting conventions that are used in this book:

Convention	Purpose
bold text	<ul style="list-style-type: none">• identifies command names• identifies GUI elements• identifies keywords/operands• identifies text to enter at the GUI or CLI
<i>italic text</i>	<ul style="list-style-type: none">• provides emphasis• identifies variables• identifies paths and internet addresses• identifies book titles and cross references
code text	<ul style="list-style-type: none">• identifies CLI output• identifies syntax examples

Notes, Cautions, and Warnings

The following notices appear in this document:

Note: A note provides a tip, emphasizes important information, or provides a reference to related information.

Caution: A caution alerts you to potential damage to hardware, firmware, software, or data.

Warning: A warning alerts you to potential danger to personnel.

Related Publications

This section lists additional documentation that you may find helpful.

Brocade Documentation

The following related publications are provided on the Brocade Documentation CD-ROM and on the Brocade Partner Web site:

- **Brocade Fabric OS documentation**
 - *Brocade Diagnostic and System Error Message Reference*
 - *Brocade Fabric OS Procedures Guide*
 - *Brocade Fabric OS Reference*
- **Brocade Fabric OS optional features documentation**
 - *Brocade Advanced Web Tools User's Guide*
 - *Brocade Advanced Zoning User's Guide*
 - *Brocade Distributed Fabrics User's Guide*
 - *Brocade Fabric Watch User's Guide*
 - *Brocade ISL Trunking User's Guide*
 - *Brocade QuickLoop User's Guide (v 3.1 only)*
 - *Brocade Secure Fabric OS User's Guide*
 - *Secure Fabric OS QuickStart Guide*
- **Brocade Hardware documentation**
 - *Brocade SilkWorm 12000 Hardware Reference (for v.4.1 software)*
 - *Brocade SilkWorm 12000 QuickStart Guide (for v4.1 software)*
 - *Brocade SilkWorm 3900 Hardware Reference (for v.4.1 software)*
 - *Brocade SilkWorm 3800 Hardware Reference (for v.3.1 software)*
 - *Brocade SilkWorm 3200 Hardware Reference (for v.3.1 software)*

Release notes are available on the Brocade Partner Web site and are also bundled with the Fabric OS.

Additional Resource Information

For practical discussions about SAN design, implementation, and maintenance, *Building SANs with Brocade Fabric Switches* is available through:

<http://www.amazon.com>

For additional Brocade documentation, visit the Brocade SAN Info Center and click on the Resource Library location:

<http://www.brocade.com>

For additional resource information, visit the Technical Committee T11 Web site. This Web site provides interface standards for high-performance and mass storage applications for fibre channel, storage management, as well as other applications:

<http://www.t11.org>

For information about the Fibre Channel industry, visit the Fibre Channel Industry Association Web site:

<http://www.fibrechannel.org>

How to Get Technical Support

Contact your switch support supplier for hardware, firmware, and software support, including product repairs and part ordering. To assist your support representative and to expedite your call, have the following three sets of information immediately available when you call:

1. General Information

- Technical Support contract number, if applicable
- switch model
- switch operating system version
- error messages received
- **supportshow** command output
- detailed description of the problem and specific questions
- description of any troubleshooting steps already performed and results

2. Switch Serial Number

The switch serial number and corresponding bar code are provided on the serial number label, as shown below.

```
*FT00X0054E9
FT00X0054E9
```

The serial number label is located as follows:

- *SilkWorm 2000 series switches*: Bottom of chassis
- *SilkWorm 3200 and 3800 switches*: Back of chassis
- *SilkWorm 3900 switches*: Bottom of chassis
- *SilkWorm 6400 and 12000 switches*: Inside front of chassis, on wall to left of ports

3. Worldwide Name (WWN)

- *SilkWorm 3900 and 12000 switches*: Provide the license ID. Use the **licenseidshow** command to display the license ID.
- *All other SilkWorm switches*: Provide the switch WWN. Use the **wwn** command to display the switch WWN.

Introducing Brocade Advanced Performance Monitoring

Performance Monitoring is a tool used for monitoring the performance of networked storage resources. This tool helps reduce over-provisioning while enabling SAN performance tuning and increasing administrator productivity.

Performance Monitoring provides SAN performance monitoring through an end-to-end monitoring system provides

- Increased end-to-end visibility into the fabric.
- More accurate reporting for service level agreements and charged access applications.
- Shortened troubleshooting time.
- Better capacity planning.
- Increased productivity with preformatted and customized screens and reports.

Performance Monitoring is administered through either telnet commands or Web Tools. To use Web Tools, a Web Tools license must be activated on the switch.

Features

The Performance Monitoring product

- Measures the bandwidth consumed by individual routes (host-target pairs).
- Provides device performance measurements by port, AL_PA, and LUN.
- Reports CRC error measurement statistics.
- Compares IP versus SCSI traffic on each port.
- Includes a wide range of predefined reports.
- Allows you to create customized user-defined reports.

License Activation

It is good practice to verify that the license is activated when initially using a feature. Use the *licenseShow* command to view a list of all licenses activated on your switch, as shown in the following example. If the license is not included in the list, continue with [License Activation Using Telnet on page 1-2](#) or [License Activation Using Web Tools on page 1-2](#).

To verify that your license is activated follow these steps:

1. Log onto the switch by telnet using an account that has administrative privileges.

2. Enter the **licenseshow** command on the telnet command line. A list of all activated licenses on the switch is generated as shown in the example.

Example:

```
switch:admin> licenseshow
SdcReRcbSbjedSfa:
    Web license
SdcReRcbSbjedSfb:
    Zoning license
SdcReRcbSbjedSfc:
    QuickLoop license
SdcReRcbSbjedSfe:
    Fabric license
SdcReRcbSbjedSff:
    Remote Switch license
SdcReRcbSbjedSfg:
    Remote Fabric license
SdcReRcbSbjedSfh:
    Extended Fabric license
SdcReRcbSbjedSfj:
    Entry Fabric license
SdcReRcbSbVedSfM:
    Fabric Watch license
SdcReRcbSbXedSfO:
    Performance Monitor license
SdcReRcbSbbedSfS:
    Trunking license
SdcReRcbSbjedSfy:
    Security license
switch:admin>
```

License Activation Using Telnet

To activate your license follow these steps:

1. On the command line enter the following command but replace the word “*key*” with the license key provided to you. The license key is case sensitive and must be entered exactly as given.

licenseadd “*key*”

2. Verify that the license was added by entering the **licenseshow** command, as shown in the example.

License Activation Using Web Tools

Licenses can be activated using Web Tools as follows:

1. Launch a web browser, enter the switch name or IP address in the **Location/Address** section of the browser, and press **Enter**. Web Tools launches, displaying the Fabric View.
2. Click the **Admin** button on the relevant switch panel. The logon window displays.
3. Enter a login name and password with administrative privileges and press **Enter**. The Administration View displays. Select the **License Admin** tab.

4. Enter the license key in the **License Key** field and click the **Add** button. The features are now available.

Using Advanced Performance Monitoring

This chapter describes how to manage Performance Monitoring using either Web Tools or telnet commands.

Managing Performance Monitoring with Web Tools

Use Web Tools to view, customize, or monitor performance by

- Viewing predefined reports for AL_PA, end-to-end, and filter-based performance monitoring.
- Creating user-definable reports.
- Viewing performance canvas for application level or fabric level views.
- Accessing configuration editor (save, copy, edit, and remove multiple configurations).
- Saving persistent graphs across reboots (saves parameter data across reboots).

Accessing Performance Monitoring Using Web Tools

Switch performance can be monitored from the Switch View of Web Tools. To access Performance Monitor through Web Tools, perform the following steps:

1. Launch Web Tools to display the Fabric view.

- Click on the switch icon of the switch you want to monitor. The Switch View is displayed, as shown in Figure 2-1.

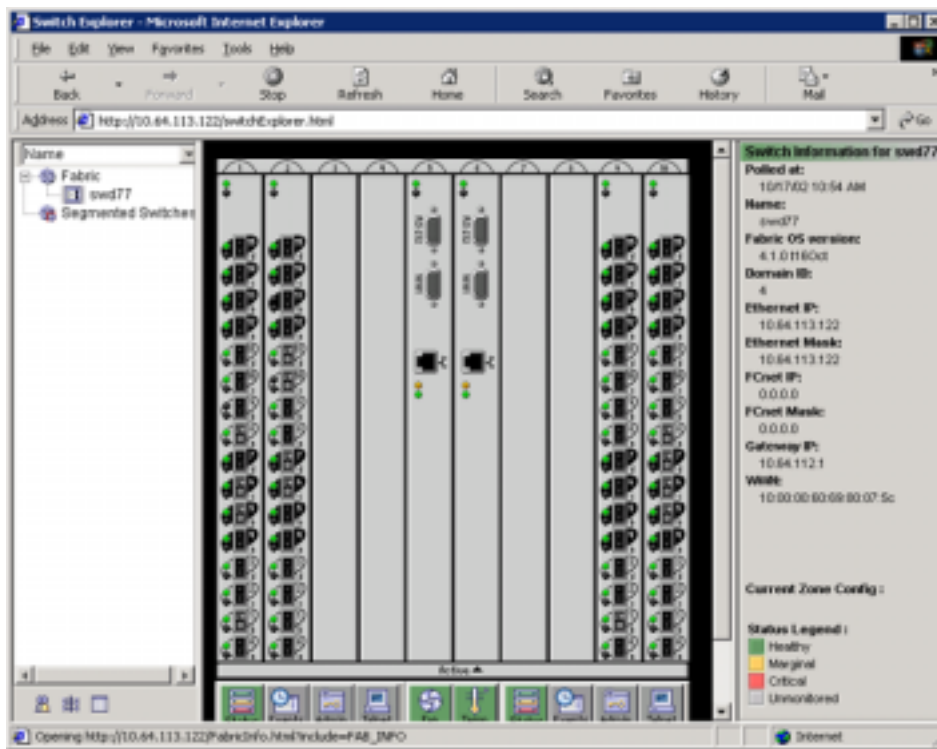


Figure 2-1 Switch View in Web Tools

3. In the Switch View click the **Perf** icon. The Performance Monitor window is displayed as shown in Figure 2-2.

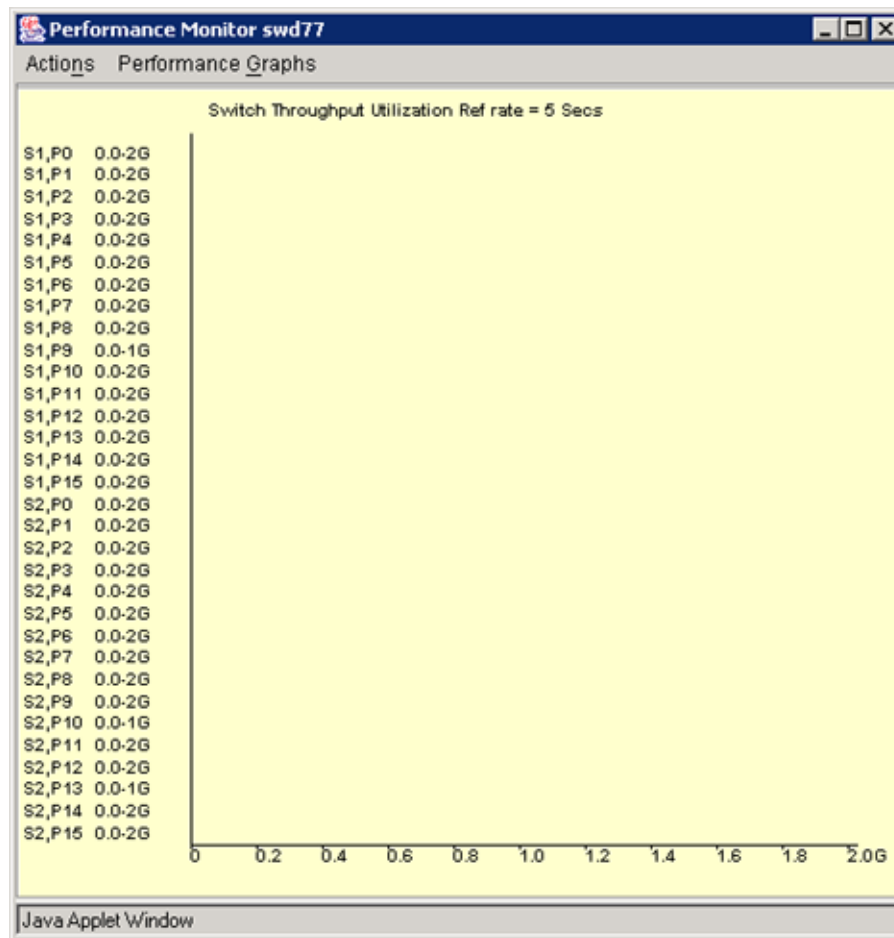


Figure 2-2 Performance Monitor Window

Using Performance Graphs

Graphs are provided to simplify performance monitoring. A wide range of end-to-end fabric, LUN, device, and port metrics graphs are included. Table 2-1 lists the performance graphs available. Basic Monitoring graphs are accessible on switches that do not have a Performance Monitoring license activated. The Advanced Monitoring graphs give more detailed performance information to aid with fabric management.

Table 2-1 Predefined Performance Graphs

Basic Monitoring	Description
Port Throughput	Displays the performance of a port in bytes/second for frames received and transmitted
Switch Aggregate Throughput	Displays the aggregate performance of all ports on a switch.
Switch Throughput Utilization	Displays the port throughput at the time the sample is taken.
Port Error	Displays a line of CRC errors for a given port.
Switch Percent Utilization	Displays the percentage of usage of a chosen switch at the time the sample is taken.
Port Snapshot Error	Displays the CRC error count between sampling periods for all the ports on a switch.
Advanced Monitoring	Description
SID/DID Performance	Displays the traffic between SID and DID pair on the switch being managed.
SCSI vs. IP Traffic	Displays percentage of SCSI versus IP frame traffic on each individual port.
AL_PA Errors	Displays CRC errors for a given port and a given AL_PA.
SCSI Commands by port and LUN (R, W, R/W)	Displays the total number of Read/Write commands on a given port and Read/Write commands to a specific LUN.

To access Performance Graphs, follow these steps:

1. On the Performance Monitoring window, click **Performance Graphs**.
2. Select either **Basic Monitoring** or **Advanced Monitoring**, and choose the specific graphs from the submenus, as shown in [Figure 2-3 on page 2-5](#).

Figure 2-3 shows how to access the list of advanced performance monitoring graphs using Web Tools.

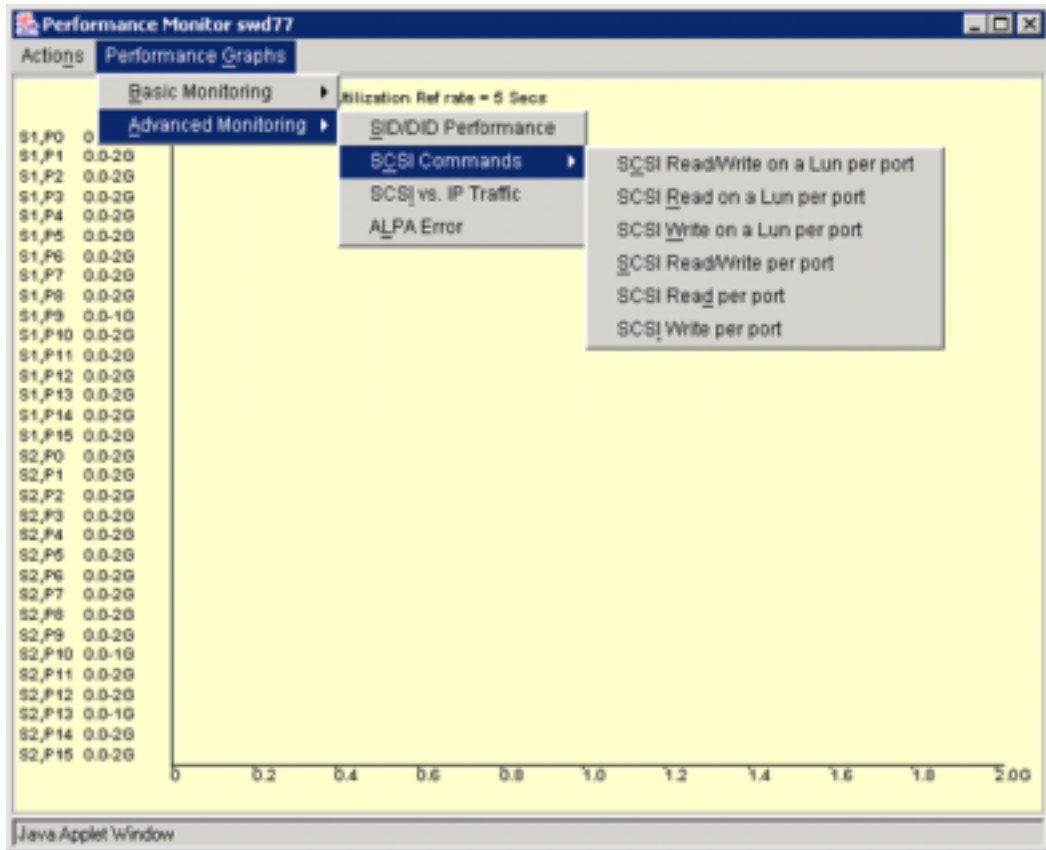


Figure 2-3 Accessing Performance Graphs

User-defined Graphs

The predefined graphs can be modified based on parameter fields such as SID/DID, LUN, AL_PA, and port. These user-defined graphs can be added and saved to canvas configurations. Figure 2-4 shows a list of user-defined graphs defined in a canvas.

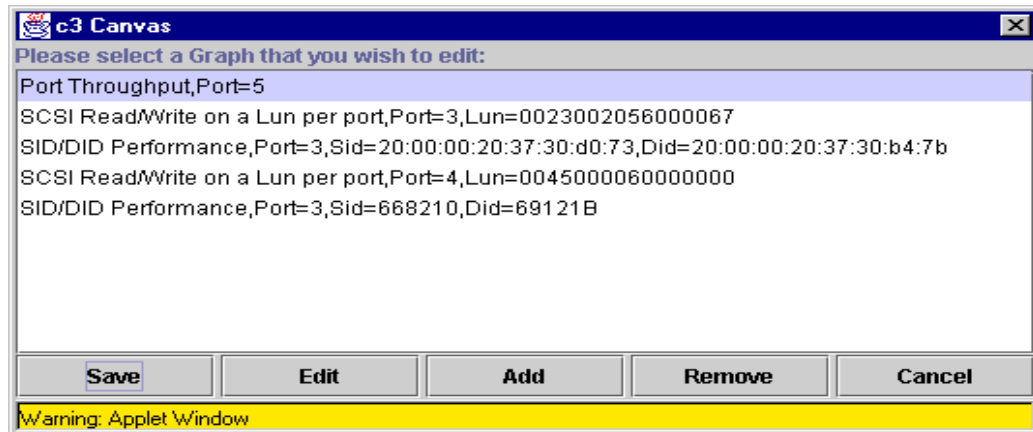


Figure 2-4 User-defined Graphs

In addition to the graphs, the Performance Monitoring Resource Usage Display (shown in Figure 2-5) shows which filter slots have been used for each port, and which are available. The color-coded interface facilitates troubleshooting.

SLOT,PORT	EE0	EE1	EE2	EE3	EE4
Slot1,Port0	Free	Free	Free	Free	Free
Slot1,Port1	Free	Free	Free	Free	Free
Slot1,Port2	Free	Free	Free	Free	Free
Slot1,Port3	Free	Free	Free	Free	Free
Slot1,Port4	Free	Free	Free	Free	Free
Slot1,Port5	Free	Free	Free	Free	Free
Slot1,Port6	Free	Free	Free	Free	Free
Slot1,Port7	Free	Free	Free	Free	Free
Slot1,Port8	Free	Free	Free	Free	Free
Slot1,Port9	Free	Free	Free	Free	Free
Slot1,Port10	Free	Free	Free	Free	Free
Slot1,Port11	Free	Free	Free	Free	Free
Slot1,Port12	Free	Free	Free	Free	Free
Slot1,Port13	Free	Free	Free	Free	Free
Slot1,Port14	Free	Free	Free	Free	Free
Slot1,Port15	Free	Free	Free	Free	Free
Slot2,Port0	Free	Free	Free	Free	Free
Slot2,Port1	Free	Free	Free	Free	Free
Slot2,Port2	Free	Free	Free	Free	Free
Slot2,Port3	Free	Free	Free	Free	Free
Slot2,Port4	Free	Free	Free	Free	Free
Slot2,Port5	Free	Free	Free	Free	Free
Slot2,Port6	Free	Free	Free	Free	Free

Refresh Cancel

Java Applet Window

Figure 2-5 Performance Monitoring Resource Usage Display

Configuring a Performance Graph Canvas

Using Web Tools, Performance Monitoring allows you to set up a canvas of performance graphs. The canvas can hold up to eight graphs per window, as shown in Figure 2-6. Multiple canvases can be set up for different users or different scenarios.

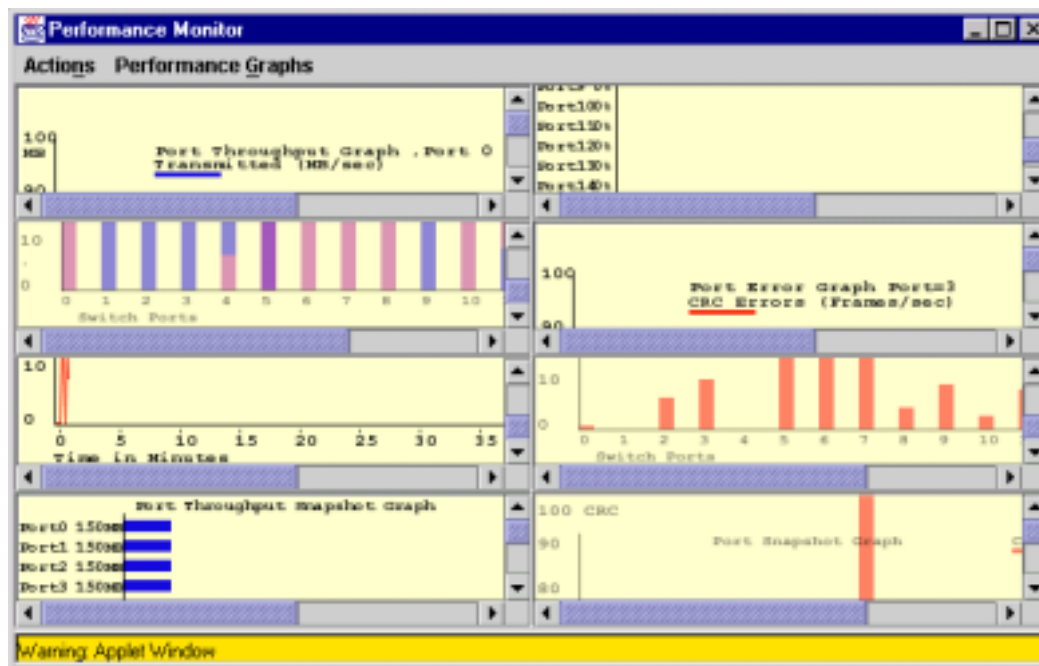


Figure 2-6 Canvas of Eight Performance Monitoring Graphs

Adding Graphs to a Canvas

To add graphs to a canvas:

1. On the Performance Monitor window, click the **Performance Graphs** menu.
2. Select the graph you want to add to the canvas, from either the **Basic** or **Advanced Monitoring** submenus. For a description of each of the graphs available, refer to [Table 2-1 on page 2-4](#).
3. Use the **Actions** menu on the Performance Monitor window to
 - Save current canvas configuration.
 - Display canvas configuration.
 - Display current canvas configuration.
 - Print all graphs.

Saving Canvas Configurations

Up to 20 individual canvases, each with up to eight graphs, can be saved. Each canvas is saved with a name and an optional brief description.

To save a current canvas configuration:

On the Performance Monitor window, from the **Actions** menu, select **Save Current Canvas Configuration**. Figure 2-7 shows an example of saved canvases.

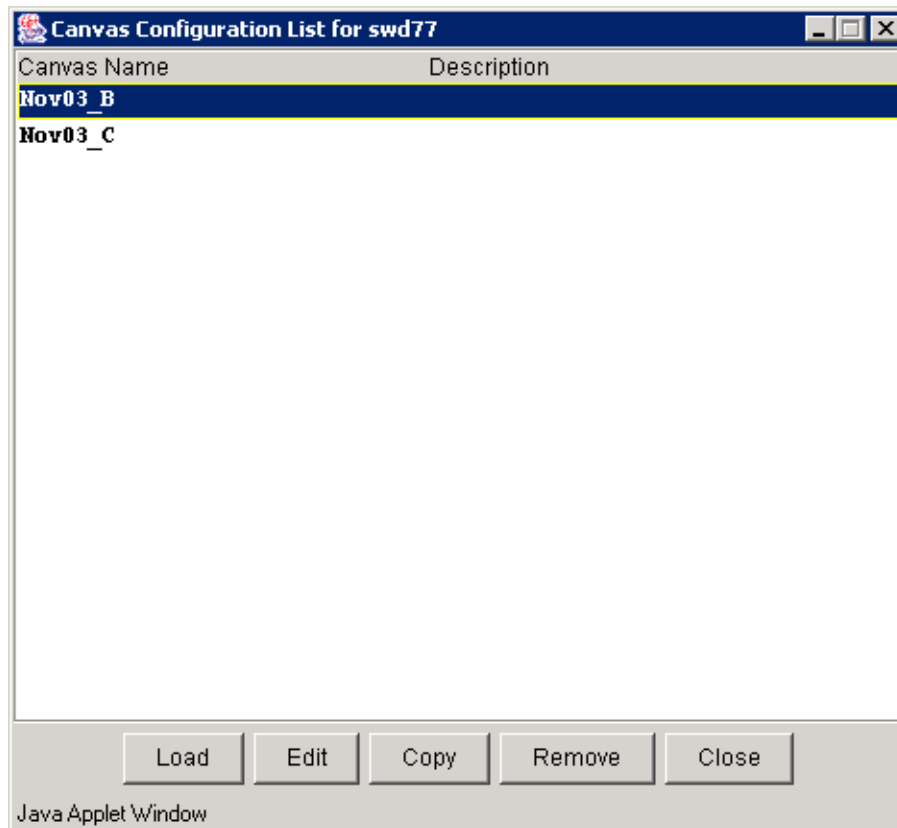


Figure 2-7 Saved Canvas Configurations

For a filter to be matched, each element specified in the filter must match at least one of the user-defined values. The range of offsets that can be matched using filters is 0 to 63. Examples of Fibre Channel frame statistics that can be measured using filters are:

- SCSI Read, Write, or Read/Write commands
- IP versus SCSI traffic comparison

Note: In 4.x the implementation of End-to-End (or Filter-based) monitors dictates the hardware counters to be probed at an interval that is a multiple of 5 seconds. For 4.x it is recommended the probing interval be at least 10 seconds. This restriction does not exist in 3.x.

Telnet Commands

Using telnet commands, you can track the following:

- Number of CRC errors for AL_PA devices
- Number of words received and transmitted in Fibre Channel frames with a defined SID/DID pair
- Number of frames with CRC errors received at the port with a defined SID/DID pair
- Number of times a particular filter pattern in a frame is transmitted by a port

Using AL_PA Performance Monitoring

AL_PA performance monitoring tracks and displays the number of CRC errors that have occurred on frames sent from each AL_PA on a specific port. AL_PA-based performance monitoring does not require explicit configuration. The switch hardware and firmware automatically monitors CRC errors for all valid AL_PAs.

Note: A system with blade slot/port syntax is used and on a system without blades, port number is used instead. All examples in this document use slot/port syntax.

Displaying the CRC Error Count

To display the CRC error count for all AL_PA devices or a single AL_PA on a specific port, use the **perfshowalpacrc** command. The port must be an active L_Port. The command used in the example displays the CRC error count for all AL_PA devices on port 3.

Example:

```
switch:admin> perfshowalpacrc 1/3
AL_PA      CRC count
-----
0x01      2
0x02      0
0x04      1
```

The command used in the example, displays the CRC error count for AL_PA 0x01 on port 3.

Example:

```
switch:admin> perfshowalpacrc 1/3, 0x01
The CRC count at ALPA 0x1 on port 3 is 0x000000002.
```

Clearing the CRC Error Count

To clear the CRC error count for AL_PA devices on a specific port, use the **perfclralpacrc** command. Using this command you can either clear the error counts for a specific AL_PA or clear the error counts on all AL_PA devices on a port. The command used in the first example below, clears the CRC error count for all AL_PA devices on port 3. The command used in the second example below, clears the CRC error count for AL_PA 0x01 on port 3.

Note: In 3.1 and 4.1 issuing portStatsClear command on a port will also result in all AL_pa based CRC error counters being cleared for all the ports in the same quad.

Example:

```
switch:admin> perfclralpacrc 1/3
No ALPA value is specified. This will clear all ALPA CRC
counts on port 3. Do you want to continue? (yes, y, no, n): [no]
Please wait ...
All alpa CRC counts are cleared on port 3.
```

Example:

```
switch:admin> perfclralpacrc 1/3, 0x01
CRC error count at ALPA 0x1 on port 3 is cleared.
```

Using End-to-End Performance Monitoring

End-to-End performance monitoring counts the number of words and CRC errors in Fibre Channel frames for a specified Source ID (SID) and Destination ID (DID) pair. An end-to-end performance monitor counts the number of

- Words in frames received at the port (RX_COUNT).
- Words in frames transmitted from the port (TX_COUNT).
- Frames received at or transmitted from the port with CRC errors (CRC_COUNT).

To enable end-to-end performance monitoring, you must configure an end-to-end monitor on a port, specifying the SID-DID pair. The monitor counts only those frames with matching SID and DID. Each SID or DID has three fields, listed in the following order:

- Domain ID (DD)
- Area ID (AA)
- AL_PA (PP)

The SID 0x118a0f has Domain ID 0x11, Area ID 0x8a, and AL_PA 0x0f. (The prefix “0x” denotes a hexadecimal number.)

Adding End-to-End Monitors

Use this command to add an End-to-End monitor to a port. The monitor counts the number of words received, number of words transmitted, and number of CRC errors detected in frames qualified using either of following two conditions:

1. For frames received at the port (with End-to-End monitor installed) the frame SID is the same as “SourceID” and frame DID is the same as “DestID”. Both RX_COUNT and CRC_COUNT will be updated accordingly.
2. For frames transmitted from the port (with End-to-End monitor installed) the frame DID is the same as “SourceID” and frame SID is the same as “DestID”, TX_COUNT, and CRC_COUNT will be updated accordingly.

Depending on the application, any port along the routing path can be selected for such monitoring.

Figure 2-8 shows two devices:

- Host A, which is connected to domain 5, switch area port 12 (AL_PA 0x00) on Switch X
- Dev B, which is connected to domain 11, switch area port 30 (AL_PA 0xef) on Switch Y.

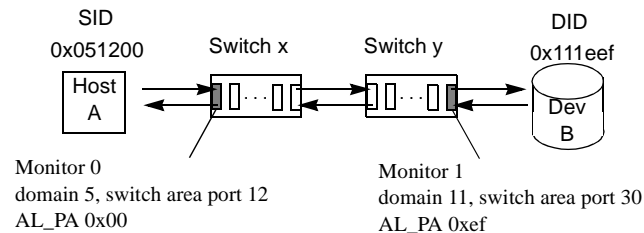


Figure 2-8 Setting End-to-End Monitors on a Port

To monitor the traffic from Host A to Dev B, add a monitor to slot 1, port 2, specifying 0x051200 as the SID and 0x111eef as the DID. To monitor the traffic from Dev B to Host A, add a monitor to slot 2, port 15, specifying 0x111eef as the SID and 0x051200 as the DID. Use the commands shown in the two examples below.

Example:

```
switch:admin> perfaddeemonitor 1/12, "0x051200" "0x111eef"
End-to-End monitor number 0 added.
```

Example:

```
switch:admin> perfaddeemonitor 2/14, "0x111eef" "0x051200"
End-to-End monitor number 1 added.
```

Monitor 0 counts the frames that have an SID of 0x051200 and a DID of 0x111eef. For monitor 0, RX_COUNT is the number of words from Host A to Dev B, TX_COUNT is the number of words from Dev B to Host A, and CRC_COUNT is the number of frames in both directions with CRC errors.

Monitor 1 counts the frames that have an SID of 0x111eef and a DID of 0x051200. For monitor 1, RX_COUNT is the number of words from Dev B to Host A, TX_COUNT is the number of words from Host A to Dev B, and CRC_COUNT is the number of frames in both directions with CRC errors.

Note: End-to-end performance monitoring monitors traffic on the receiving port respective to the SID only. In Figure 2-8, if you add a monitor to slot 2, port 14 specifying Dev B as the SID and Host A as the DID, no counters, except CRC, will be incremented.

Figure 2-9 shows several switches and the proper ports on which to add performance monitors for a specified SID-DID pair.

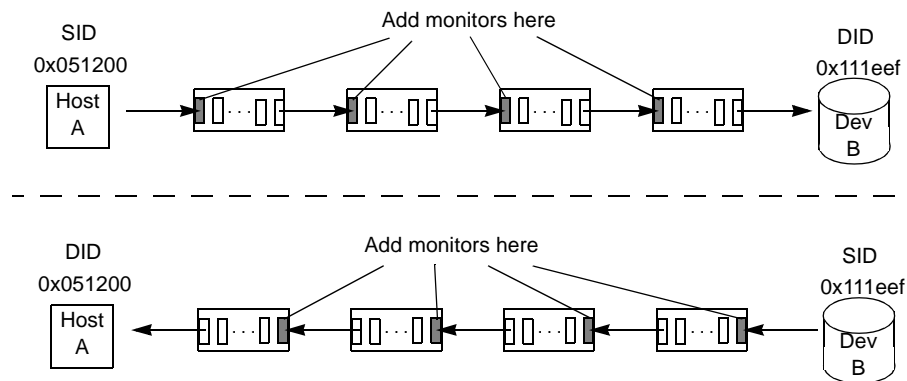


Figure 2-9 Proper Placement of End-to-End Performance Monitors

Setting a Mask for End-to-End Monitors

End-to-End monitors count the number of words in Fibre Channel frames that match a specific SID/DID pair. If you want to match only part of the SID or DID, you can set a mask on the port to compare only certain parts of the SID or DID. With no mask set, the frame must match the entire SID and DID to trigger the monitor. By setting a mask, you can choose to have the frame match only one or two of the three fields (Domain ID, Area ID, AL_PA) to trigger the monitor.

Note: Only one mask per port can be set. When setting a mask, all existing end-to-end monitors will be deleted.

The example specifies the mask in the form.

Example:

```
"dd:aa:pp"
```

Where

- *dd* is the Domain ID mask
- *aa* is the Area ID mask
- *pp* is the AL_PA mask.

The values for *dd*, *aa*, and *pp* are either **ff** (the field must match) or **00** (the field is ignored).

To set a mask for end-to-end monitors use the **perfsetporteemask** command. The command sets the mask for all end-to-end monitors of a port. If any End-to-End monitors are programmed on a port when the **perfsetporteemask** command is issued, you will see the message displayed as in the example.

Example:

```
'< n > EE monitors are currently programmed on this port. Changing EE mask
for this port will cause ALL EE monitors on this port to be deleted.
Do you want to continue? (yes, y, no, n): [no]

EE mask on port <port-number> is set and EE monitors were deleted
```

The **perfsetporteemask** command sets a mask for the Domain ID, Area ID, and AL_PA of the SIDs and DIDs for frames transmitted from and received by the port. Figure 2-10 shows the mask positions in the command.

In Figure 2-10, a mask (“ff”) is set on slot 1, port 2 to compare the AL_PA fields on the SID and DID in all frames (transmitted and received) on port 2. The frame SID and DID must match only the AL_PA portion of the specified SID-DID pair. Each port can have only one EE mask. The mask is applied to all end-to-end monitors on the port. Individual masks for each monitor on the port cannot be specified. The default EE mask value upon power-on is “ff:ff:ff” for everything—SID and DID on all transmitted and received frames.

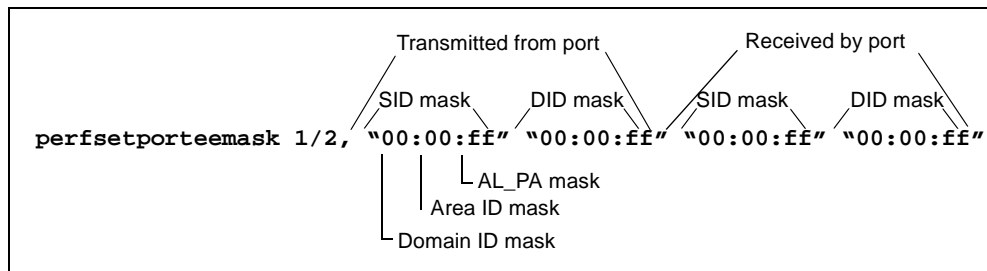


Figure 2-10 Mask Positions for End-to-End Monitors

If the monitor on a port is set as in the example, then the frame SID must be “0x051200” and the frame DID must be “0x111eef” to trigger the monitor.

Example:

```
perfaddeemonitor 1/2, "0x051200" "0x111eef"
```

Displaying the End-to-End Mask of a Port

The **perfshowporteemask** command is used to display the current end-to-end mask of a port. The end-to-end mask has 12 fields, and each field has a value of **on** or **off**. The examples sets an end-to-end mask on port 11 and displays the mask.

Example:

```
switch:admin> perfsetporteemask 1/11,
"00:00:ff" "00:00:ff" "00:00:ff" "00:00:ff"
The EE mask on port 11 is set and EE counters are reset.
```

Example:

```
switch:admin> perfshowportteemask 1/11
The EE mask on port 11 is set by application TELNET
TxSID Domain:  off
TxSID Area:    off
TxSID ALPA:    on
TxDID Domain:  off
TxDID Area:    off
TxDID ALPA:    on
RxSID Domain:  off
RxSID Area:    off
RxSID ALPA:    on
RxDID Domain:  off
RxDID Area:    off
RxDID ALPA:    on
```

Displaying End-to-End Monitors

The **perfshoweemonitor** command is used to display all the end-to-end monitors defined on a port. Cumulative counters or a rolling table of counters can be displayed at specified intervals. This command displays the following information on all end-to-end monitors:

- Monitor number (KEY)
- SID
- DID
- CRC error count (CRC_COUNT)
- Number of Fibre Channel words transmitted (TX_COUNT)
- Number of Fibre Channel words received (RX_COUNT)
- Creator application (OWNER_APP)
- IP address of the creator, if known (OWNER_IP_ADDR)

If an interval number is specified in the **perfshoweemonitor** command, the command displays a rolling table of CRC error, TX, and RX counters on a per-interval basis for all the valid monitors on the port. The counter values are the number of bytes, in decimal format. If you omit the display interval number, the command displays the cumulative transmit counter (TX_COUNT), receive counter (RX_COUNT), and CRC error counter. These cumulative counters are 64-bit values in hexadecimal format.

The example displays all of the end-to-end monitors on port 3. In this example, three monitors are on port 3, numbered 0, 1, and 2.

Note: In 4.x, registers are scanned every 5 seconds and display intervals should be specified in multiples of 5 seconds. In 3.x, there is no requirement for the interval restriction.

Example:

```
switch:admin> perfshoweemonitor 1/3, 5
perfShowEEMonitor 3, 5: Tx/Rx are # of bytes and crc is # of crc errors
```

0			1			2		
-----	-----	-----	-----	-----	-----	-----	-----	-----
crc	Tx	Rx	crc	Tx	Rx	crc	Tx	Rx
=====	=====	=====	=====	=====	=====	=====	=====	=====
0	0	0	0	0	0	0	0	0
0	53m	4.9m	0	53m	4.9m	0	53m	4.9m
0	53m	4.4m	0	53m	4.4m	0	53m	4.4m
0	53m	4.8m	0	53m	4.8m	0	53m	4.8m
0	53m	4.6m	0	53m	4.6m	0	53m	4.6m
0	53m	5.0m	0	53m	5.0m	0	53m	5.0m
0	52m	4.6m	0	52m	4.6m	0	52m	4.6m

Note: In the above example, “m” stands for megabytes. You may also see “g” for gigabytes, or “k” for kilobytes.

The example displays the cumulative counters on all end-to-end monitors defined on port 3. The KEY column contains the monitor number.

Example:

```
switch:admin> perfshoweemonitor 1/3
There are 3 end-to-end monitor(s) defined on port 3.
```

KEY	SID	DID	OWNER_APP	OWNER_IP_ADDR	TX_COUNT	RX_COUNT	CRC_COUNT
-----	-----	-----	-----	-----	-----	-----	-----
0	0xb1300	0xb23ef	TELNET	NA	0x00000004d0ba9915	0x0000000067229e65	0x0000000000000000
1	0xb1200	0xb22ef	TELNET	NA	0x00000004d0baa754	0x0000000067229e87	0x0000000000000000
2	0x58e0f	0x1182ef	WEB_TOOLS	192.168.169.40	0x00000004d0bade54	0x0000000067229e87	0x0000000000000000

Deleting End-to-End Monitors

The **perfdeleemonitor** command is used to delete an end-to-end monitor on a port. Indicate which monitor to delete by specifying the monitor number that was returned by a previous **perfaddeemonitor** command. The example deletes the end-to-end monitor number 0 on port 2.

Example:

```
switch:admin> perfdeleemonitor 1/2, 0
End-to-End monitor number 0 deleted
```

Clearing End-to-End Monitor Counters

To clear statistics counters for all or a specified end-to-end monitor on a port, use the **perfcleareemonitor** command. After the command has been executed, the telnet shell confirms that the monitor counters have been cleared. Before issuing this command, verify that all of the valid end-to-end monitor numbers on a specific port using the **perfshoweemonitor** command to make sure the correct monitor counters will be cleared. The example clears statistic counters for an end-to-end monitor on slot 1, port 2, monitor 5.

Note: In 4.1 and 3.1 issuing the command **portStatsClear** on a port will also result in all End-to-End monitors being cleared for all the ports in the same quad.

Example:

```
switch:admin> perfcleareemonitor 1/2, 5
End-to-End monitor number 5 counters are cleared
```

Using Filter-based Performance Monitoring

Filter-based monitoring counts the number of times a frame with a particular pattern is received by a port. Filter-based monitoring is achieved by configuring a filter for a particular purpose. The filter can be a standard filter (for example, a read command filter that counts the number of read commands that have been received by the port) or a user-defined filter that you customize for your particular use. The maximum number of filters is eight per port, in any combination of standard filters and user-defined filters.

Adding Standard Filter-based Monitors

Table 2-2 lists the telnet commands used when you add standard filter-based monitors to a port.

Table 2-2 Telnet Commands to Add Filter-based Monitors

Telnet command	Description
perfaddreadmonitor	Count the number of SCSI Read commands.
perfaddwritemonitor	Count the number of SCSI Write commands.
perfaddrwmonitor	Count the number of SCSI Read and Write commands.
perfaddscsimonitor	Count the number of SCSI traffic frames.
perfaddipmonitor	Count the number of IP traffic frames.

The example adds filter-based monitors to port 2 using the **perfaddreadmonitor** command and displays the results.

Example:

```
switch:admin> perfaddreadmonitor 1/2
SCSI Read filter monitor #0 added
```

The example adds filter-based monitors to port 2 using the **perfaddwritemonitor** command and displays the results.

Example:

```
switch:admin> perfaddwritemonitor 1/2
SCSI Write filter monitor #1 added
```

The example adds filter-based monitors to port 2 using the **perfaddrwmonitor** command and displays the results.

Example:

```
switch:admin> perfaddrwmonitor 1/2
SCSI Read/Write filter monitor #2 added
```

The example adds filter-based monitors to port 2 using the **perfaddscsimonitor** command and displays the results.

Example:

```
switch:admin> perfaddscsimonitor 1/2
SCSI traffic frame monitor #3 added
```

The example adds filter-based monitors to port 2 using the **perfaddipmonitor** command and displays the results.

Example:

```
switch:admin> perfaddipmonitor 1/2
IP traffic frame monitor #4 added
```

The example displays filter-based monitors configured on port 2 using the **perfshowfiltermonitor** command.

Example:

```
switch:admin> perfshowfiltermonitor 1/2
There are 5 filter-based monitors defined on port 2.
```

KEY	ALIAS	OWNER_APP	OWNER_IP_ADDR	FRAME_COUNT
0	SCSI Read	TELNET	N/A	0x0000000000000000
1	SCSI Write	TELNET	N/A	0x0000000000000000
2	SCSI R/W	TELNET	N/A	0x0000000000000000
3	SCSI Frame	TELNET	N/A	0x0000000000000000
4	IP Frame	TELNET	N/A	0x0000000000000000

Adding User-defined Filter-based Monitors

In addition to the standard filters (read, write, read/write, and frame count), you can create custom filters to qualify frames to gather statistics to fit your needs.

To define a custom filter, use the **perfaddusermonitor** telnet command. With this command, you must specify a series of *offsets*, *masks*, and *values*. For all incoming frames, the switch

- Locates the byte found in the frame at the specified *offset*.
- Applies the *mask* to the byte found in the frame.

- Compares the value with the given *values* in the **perfaddusermonitor** command.
- Increments the filter counter if a match is found.

Up to six different offsets for each port and up to four values to compare against each offset can be specified. If more than one offset is required to properly define a filter, the bytes found at each offset must match one of the given values for the filter to increment its counter. If one or more of the given offsets does not match any of the given values, the counter does not increment.

The value of the offset must be between 0 and 63, in decimal format. Byte 0 indicates the first byte of the Start of Frame (SOF), byte 4 is the first byte of the frame header, and byte 28 is the first byte of the payload. Thus only the SOF, frame header, and first 36 bytes of payload may be selected as part of a filter definition. Offset 0 is a special case, which can be used to monitor the first 4 bytes of the frame (SOF). When the *offset* is 0, the *values* are from 0–7, as indicated in Table 2-3.

Table 2-3

0	SOFf
1	SOFc1
2	SOFi1
3	SOFn1
4	SOFi2
5	SOFn2
6	SOFi3
7	SOFn3

The hardware can manage only 16 unique offsets and values, 13 of which are already specified. Three offsets can be created as new user defined offsets. If the switch does not have enough resources to create a given filter, then other filters may have to be deleted to free up resources.

The example adds a filter-based monitor to count all FCP and IP frames received from domain 0x02 for port 2 on slot 4. The FCP and IP protocols are selected by monitoring offset 12, mask 0xff and matching values of 0x05 or 0x08. Domain 2 is selected by monitoring offset 9, mask 0xff, and matching a value of 0x02.

Example:

```
switch:admin> perfaddusermonitor 4/2,
"12, 0xff, 0x05, 0x08; 9, 0xff, 0x02" "FCP/IP"
User monitor #5 added
```

The monitor counter is incremented for all outgoing frames from port 2 where byte 9 is 0x02 and byte 12 is 0x05 or 0x08. The example adds a special case filter-based monitor for SOFi3 on slot 1, port 2.

Example:

```
switch:admin> perfaddusermonitor 1/2, "0, 0xff, 6"
User Monitor #6 added
```

Displaying Filter-based Monitors

Use the **perfshowfiltermonitor** command to display all the filter-based monitors on a specified port. The cumulative count of the traffic detected by the monitors can be displayed, or you can display a snapshot of the traffic at specified intervals.

Note: In 4.x, registers are scanned every 5 seconds and display intervals should be specified in multiples of 5 seconds. In 3.x, there is no requirement for the interval restriction.

The example displays filter monitor traffic on slot 1, port 2 at an interval of once every 5 seconds. In the command output, “#CMDs” refers to the read, write, and read-write counters, and “#Frames” refers to SCSI frame, IP frame, and user-defined counters.

Example:

```
switch:admin> perfshowfiltermonitor 1/2, 5
  0          1          2          3          4          5          6
  #CMDs     #CMDs     #CMDs     #Frames   #Frames   #Frames   #CMDs
-----
  0          0          0          0          0          0          0
26k         187        681        682        682        494        187
26k         177        711        710        710        534        176
26k         184        734        734        734        550        184
26k         182        649        649        649        467        182
26k         188        754        755        755        567        184
```

The example displays the cumulative frame count of all filter-based monitors defined on port 2. The KEY column lists the monitor numbers.

Example:

```
switch:admin> perfshowfiltermonitor 1/2
There are 7 filter-based monitors defined on port 2.
KEY   ALIAS   OWNER_APP   OWNER_IP_ADDR   FRAME_COUNT
-----
0     SCSI Read  TELNET           N/A             0x0000000000002208
1     SCSI Write TELNET           N/A             0x000000000000464a
2     SCSI R/W   TELNET           N/A             0x000000000000fd8c
3     SCSI Frame WEB_TOOLS       192.168.169.40 0x000000000002c2229
4     IP Frame   WEB_TOOLS       192.168.169.40 0x0000000000000492
5     FCP/IP     WEB_TOOLS       192.168.169.40 0x0000000000000009
6     SCSI_RD    WEB_TOOLS       192.168.161.140 0x000000000000023a
```

Deleting Filter-based Monitors

To delete a filter-based monitor:

1. List the valid monitor numbers using the **perfshowfiltermonitor** command.
2. Use the **perfdelfiltermonitor** command to delete a specific monitor. If you do not specify which monitor number to delete, you are asked if you want to delete all entries.

The example displays the monitors on port 4 using the **perfshowfiltermonitor** command (the monitor numbers are listed in the KEY column).

Example:

```
switch:admin> perfshowfiltermonitor 1/4
There are 4 filter-based monitors defined on port 4.
KEY    ALIAS    OWNER_APP    OWNER_IP_ADDR    FRAME_COUNT
-----
0  SCSI Read  TELNET                N/A    0x0000000000002208
1  SCSI Write TELNET                N/A    0x000000000000464a
2  SCSI R/W  TELNET                N/A    0x000000000000fd8c
3  SCSI Frame WEB_TOOLS    192.168.169.40  0x000000000002c229
```

The example deletes monitor number 1 on slot 1, port 4 using the **perfdelfiltermonitor** command.

Example:

```
switch:admin> perfdelfiltermonitor 1/4, 1
The specified filter-based monitor is deleted.
```

Clearing Filter-based Monitor Counters

Before you clean statistics counters, verify all of the valid monitor numbers with user-defined aliases on a specific port using the **perfshowfiltermonitor** command, to make sure the correct monitor counters are cleared. To clear statistics counters for all or a specified filter-based monitor, use the **perfclearfiltermonitor** command. After the command has been executed, the telnet shell confirms that the counters on the monitor have been cleared.

Note: In 4.1 and 3.1 issuing the command **portStatsClear** on a port will also result in all Filter-based monitors being cleared for all the ports in the same quad.

The example clears the statistics counters for a filter-based monitor 4 on port 2 in slot 1.

Example:

```
switch:admin> perfclearfiltermonitor 1/2, 4
Filter-based monitor number 4 counters are cleared
```

Saving and Restoring Monitor Configuration

The **perfcfgsave** command is used to save the current end-to-end and filter monitor configuration settings into flash memory. You can use the **perfcfgrestore** command to restore the saved monitor configuration from flash memory. For example, after a power cycle you want to use the same end-to-end and filter monitoring configuration that was in effect prior to the power cycle. Follow these steps:

1. Use the **perfcfgsave** command to save the monitor configuration settings.
2. Power cycle the switch.
3. Use the **perfcfgrestore** command to restore the saved monitor configuration.

The example saves the monitor configuration settings using the **perfcfgsave** command.

Example:

```
switch:admin> perfcfgsave
This will overwrite previously saved Performance Monitoring settings in FLASH ROM.
Do you want to continue? (yes, y, no, n): [no]
Please wait...
Committing configuration...done.
Performance monitoring configuration saved in FLASH ROM.
```

The example restores the saved monitor configuration using the **perfcfgrestore** command.

Example:

```
switch:admin> perfcfgrestore
This will overwrite current Performance Monitoring settings in RAM. Do you want to
continue? (yes, y, no, n): [no]
Please wait...
Performance monitoring configuration restored from FLASH ROM.
```

The **perfcfgclear** command is used to clear the previously saved performance monitoring configuration settings from flash memory, as in the example.

Example:

```
switch:admin> perfcfgclear
This will clear Performance Monitoring settings in FLASH ROM. The RAM settings won't
change. Do you want to continue? (yes, y, no, n): [no]
Please wait...
Committing configuration...done.
Performance Monitoring configuration cleared from FLASH.
```


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