

# Brocade NetIron Administration Guide

Supporting Multi-Service Ironware R05.9.00b

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# Preface

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## Document conventions

The document conventions describe text formatting conventions, command syntax conventions, and important notice formats used in Brocade technical documentation.

## Text formatting conventions

Text formatting conventions such as boldface, italic, or Courier font may be used in the flow of the text to highlight specific words or phrases.

Format	Description
<b>bold text</b>	Identifies command names Identifies keywords and operands Identifies the names of user-manipulated GUI elements
<i>italic text</i>	Identifies text to enter at the GUI Identifies emphasis Identifies variables
Courier font	Identifies document titles Identifies CLI output Identifies command syntax examples

## Command syntax conventions

Bold and italic text identify command syntax components. Delimiters and operators define groupings of parameters and their logical relationships.

Convention	Description
<b>bold text</b>	Identifies command names, keywords, and command options.
<i>italic text</i>	Identifies a variable.
value	In Fibre Channel products, a fixed value provided as input to a command option is printed in plain text, for example, <b>--show</b> WWN.
[ ]	Syntax components displayed within square brackets are optional.
{ x   y   z }	Default responses to system prompts are enclosed in square brackets. A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options.
x   y	In Fibre Channel products, square brackets may be used instead for this purpose. A vertical bar separates mutually exclusive elements.
< >	Nonprinting characters, for example, passwords, are enclosed in angle brackets.

Convention	Description
...	Repeat the previous element, for example, <i>member{member...}</i> .
\	Indicates a "soft" line break in command examples. If a backslash separates two lines of a command input, enter the entire command at the prompt without the backslash.

## Notes, cautions, and warnings

Notes, cautions, and warning statements may be used in this document. They are listed in the order of increasing severity of potential hazards.

### NOTE

A Note provides a tip, guidance, or advice, emphasizes important information, or provides a reference to related information.

### ATTENTION

An Attention statement indicates a stronger note, for example, to alert you when traffic might be interrupted or the device might reboot.



### CAUTION

A Caution statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.



### DANGER

*A Danger statement indicates conditions or situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these conditions or situations.*

## Brocade resources

Visit the Brocade website to locate related documentation for your product and additional Brocade resources.

You can download additional publications supporting your product at [www.brocade.com](http://www.brocade.com). Select the Brocade Products tab to locate your product, then click the Brocade product name or image to open the individual product page. The user manuals are available in the resources module at the bottom of the page under the Documentation category.

To get up-to-the-minute information on Brocade products and resources, go to [MyBrocade](http://MyBrocade). You can register at no cost to obtain a user ID and password.

Release notes are available on [MyBrocade](http://MyBrocade) under Product Downloads.

White papers, online demonstrations, and data sheets are available through the [Brocade website](http://Brocade website).

## Contacting Brocade Technical Support

As a Brocade customer, you can contact Brocade Technical Support 24x7 online, by telephone, or by e-mail. Brocade OEM customers contact their OEM/Solutions provider.

## Brocade customers

For product support information and the latest information on contacting the Technical Assistance Center, go to <http://www.brocade.com/services-support/index.html>.

If you have purchased Brocade product support directly from Brocade, use one of the following methods to contact the Brocade Technical Assistance Center 24x7.

Online	Telephone	E-mail
Preferred method of contact for non-urgent issues: <ul style="list-style-type: none"> <li>• <a href="#">My Cases</a> through MyBrocade</li> <li>• <a href="#">Software downloads</a> and licensing tools</li> <li>• <a href="#">Knowledge Base</a></li> </ul>	Required for Sev 1-Critical and Sev 2-High issues: <ul style="list-style-type: none"> <li>• Continental US: 1-800-752-8061</li> <li>• Europe, Middle East, Africa, and Asia Pacific: +800-AT FIBREE (+800 28 34 27 33)</li> <li>• For areas unable to access toll free number: +1-408-333-6061</li> <li>• <a href="#">Toll-free numbers</a> are available in many countries.</li> </ul>	<a href="mailto:support@brocade.com">support@brocade.com</a> Please include: <ul style="list-style-type: none"> <li>• Problem summary</li> <li>• Serial number</li> <li>• Installation details</li> <li>• Environment description</li> </ul>

## Brocade OEM customers

If you have purchased Brocade product support from a Brocade OEM/Solution Provider, contact your OEM/Solution Provider for all of your product support needs.

- OEM/Solution Providers are trained and certified by Brocade to support Brocade® products.
- Brocade provides backline support for issues that cannot be resolved by the OEM/Solution Provider.
- Brocade Supplemental Support augments your existing OEM support contract, providing direct access to Brocade expertise. For more information, contact Brocade or your OEM.
- For questions regarding service levels and response times, contact your OEM/Solution Provider.

## Document feedback

To send feedback and report errors in the documentation you can use the feedback form posted with the document or you can e-mail the documentation team.

Quality is our first concern at Brocade and we have made every effort to ensure the accuracy and completeness of this document. However, if you find an error or an omission, or you think that a topic needs further development, we want to hear from you. You can provide feedback in two ways:

- Through the online feedback form in the HTML documents posted on [www.brocade.com](http://www.brocade.com).
- By sending your feedback to [documentation@brocade.com](mailto:documentation@brocade.com).

Provide the publication title, part number, and as much detail as possible, including the topic heading and page number if applicable, as well as your suggestions for improvement.



# About This Document

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## Audience

This document is designed for system administrators with a working knowledge of Layer 2 and Layer 3 switching and routing.

If you are using a Brocade device, you should be familiar with the following protocols if applicable to your network - IP, RIP, OSPF, BGP, ISIS, IGMP, PIM, MPLS, and VRRP.

## Supported hardware and software

The following hardware platforms are supported by this release of this guide:

**TABLE 1** Supported devices

Brocade NetIron XMR Series	Brocade NetIron MLX Series	NetIron CES 2000 and NetIron CER 2000 Series
Brocade NetIron XMR 4000	Brocade MLX-4	Brocade NetIron CES 2024C
Brocade NetIron XMR 8000	Brocade MLX-8	Brocade NetIron CES 2024F
Brocade NetIron XMR 16000	Brocade MLX-16	Brocade NetIron CES 2048C
Brocade NetIron XMR 32000	Brocade MLX-32	Brocade NetIron CES 2048CX
	Brocade MLXe-4	Brocade NetIron CES 2048F
	Brocade MLXe-8	Brocade NetIron CES 2048FX
	Brocade MLXe-16	Brocade NetIron CER 2024C
	Brocade MLXe-32	Brocade NetIron CER-RT 2024C
		Brocade NetIron CER 2024F
		Brocade NetIron CER-RT 2024F
		Brocade NetIron CER 2048C
		Brocade NetIron CER-RT 2048C
		Brocade NetIron CER 2048CX
		Brocade NetIron CER-RT 2048CX
		Brocade NetIron CER 2048F
		Brocade NetIron CER-RT 2048F
		Brocade NetIron CER 2048FX
		Brocade NetIron CER-RT 2048FX

## Supported software

For the complete list of supported features and the summary of enhancements and configuration notes for this release, refer to the *Brocade NetIron Unified R5.9.00b Release Notes*.

## How command information is presented in this guide

Starting with NetIron 5.6.00, command syntax and parameter descriptions are removed from commands that are referenced in configuration tasks. To find the full description of a specific command, including all required and optional keywords and variables, refer to the *NetIron Command Reference* for your software release.

## Notice to the reader

This document may contain references to the trademarks of the following corporations. These trademarks are the properties of their respective companies and corporations.

These references are made for informational purposes only.

Corporation	Referenced Trademarks and Products
Microsoft Corporation	Internet Explorer
Mozilla Corporation	Mozilla Firefox
Sun Microsystems	Java Runtime Environment

## Related publications

For the latest edition of these documents, which contain the most up-to-date information, see Documentation at <http://www.brocade.com/ethernetproducts>

- *Brocade NetIron Administration Guide*
- *Brocade NetIron Security Configuration Guide*
- *Brocade NetIron Switching Configuration Guide*
- *Brocade NetIron Routing Configuration Guide*
- *Brocade NetIron QoS and Traffic Management Configuration Guide*
- *Brocade NetIron Multicast Configuration Guide*
- *Brocade NetIron Multiprotocol Label Switch (MPLS) Configuration Guide*
- *Brocade NetIron Software Defined Networking (SDN) Guide*
- *Brocade NetIron YANG Configuration Guide*
- *Brocade NetIron MLX Series and NetIron XMR Series Diagnostic Reference*
- *Unified IP MIB Reference*
- *Brocade NetIron Software Upgrade Guide*
- *Brocade MLXe Series Hardware Installation Guide*
- *Brocade NetIron MLX Series and NetIron XMR Installation Guide*
- *Brocade NetIron CES 2000 Series and NetIron CER 2000 Series Hardware Installation Guide*

# Configuring Basic Parameters

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This chapter describes how to configure basic system parameters.

The Brocade device is configured with default parameters to allow you to begin using the basic features of the system immediately. However, many advanced features, such as VLANs or routing protocols for the device, must first be enabled at the system (global) level before they can be configured.

You can find system level parameters at the Global CONFIG level of the CLI.

## NOTE

Before assigning or modifying any device parameters, you must assign the IP subnet (interface) addresses for each port.

## Enabling and disabling interactivity for scripts

Table 2 lists certain configuration and action commands that are interactive by default.

Because these commands require a user response, confirmation, or result in multiple changes across the system before the device can complete the configuration changes, they cannot be used in scripts as they are. You can, however, disable the interactive behavior by entering the **prompt** command.

### Syntax: [no] prompt

The **no prompt** command will only disable the confirmation prompt for commands in configuration mode. Commands executed in the EXEC mode will continue to prompt for confirmation.

Entering the **no prompt** command allows you to use the commands and actions that are listed in [Table 2](#) within scripts without difficulty. After running a script, you can re-enable the default interactive behavior by entering the **prompt** command.

**TABLE 2** Interactive commands

Command type	Command
Configuration	cluster-l2protocol-forward route-only rate-limit policy-map spanning-tree pms disable enable violation deny violation restrict violation shutdown
Action	reboot-standby reset reload switchover power-off lp all   slot power-off power-supply index   forced hitless-reload mp primary   secondary lp primary   secondary power-supply monitoring clear all  index boot system flash primary   secondary

Default behavior for certain configuration commands:

```
device(config)#route-only
This will change the route-only behavior at the global level.
Are you sure? (enter 'y' or 'n'): y
Global 'route-only' committed.
```

Disabling default behavior to allow for script use:

```
device(config)#
no prompt
device(config)#no route-only
Global 'no route-only' committed.
```

Re-enabling default behavior:

```
device(config)#
prompt
device(config)#route-only
This will change the route-only behavior at the global level.
Are you sure? (enter 'y' or 'n'): y
Global 'route-only' committed.
```

## Entering system administration information

You can configure a system name, contact, and location for the Brocade device and save the information locally in the configuration file for future reference. The information is not required for system operation but recommended. When you configure a system name, it replaces the default system name in the CLI command prompt.

To configure a system name, contact, and location, enter commands such as the following.

```
device(config)# hostname home
home(config)# snmp-server contact Suzy Sanchez
home(config)# snmp-server location Centerville
home(config)# end
home# write memory
```

The system name you configure **home** replaces the system name device.

**Syntax:** `[no] hostname string`

**Syntax:** `[no] snmp-server contact string`

**Syntax:** `[no] snmp-server location string`

The *name*, contact, and location each can be up to 255 alphanumeric characters. The text strings can contain blanks. The SNMP text strings do not require quotation marks when they contain blanks but the host name does.

## Configuring optical monitoring

You can configure your Brocade device to monitor XFPs or SFPs in the system either globally or by specified port. If monitoring is enabled, console messages, syslog messages, and SNMP traps are sent when XFP or SFP operating conditions warrant it and a port is enabled.

Configure all XFP and SFP ports for optical monitoring, using the following command.

```
device(config)# optical-monitor
```

Configure a specific XFP or SFP port for optical monitoring, using the following command.

```
device(config)# interface ethernet 1/1
device(config-if-e10000-1/1)# optical-monitor
```

Configure a range of XFP or SFP ports for optical monitoring, using the following command.

```
device(config)# interface ethernet 1/1 to 1/2
device(config-mif-e10000-1/1-1/2)# optical-monitor
```

**Syntax:** `[no] optical-monitor alarm-interval`

The optional *alarm-interval* variable sets the interval in minutes between which alarms or messages are sent. The default interval is 3 minutes.

You can view the XFP optical monitoring information using the show optic command as displayed in the following.

```
device#show optic 4
Port Temperature Tx Power Rx Power Tx Bias Current
+-----+-----+-----+-----+-----+
4/1 30.8242 C -001.8822 dBm -002.5908 dBm 41.790 mA
     Normal Normal Normal Normal
4/2 31.7070 C -001.4116 dBm -006.4092 dBm 41.976 mA
     Normal Normal Normal Normal
4/3 30.1835 C Low-Alarm Normal 0.000 mA
     Normal Low-Alarm Normal Low-Alarm
4/4 0.0000 C Normal Normal Normal 0.000 mA
     Normal Normal Normal Normal
```

For Temperature, Tx Power, Rx Power, and Tx Bias Current, values are displayed along with one of the following status values: Low-Alarm, Low-Warn, Normal, High-Warn or High-Alarm. The thresholds that determine these status values are set by the manufacturer of the XFPs. [Table 3](#) describes each of these status values.

**TABLE 3** Status value description

Status value	Description
Low-alarm	The monitored level has dropped below the "low-alarm" threshold set by the XFP or SFP manufacturer.
Low-warn	The monitored level has dropped below the "low-warn" threshold set by the XFP or SFP manufacturer.
Normal	The monitored level is within the "normal" range set by the XFP or SFP manufacturer.
High-warn	The monitored level has climbed above the "high-warn" threshold set by the XFP or SFP manufacturer.
High-alarm	The monitored level has climbed above the "high-alarm" threshold set by the XFP or SFP manufacturer.

When the **show optic** command is issued on a BR-MLX-100GX interface card, the following conditions apply.

- The temperature is averaged over all lanes.
- TX bias, RX power and RX power are aggregate values.

#### NOTE

This function takes advantage of information stored and supplied by the SFP or XFP device. This information is an optional feature of the Multi-Source Agreement standard defining the SFP or XFP interface. Not all component suppliers have implemented this feature set. In such cases where the SFP or XFP device does not supply the information, a "Not Available" message will be displayed for the specific port that the device is installed

## Displaying optical monitoring thresholds

To display information about the optical monitoring thresholds, enter the following command.

```
device#show optic threshold 3
Port 3/1
Transceiver Temperature High alarm 4600 70.0000 C
Transceiver Temperature High warning 4400 68.0000 C
Transceiver Temperature Low warning 0200 2.0000 C
Transceiver Temperature Low alarm 0000 0.0000 C
VCC Voltage High alarm 875a 3.4650 mV
VCC Voltage High warning 8610 3.4320 mV
VCC Voltage Low warning 7bc0 3.1680 mV
VCC Voltage Low alarm 7a76 3.1350 mV
SOA Bias Current High alarm 0000 0.000 mA
SOA Bias Current High warning 0000 0.000 mA
SOA Bias Current Low warning 0000 0.000 mA
SOA Bias Current Low alarm 0000 0.000 mA
Auxiliary 1 Monitor High alarm 0000
Auxiliary 1 Monitor High warning 0000
Auxiliary 1 Monitor Low warning 0000
Auxiliary 1 Monitor Low alarm 0000
```

```

Auxiliary 2 Monitor High alarm      0000
Auxiliary 2 Monitor High warning    0000
Auxiliary 2 Monitor Low warning     0000
Auxiliary 2 Monitor Low alarm       0000
Laser Bias Current High alarm       ea60      120.000  mA
Laser Bias Current High warning     e09c      115.000  mA
Laser Bias Current Low warning       445c      35.000   mA
Laser Bias Current Low alarm         3a98      30.000   mA
Laser TX Power High alarm            6e18      004.5000 dBm
Laser TX Power High warning          621f      004.0000 dBm
Laser TX Power Low warning           1049      -003.7996 dBm
Laser TX Power Low alarm             0e83      -004.3004 dBm
Laser Temperature High alarm         3700      55.0000  C
Laser Temperature High warning       3500      53.0000  C
Laser Temperature Low warning        1b00      27.0000  C
Laser Temperature Low alarm          1900      25.0000  C
Laser RX Power High alarm            6e18      004.5000 dBm
Laser RX Power High warning          621f      004.0000 dBm
Laser RX Power Low warning           01f5      -013.0016 dBm
Laser RX Power Low alarm             00fb      -016.0032 dBm
Port 3/2
Transceiver Temperature High alarm   4600      70.0000  C
Transceiver Temperature High warning 4400      68.0000  C
Transceiver Temperature Low warning   0200      2.0000   C
Transceiver Temperature Low alarm     0000      0.0000   C
VCC Voltage High alarm               875a      3.4650   mV
VCC Voltage High warning             8610      3.4320   mV
VCC Voltage Low warning              7bc0      3.1680   mV
VCC Voltage Low alarm                7a76      3.1350   mV
SOA Bias Current High alarm          0000      0.000    mA
SOA Bias Current High warning         0000      0.000    mA
SOA Bias Current Low warning          0000      0.000    mA
SOA Bias Current Low alarm           0000      0.000    mA
Auxiliary 1 Monitor High alarm       0000
Auxiliary 1 Monitor High warning     0000
Auxiliary 1 Monitor Low warning       0000
Auxiliary 1 Monitor Low alarm         0000
Auxiliary 2 Monitor High alarm       0000
Auxiliary 2 Monitor High warning     0000
Auxiliary 2 Monitor Low warning       0000
Auxiliary 2 Monitor Low alarm         0000
Laser Bias Current High alarm       ea60      120.000  mA
Laser Bias Current High warning     e09c      115.000  mA
Laser Bias Current Low warning       445c      35.000   mA
Laser Bias Current Low alarm         3a98      30.000   mA
Laser TX Power High alarm            6e18      004.5000 dBm
Laser TX Power High warning          621f      004.0000 dBm
Laser TX Power Low warning           1049      -003.7996 dBm
Laser TX Power Low alarm             0e83      -004.3004 dBm
Laser Temperature High alarm         3700      55.0000  C
Laser Temperature High warning       3500      53.0000  C
Laser Temperature Low warning        1b00      27.0000  C
Laser Temperature Low alarm          1900      25.0000  C
Laser RX Power High alarm            6e18      004.5000 dBm
Laser RX Power High warning          621f      004.0000 dBm
Laser RX Power Low warning           01f5      -013.0016 dBm
Laser RX Power Low alarm             00fb      -016.0032 dBm
Show optics thresholds done
device#

```

The example above displays information about the optical monitoring thresholds.

**Syntax:** show optic thresholds slot-number

## Displaying media information

To display media information for SFP and XFP devices installed in a specific slot, enter the following command at any CLI level.

```
device#show media slot 3
Port 3/1:
  Type : 10GBASE-ER/EW 1547.50nm (XFP)
  Vendor: BOOKHAM , Version: 01
  Part# : IGF-32511J , Serial#: BTH0622357
Port 3/2:
  Type : 10GBASE-LR/LW 1310.00nm (XFP)
  Vendor: foundry networks, Version: 00
  Part# : FTRX-1411E3 , Serial#: K68034S
Port 3/3:
  Type : 10GBASE-ER/EW 1547.50nm (XFP)
  Vendor: BOOKHAM , Version: 01
  Part# : IGF-32511J , Serial#: BTH0622410
Port 3/4:
  Type : 10GBASE-SR/SW 854.00nm (XFP)
  Vendor: Foundry Networks, Version: 02
  Part# : JXPR01SW05306 , Serial#: F74340380372
```

The example above displays all optical devices on slot 3.

### Syntax: show media slot slot-number

To display media information for SFP and XFP devices installed in an ethernet port, enter the following command at any CLI level.

```
device#show media ethernet 3/4
Port 3/4:
  Type : 10GBASE-SR/SW 854.00nm (XFP)
  Vendor: Foundry Networks, Version: 02
  Part# : JXPR01SW05306 , Serial#: F74340380372
```

### Syntax: show media [ ethernet slot-port [ to slot-port ] ]

You can display media information for all ports in an Brocade device by using the **show media** command without options.

The **ethernet slot-port** parameter limits the display to a single port.

The **to slot-port** parameter displays information for a range of ports.

This results displayed from this command provide the Type, Vendor, Part number, Version and Serial number of the SFP or XFP optical device installed in the port.

If no SFP or XFP device is installed in a port, the "Type" field will display "N/A", the "Vendor" field will be empty and the other fields will display "Unknown".

Multi-rate optical transceivers are supported. In this case, if a multi-rate optical transceiver is inserted in an Interface module, the "Type" parameter will display the transmission code for the correct value for the port as determined by either the Interface module type or the configuration of the port. There is one exception to this rule however. If a port is in the disabled state only one type will be displayed. Once the port is enabled, the correct "Type" will be displayed in accordance with the configuration.

## Optics compatibility checking

This feature checks the installation of the following optical transceivers into Interface module ports and shuts down the port if the transceiver is incompatible with the port:

- 10 GbE XFP - This interface is brought up if the XFP is compliant with Ethernet transmission compliance.
- 1 Gb (100/1000) Ethernet interface will be enabled if the SFP is Ethernet capable

If the interface is incompatible with the optical transceiver installed, the port will not come up and the syslog message "**Incompatible optical trans-receiver detected on port n** " is displayed. An SNMP trap is also generated and the port is described as "down" because of "(incompatible transceiver)" in the output from the **show interface** command.

Multi-rate optical transceivers (XFP and SFP) are supported as described in the following:

- In Multi-rate SFPs and XFPs, the EEPROM is programmed for multi-rate - for example both Ethernet 1 Gb and SONET compliance codes can be programmed in the internal EEPROM of a multi-rate optical transceiver.
- Multi-rate SFPs and XFPs are supported. The system software checks for transmission compatibility against the interface configuration. Therefore an OC-12 interface will be brought up if the SFP is compatible for both OC-12 SONET and 1 Gb Ethernet transmission. The same SFP can also be used in a 1 Gb Ethernet interface.
- The **show media** command described in [Configuring optical monitoring](#) on page 19 continues to show only one transmission rate even for multi-rate SFPs and XFPs. If the interface is enabled and the SFP or XFP is compatible, the **show media** command only displays the compatible transmission code in the "Type" field. If the interface is disabled, the **show media** display depends on the module type. For Ethernet interface modules, the Ethernet compliance code is shown. If the Ethernet compliance code is not set then the SONET compliance code is displayed.

## Disabling transceiver type checking

When transceiver type checking is disabled, the syslog message "**Incompatible optical trans-receiver detected on port n** " is still displayed but the port is not shut down. You can disable transceiver type checking with the **no transceiver-type-check** command as shown in the following.

```
device(config)# no transceiver-type-check
```

### Syntax: [no] transceiver-type-check

Transceiver type checking is on by default and the command is not included in the configuration.

The **no** option of the **transceiver-type-check** command, disables transceiver type checking as described, sends a syslog message and places the command in the configuration.

Using the **transceiver-type-check** command without the **no** option, enables transceiver type checking, sends a syslog message and removes the command from the configuration.

## Designating an interface as the packet source

The software uses the lowest-numbered IP address configured on an interface as the source IP address for all Telnet, SSH, NTP, TFTP, TACACS or TACACS+, or RADIUS packets originated from the Brocade device.

You can specify the source interface for one or more of these types of packets.

## Configuring an interface as the source for all Telnet packets

Identifying a single source IP address for Telnet packets provides the following benefits:

- If your Telnet server is configured to accept packets only from specific links or IP addresses, you can simplify configuration of the Telnet server by configuring the Brocade device to always send the Telnet packets from the same link or source address.
- If you specify a loopback interface as the single source for Telnet packets, Telnet servers can receive the packets regardless of the states of individual links. Thus, if a link to the Telnet server becomes unavailable but the client or server can be reached through another link, the client or server still receives the packets, and the packets still have the source IP address of the loopback interface.

To specify the lowest-numbered IP address configured on a loopback interface as the device's source for all Telnet packets, enter commands such as the following.

```
device(config)# int loopback 2
device(config-lbif-2)# ip address 10.0.0.2/24
device(config-lbif-2)# exit
device(config)# ip telnet source-interface loopback 2
```

The commands configure loopback interface 2, assign IP address 10.0.0.2/24 to it, then designate it as the source for all Telnet packets from the Brocade device.

**Syntax:** `[no] ip telnet source-interface ethernet portnum | loopback num | ve num`

The following commands configure an IP interface on an Ethernet port and designate the address port as the source for all Telnet packets from the Brocade device.

```
device(config)# interface ethernet 1/4
device(config-if-e10000-1/4)# ip address 10.157.22.110/24
device(config-if-e10000-1/4)# exit
device(config)# ip telnet source-interface ethernet 1/4
```

## Cancelling an outbound Telnet session

If you want to cancel a Telnet session from the console to a remote Telnet server (for example, if the connection is frozen), you can terminate the Telnet session by performing the tasks listed below.

1. At the console, press Ctrl-^ (Ctrl-Shift-6).
2. Press the X key to terminate the Telnet session.

Pressing Ctrl-^ twice in a row causes a single Ctrl-^ character to be sent to the Telnet server. After you press Ctrl-^, pressing any key other than X or Ctrl-^ returns you to the Telnet session.

## Configuring an interface as the source for all SSH packets

You can configure the Brocade device to use the lowest-numbered IP address configured on a loopback interface, virtual routing interface, or Ethernet port as the source for the SSH packets it sends.

For example, to specify an Ethernet port as the interface whose lowest-numbered IP address will be the source address for the SSH packets originated from the Brocade device, enter commands such as the following.

```
device(config)# interface ethernet 1/5
device(config-if-e10000-1/5)# ip address 10.157.22.111/24
device(config-if-e10000-1/5)# exit
device(config)# ip ssh source-interface ethernet 1/5
```

The commands configure Ethernet port 1/5, assign IP address 10.157.22.111/24 to it, then designate it as the source interface.

**Syntax:** `[no] ip ssh source-interface ethernet portnum | loopback num | ve num`

## Configuring an interface as the source for all TFTP packets

You can configure the Brocade device to use the lowest-numbered IP address configured on a loopback interface, virtual routing interface, or Ethernet port as the source for all TFTP packets it sends.

For example, to specify the lowest-numbered IP address configured on a virtual routing interface as the Brocade device's source for all TFTP packets, enter commands such as the following.

```
device(config)# int ve 1
device(config-vif-1)# ip address 10.0.0.3/24
device(config-vif-1)# exit
device(config)# ip tftp source-interface ve 1
```

The commands configure virtual routing interface 1, assign IP address 10.0.0.3/24 to it, then designate the address as the source address for all TFTP packets.

**Syntax:** `[no] ip tftp source-interface ethernet portnum | loopback num | ve num`

The default is the lowest-numbered IP address configured on the port through which the packet is sent. The address therefore changes, by default, depending on the port.

## Configuring an interface as the source for all TACACS or TACACS+ packets

You can configure the Brocade device to use the lowest-numbered IP address configured on a loopback interface, virtual routing interface, or Ethernet port as the source for the TACACS or TACACS+ packets it sends.

For example, to specify a virtual routing interface as the interface whose lowest-numbered IP address will be the source address for the TACACS or TACACS+ packets originated from the Brocade device, enter commands such as the following.

```
device(config)# int ve 1
device(config-vif-1)# ip address 10.0.0.3/24
device(config-vif-1)# exit
device(config)# ip tacacs source-interface ve 1
```

The commands configure virtual routing interface 1, assign IP address 10.0.0.3/24 to it, then designate it as the source interface.

**Syntax:** `[no] ip tacacs source-interface ethernet portnum | loopback num | ve num`

## Configuring an interface as the source for all RADIUS packets

You can configure the Brocade device to use the lowest-numbered IP address configured on a loopback interface, virtual routing interface, or Ethernet port as the source for the RADIUS packets it sends.

For example, to specify an Ethernet port as the interface whose lowest-numbered IP address will be the source address for the RADIUS packets originated from the Brocade device, enter the following commands.

```
device(config)# interface ethernet 1/5
device(config-if-e10000-1/5)# ip address 10.157.22.111/24
device(config-if-e10000-1/5)# exit
device(config)# ip radius source-interface ethernet 1/5
```

The commands configure Ethernet port 1/5, assign IP address 10.157.22.111/24 to it, then designate it as the source interface.

**Syntax:** `[no] ip radius source-interface ethernet portnum | loopback num | ve num`

## Setting the system clock

The Brocade device allows you to manually set the system clock. Using the **clock set** command starts the system clock with the time and date you specify. The time counter setting is retained across power cycles.

To set the system time and date to 10:15:05 on October 15, 2005, enter the following command.

```
device# clock set 10:15:05 10-15-05
```

**Syntax:** `[no] clock set hh:mm:ss mm-dd-yy | mm-dd-yyyy`

By default, the Brocade device does not change the system time for daylight savings time. To enable daylight savings time, enter the following command.

```
device# clock summer-time
```

**Syntax:** `[no] clock summer-time`

You can configure the Brocade device to adjust the time for any one-hour offset from GMT or for one of the following U.S. time zones:

- US Pacific (default)
- Alaska
- Aleutian
- Arizona
- Central
- East-Indiana
- Eastern
- Hawaii
- Michigan
- Mountain
- Pacific
- Samoa

The default is US Pacific.

To change the time zone to Australian East Coast time (which is normally 10 hours ahead of GMT), enter the following command.

```
device(config)# clock timezone gmt gmt+10
```

**Syntax:** `[no] clock timezone gmt gmt | us time-zone`

You can enter one of the following values for *time-zone*:

- US time zones (**us**): alaska, aleutian, arizona, central, east-indiana, eastern, hawaii, michigan, mountain, pacific, samoa.
- GMT time zones (**gmt**): gmt+12, gmt+11, gmt+10...gmt+01, gmt+00, gmt-01...gmt-10, gmt-11, gmt-12.

## DST "change" notice for networks using US time zones

The new Daylight Saving Time (DST) change that went into effect on March 11, 2007 affects networks in the US time zones. Because of this change, your network clock might not be correct. If your network uses US time zones, and it needs to maintain the correct time, you must enable the following command.

```
device(config)# clock timezone us pacific
```

**Syntax:** `[no] clock timezone us { pacific | eastern | central | mountain }`

### NOTE

This command must be configured on every device that uses the US DST.

To verify the change, use the following command.

```
device(config)# show clock
```

For more information, refer to [www.brocade.com](http://www.brocade.com).

## Creating a command alias

Use the **alias** command to create an alias for a command and to save that alias within the device's configuration.

To create the alias "shro" for the **show ip routes** command, use the following command.

```
device(config)# alias shro = show ip routes
device(config)# write memory
```

**Syntax:** `[no] alias [ name = command ]`

The *name* variable is the name that you want to assign to the alias.

The *command* variable is the syntax for the command you want to create an alias for.

The **write memory** command is used to save the alias within the configuration.

## Removing an alias

You can remove an alias using the **no** version of the alias command as shown in the following.

```
device(config)# no alias shro
```

Alternately, you can use the **unalias** command as shown in the following.

```
device(config)# unalias shro
```

**Syntax:** `[no] unalias`

If the alias you try to remove does not exist, the following error will be displayed.

```
device(config)# unalias wrs
Error: Alias wrs does not exist, unalias failed
```

## Displaying a list of all configured alias

The following command allows you to display a list of all configured alias.

```
device# alias
#alias
      savemem      write memory
      shro         show ip routes
```

**Syntax:** `[no] alias`

## Limiting broadcast, multicast, or unknown unicast rates

The Brocade device can forward all traffic at wire speed. However, some third-party networking devices cannot handle high forwarding rates for broadcast, multicast, or unknown unicast packets.

The limits are individually configurable for broadcasts, multicasts, and unknown unicasts. You can configure limits globally to apply to each individual inbound interface module. The valid range is 1 - 4294967295 packets per second. The default is 0, which disables limiting.

### NOTE

These packets will be sent to the CPU for software forwarding. Brocade recommends that you use the BUM rate limiting or ACL-based rate limiting as they are performed by hardware forwarding.

## Limiting broadcasts

To globally limit the number of broadcast packets a Brocade device forwards to 100,000 per second, enter the following command at the global CONFIG level of the CLI.

```
device(config)# broadcast limit 100000
device(config)# write memory
```

**Syntax:** [no] broadcast limit number

## Limiting multicasts

To globally limit the number of multicast packets a Brocade device forwards to 120,000 per second, enter the following command at the global CONFIG level of the CLI.

```
device(config)# multicast limit 120000
device(config)# write memory
```

**Syntax:** [no] multicast limit number

### NOTE

The multicast limit is configured at the global level, but the value you enter applies to each interface module (slot) installed on the device.

## Limiting unknown unicasts

To globally limit the number of unknown unicast packets a Brocade device forwards to 110,000 per second, enter the following command at the global CONFIG level of the CLI.

```
device(config)# unknown-unicast limit 110000
device(config)# write memory
```

**Syntax:** [no] unknown-unicast limit number

### NOTE

Only the **unknown-unicast limit** is configured on the global level, but the value you enter applies to each interface module (slot) installed on the device.

## Configuring CLI banners

The Brocade device can be configured to display a greeting message on users' terminals when they enter the Privileged EXEC CLI level or access the device through Telnet. In addition, a Brocade device can display a message on the Console when an incoming Telnet CLI session is detected.

### Setting a message of the day banner

You can configure the Brocade device to display a message on a user's terminal when he or she establishes a Telnet CLI session. For example, to display the message "Welcome to Brocade!" when a Telnet CLI session is established, enter the following.

```
device(config)# banner motd $(Press Return)
Enter TEXT message, End with the character '$'.
Welcome to Brocade! $
```

A delimiting character is established on the first line of the **banner motd** command. You begin and end the message with this delimiting character. The delimiting character can be any character except "(double-quotation mark) and cannot appear in the banner text. In this

example, the delimiting character is \$(dollar sign). The text in between the dollar signs is the contents of the banner. The banner text can be up to 2047 characters long and can consist of multiple lines. To remove the banner, enter the **no banner motd** command.

**Syntax:** **[no] banner delimiting-character [ [ motd delimiting-character ]**

#### NOTE

The **banner delimiting-character** command is equivalent to the **banner motd delimiting-character** command.

#### NOTE

The size of the MOTD banner will be restricted (truncated) to 1850 characters when using an SSH client.

## Setting a privileged EXEC CLI level banner

You can configure the Brocade device to display a message when a user enters the Privileged EXEC CLI level.

```
device(config)# banner exec_mode # (Press Return)
Enter TEXT message, End with the character '#'.
You are entering Privileged EXEC level
Don't foul anything up! #
```

As with the **banner motd** command, you begin and end the message with a delimiting character; in this example, the delimiting character is # (pound sign). To remove the banner, enter the **no banner exec\_mode** command.

**Syntax:** **[no] banner exec\_mode delimiting-character**

## Displaying a message on the console when an incoming Telnet session is detected

You can configure the Brocade device to display a message on the Console when a user establishes a Telnet session. This message indicates where the user is connecting from and displays a configurable text message.

```
device(config)# banner incoming $(Press Return)
Enter TEXT message, End with the character '$'.
Incoming Telnet Session! $
```

When a user connects to the CLI using Telnet, the following message appears on the Console.

```
Telnet from 10.157.22.63
Incoming Telnet Session!
```

**Syntax:** **[no] banner incoming delimiting-character**

To remove the banner, enter the **no banner incoming** command.

## Configuring terminal display

You can configure and display the number of lines displayed on a terminal screen during the current CLI session.

The **terminal length** command allows you to determine how many lines will be displayed on the screen during the current CLI session. This command is useful when reading multiple lines of displayed information, especially those that do not fit on one screen.

To specify the maximum number of lines displayed on one page, enter a command such as the following.

```
device#terminal length 15
```

**Syntax:** **[no] terminal length number-of-lines**

The *number-of-lines* parameter indicates the maximum number of lines that will be displayed on a full screen of text during the current session. If the displayed information requires more than one page, the terminal pauses. Pressing the space bar displays the next page.

The default for *number-of-lines* is 24. Entering a value of 0 prevents the terminal from pausing between multiple output pages:

## Checking the length of terminal displays

The **show terminal** command specifies the number of lines that will be displayed on the screen as specified by the **terminal length**, **page display**, and **skip-page-display** commands. It also shows if the **enable skip-page-display** command has been configured. The **enable skip-page-display** command allows you to use the skip-page-display to disable the configured page-display settings.

```
device(config)# show terminal
Length: 24 lines
Page display mode (session): enabled
Page display mode (global): enabled
```

**Syntax:** show terminal

## Enabling or disabling routing protocols

The Multi-Service IronWare supports the following protocols:

- BGP4
- IP
- IS-IS
- MPLS
- MSDP
- OSPF
- PIM
- RIP
- VRRP
- VRRPE

By default, IP routing is enabled on the Brocade device. All other protocols are disabled, so you must enable them to configure and use them.

To enable a protocol on a Brocade device, enter **router** at the global CONFIG level, followed by the protocol to be enabled. The following example shows how to enable OSPF.

```
device(config)# router ospf
```

**Syntax:** [no] router bgp | ospf | pim | rip | vrrp | vrrpe

## Displaying and modifying default settings for system parameters

The Multi-Service IronWare has default table sizes for the following parameters. The table sizes determine the maximum number of entries the tables can hold. You can adjust individual table sizes to accommodate your configuration needs:

- MAC address entries
- VLANs supported on a system
- Virtual interfaces
- Spanning tree instances
- RSTP instances

- IP cache size
- ARP entries
- IP routes
- IP ACL filter entries
- L2 ACL entries per ACL table
- Size for management port ACL
- IP subnets per port and per device
- IPv6 Multicast routes
- IPv6 PIM mcache
- Layer 4 sessions supported
- Number of VPLS's
- VPLS MAC entries
- VRF routes
- IPv6 cache
- IPv6 routes
- Number of tunnels
- Number of LAGs
- Configuration file size

The tables you can configure as well the defaults and valid ranges for each table differ depending on the Brocade device you are configuring.

#### NOTE

If you increase the number of subnet addresses you can configure on each port to a higher amount, you might also need to increase the total number of subnets that you can configure on the device.

#### NOTE

Changing the table size for a parameter reconfigures the device's memory. Whenever you reconfigure the memory on a Brocade device, you must save the change to the startup configuration file, then reload the software to place the change into effect.

To display the configurable tables and their defaults and maximum values, enter the following command at any level of the CLI.

Output for the Brocade NetIron XMR Series and Brocade MLX Series

```
device#show default values
sys log buffers:50          mac age time:300 sec      telnet sessions:5
ip arp age:10 min         bootp relay max hops:4    ip ttl:64 hops
ip addr per intf:24
when multicast enabled :
igmp group memb.: 260 sec  igmp query:          125 sec
when ospf enabled :
ospf dead:40 sec          ospf hello:10 sec        ospf retrans:5 sec
ospf transit delay:1 sec
when bgp enabled :
bgp local pref.:100       bgp keep alive:60 sec    bgp hold:180 sec
bgp metric:10             bgp local as:1          bgp cluster id:0
bgp ext. distance:20      bgp int. distance:200    bgp local distance:200
when IS-IS enabled :
isis hello interval:10 sec      isis hello multiplier:3
isis port metric:10            isis priority:64
isis csnp-interval:10 sec      isis default-metric:10
isis distance:115             isis lsp-gen-interval:10 sec
```

```
isis lsp-interval:33 msec          isis lsp-refresh-interval:900 sec
isis max-lsp-lifetime:1200 sec    isis maximum-paths:4
isis retransmit-interval:5 sec     isis spf-interval:5 sec
filter change update delay:10 sec
```

System Parameters	Default	Maximum	Current	Actual	Bootup	Revertible
mac	131072	2097152	2097152	2097152	2097152	Yes
vlan	512	4095	4095	4095	4095	No
spanning-tree	32	128	128	128	128	No
rstp	32	128	128	128	128	No
ip-arp	8192	65536	65536	65536	65536	No
multicast-route (IPv6)	8192	153600	153600	153600	153600	Yes
pim-mcache (IPv6)	4096	4096	4096	4096	4096	Yes
ip-cache	204800	1048576	1048576	1048576	1048576	Yes
ip-route	204800	1048576	1048576	1048576	1048576	Yes
ip-subnet-port	24	128	128	128	128	No
virtual-interface	255	4095	4095	4095	4095	No
vpls-mac	8192	1000000	1000000	1000000	1000000	Yes
vpls-num	2048	16384	16384	16384	16384	No
session-limit	32768	163840	163840	163840	163840	Yes
ip-filter-sys	4096	40960	40960	40960	40960	No
mgmt-port-acl-size	20	100	100	100	100	No
l2-acl-table-entries	64	256	256	256	256	No
ipv6-cache	65536	245760	245760	245760	245760	Yes
ipv6-route	65536	245760	245760	245760	245760	Yes
vrf-route	5120	262143	262143	262143	262143	Yes
receive-cam	1024	8192	8192	8192	8192	No
ip-tunnels	256	8192	8192	8192	8192	No
lsp-out-acl-cam	0	16384	16384	16384	16384	No
trunk-num	128	256	256	256	256	No
config-file-size	8388608	16777216	16777216	16777216	16777216	No
ifl-cam	0	81920	49152	49152	49152	No
ip-source-guard-cam	0	131072	30000	30000	30000	No
ipv4-mcast-cam	8192	65536	10000	10000	10000	No
ipv6-mcast-cam	2048	16384	3500	3500	3500	No

Output for the Brocade NetIron CES Series

```
device#show default values
sys log buffers:50          mac age time:300 sec          telnet sessions:5
ip arp age:10 min          bootp relay max hops:4      ip ttl:64 hops
ip addr per intf:24
when multicast enabled :
igmp group memb.:140 sec   igmp query:60 sec
when ospf enabled :
ospf dead:40 sec          ospf hello:10 sec          ospf retrans:5 sec
ospf transit delay:1 sec
when bgp enabled :
bgp local pref.:100       bgp keep alive:60 sec      bgp hold:180 sec
bgp metric:10             bgp local as:1            bgp cluster id:0
bgp ext. distance:20      bgp int. distance:200     bgp local distance:200
when IS-IS enabled :
isis hello interval:10 sec isis hello multiplier:3
isis port metric:10       isis priority:64
isis csnp-interval:10 sec isis default-metric:10
isis distance:115        isis lsp-gen-interval:10 sec
isis lsp-interval:33 msec isis lsp-refresh-interval:900 sec
isis max-lsp-lifetime:1200 sec isis maximum-paths:4
isis retransmit-interval:5 sec isis spf-interval:5 sec
filter change update delay:10 sec
```

System Parameters	Default	Maximum	Current
mac	56320	131072	56320
vlan	512	4095	512
spanning-tree	32	128	32
rstp	32	128	32
ip-arp	4096	16384	4096
multicast-route (IPv6)	1024	2048	1024
pim-mcache (IPv6)	1024	2048	1024
ip-cache	16384	32768	16384
ip-route	16384	32768	16384
ip-subnet-port	24	128	24
virtual-interface	255	1024	255

vpls-mac	512	1024	512
vpls-num	512	1024	512
session-limit	32768	32768	32768
ip-filter-sys	4096	8192	8192
mgmt-port-acl-size	20	100	20
l2-acl-table-entries	64	256	256
ipv6-cache	1024	8192	1024
ipv6-route	1024	8192	1024
vrf-route	1024	32768	1024
receive-cam	1	1	1
ip-tunnels	32	128	32
lsp-out-acl-cam	1	1	1
trunk-num	128	255	128

## Output for the Brocade NetIron CER Series device

```

device#show default values
sys log buffers:50          mac age time:300 sec          telnet sessions:5
ip arp age:10 min          bootp relay max hops:4        ip ttl:64 hops
ip addr per intf:24
when multicast enabled :
igmp group memb.: 260 sec  igmp query:          125 sec
when ospf enabled :
ospf dead:40 sec          ospf hello:10 sec          ospf retrans:5 sec
ospf transit delay:1 sec
when bgp enabled :
bgp local pref.:100      bgp keep alive:60 sec      bgp hold:180 sec
bgp metric:10            bgp local as:1            bgp cluster id:0
bgp ext. distance:20     bgp int. distance:200     bgp local distance:200
when IS-IS enabled :
isis hello interval:10 sec      isis hello multiplier:3
isis port metric:10            isis priority:64
isis csnp-interval:10 sec      isis default-metric:10
isis distance:115             isis lsp-gen-interval:10 sec
isis lsp-interval:33 msec      isis lsp-refresh-interval:900 sec
isis max-lsp-lifetime:1200 sec  isis maximum-paths:4
isis retransmit-interval:5 sec  isis spf-interval:5 sec
filter change update delay:10 sec
System Parameters          Default      Maximum      Current      Actual      Bootup      Revertible
mac                        65536       131072      65536       65536       65536       Yes
vlan                       512         8192        512         512         512         Yes
spanning-tree              32          128         32          32          32         Yes
rstp                       32          128         32          32          32         Yes
ip-arp                     4096        16384      4096        4096        4096       Yes
ip-cache                   290816      524288     290816     290816     290816    Yes
ip-route                   290816      524288     290816     290816     290816    Yes
ip-subnet-port             24          128         24          24          24         Yes
virtual-interface         255         4095       255         255         255       Yes
vpls-mac                   2048        131072     2048        2048        2048       Yes
vpls-num                   128         1024       128         128         128       Yes
session-limit              32768       32768     32768     32768     32768     Yes
ip-filter-sys              4096        32768     4096        4096        4096       Yes
mgmt-port-acl-size        20          100         20          20          20         Yes
l2-acl-table-entries       64          256         64          64          64         Yes
ipv6-cache                 8192        131072     8192        8192        8192       Yes
ipv6-route                 8192        131072     8192        8192        8192       Yes
ip-vrf-route              1024        524288     1024        1024        1024       Yes
ip-tunnels                 32          256         32          32          32         Yes
config-file-size          8388608     16777216   8388608     8388608     8388608    Yes
ip-source-guard-cam       0           131072     0           0           0          No
ip-vrf                    16          128         16          16          16         Yes
ipv6-vrf-route            128         16384     128         128         128       Yes
openflow-pvlan-entries    0           2048        0           0           0          Yes
No

```

## Syntax: show default values

The following table describes the system-max values of the **show default values** command for Brocade NetIron XMR Series and Brocade NetIron MLX Series.

**TABLE 4** Display of show default values for system parameters

This field...	Displays...
Default	The default value for the system-max element. This value is used in the following conditions: a) There is no system-max configured for the corresponding element. b) If the system-max element configuration is reverted at bootup time (if it is a revertible element).
Maximum	The maximum value that this element can be configured at.
Current	The most current configured value for the system-max element. If the system-max element is configured in the running system, then the value under this column will change to reflect this value.  <b>NOTE</b> The new value does not take affect until the node is reloaded.
Actual	The system-max value that is used by the target application of the running system. If system-max elements are reverted at bootup, then only the Actual column is affected. The Application is now using default values and will be displayed in the Actual column. Please refer to the example on the next page for more information.  The Current and Bootup values are still configured on the system, and are not affected by the reversion of system-max elements at bootup.
Bootup	The system-max value that was read from the configuration when the system was booting up. If the read values are found to be acceptable, and not reverted, then the values in this column, and in the "Actual" column will have the same values. However, if the values were reverted during bootup, then the values are different for the "Revertible" elements.
Revertible	This column displays which corresponding system-max element is revertible or not. If "Yes" is displayed then the value is changed to a default value. If "No" is displayed then there no change to the value.

If system-max elements are reverted at bootup time, then the following message will display on the CLI.

```
device#show default values
...
NOTE: All the Revertible Elements were Reverted During System Bringup.
System Parameters  Default      Maximum      Current      Actual      Bootup      Revertible
mac                131072      2097152      2097152      131072      2097152      Yes
vlan               512         4095         512          512         512         No
spanning-tree     32          128          32           32          32         No
rstp               32          128          32           32          32         No
ip-arp             8192        65536        65536        65536        65536      No
multicast-route (IPv6) 8192        153600       8192         8192        8192      Yes
pim-mcache (IPv6)  4096        4096         4096         4096        4096      Yes
ip-cache           204800      1048576      524288       204800      524288    Yes
...
```

Information for the configurable tables appears under the columns shown in bold type. To simplify configuration, the command parameter you enter to configure the table is used for the table name.

: To increase the size of the IP route table

```
device(config)# system-max ip-route 120000
device(config)# write memory
device(config)# exit
device# reload
```

#### NOTE

If you enter a value that is not within the valid range of values, the CLI will display the valid range for you.

To increase the number of IP subnet interfaces you can configure on each port on a Brocade device to 64, enter the following commands.

```
device(config)# system-max ip-subnet-port 64
device(config)# write memory
device(config)# exit
device# reload
```

**Syntax: [no] system-max ip-subnet-port num**

The *num* parameter specifies the maximum number of subnet addresses per port. The minimum, maximum and default values for this parameter are described in [Configuring system max values](#) on page 38.

**NOTE**

You must reload the software for the change to take effect.

## Enabling or disabling layer 2 switching

By default, Brocade devices supports routing over layer 2 switching. You can enable layer 2 switching globally or on individual port using the **no route-only** command.

**NOTE**

On the Brocade NetIron CES Series and Brocade NetIron CER Series, the **route-only** command should not be configured on untagged MPLS uplinks when using it for VPLS or VLL. Otherwise, incoming VPLS or VLL traffic is dropped.

The **no route-only** and **route-only** commands prompts you for whether or not you want to change the "route-only" behavior. You must enter *y* if you want to proceed or *n* if you do not. The prompt is displayed as shown in the following examples of the **no route-only** and **route-only** commands.

**NOTE**

Always perform a reload after removing a route-only config or enabling route-only. Removing or enabling the route-only option without a reload will cause multicast issues.

To enable Layer 2 switching globally, enter the following.

```
device(config)# no route-only
This will change the route-only behavior at the global level.
Are you sure? (enter 'y' or 'n'): y
Global 'route-only' committed.
```

To globally disable Layer 2 switching on a Brocade device and return to the default (route-only) condition, enter commands such as the following:

```
device(config)# route-only
This will change the route-only behavior at the global level.
Are you sure? (enter 'y' or 'n'): y
Global 'no route-only' committed.
```

**Syntax: [no] route-only**

**NOTE**

On the Brocade NetIron XMR Series and Brocade NetIron MLX Series devices, **route-only** is the default condition. Because **route-only** is the default condition, it will not be displayed in the configuration. If you use **no route-only** to enable switching, the **no route-only** command will be displayed in the configuration.

**NOTE**

On the Brocade NetIron CES Series device, **route-only** is disabled by default. Therefore, if **route-only** is enabled on a Brocade NetIron CES Series device, it will be displayed in the configuration.

To enable Layer 2 switching only on a specific interface, go to the Interface configuration level for that interface, and add the **no route-only** command. The following commands show how to enable Layer 2 switching on port 3/2.

```
device(config)# interface ethernet 3/2
device(config-if-e10000-3/2)# no route-only
```

**Syntax: [no] route-only**

To re-enable the default **route-only** condition on port 3/2, enter the **route-only** command as shown.

```
device(config-if-e10000-3/2)# route-only
```

When **route-only** is enabled on a physical interface, incoming unknown unicast packets are not sent to the CPU and are dropped locally by the hardware.

**NOTE**

Configuring **route-only** on a physical interface affects incoming frames only. In other words, interface **route-only** disables L2 switching for incoming frames but does not disable L2 switching for outgoing frames. If the **route-only** interface is a member of a VLAN, the interface will still transmit frames received on other interfaces of that VLAN if those other interfaces still have L2 switching enabled. To prevent this from happening, make sure that any interface you have configured for **route-only** are not also members of VLANs where you are intentionally performing L2 switching.

## Configuring static MAC addresses

You can assign static MAC addresses to ports of a Brocade device.

You can manually input the MAC address of a device to prevent it from being aged out of the system address table, to prevent traffic for a specific device, such as a server, from flooding the network with traffic when it is down, and to assign higher priorities to specific MAC addresses.

Static MAC addresses are configured within a specified VLAN including the default VLAN 1. Optionally you can specify a port priority (QoS).

The default and maximum configurable MAC table sizes can differ depending on the device. To determine the default and maximum MAC table sizes for your device, display the system parameter values. Refer to [Displaying and modifying default settings for system parameters](#) on page 30.

**NOTE**

The absolute maximum number of static MACs is 400.

The ability of the CAM to store depends on the following:

- The number of source MAC address being learned by the CAM.
- The number of destination MAC addresses being forwarded by the CAM
- The distribution of the MAC address entries across ports. For example, if one port is learning all the source MAC addresses, the available of the CAM for that port will be depleted.

In the following example, a static MAC address of 0000.0063.67FF with a priority of 7 is assigned to port 2 of module 1 in VLAN 200.

```
device(config)# vlan 200
device(config)# static-mac-address 0000.0063.67FF e 1/2 priority 7
```

**Syntax: [no] static-mac-address mac-addr ethernet portnum [ priority number ]**

The *mac-addr* variable specifies the MAC address that you assigning.

The *portnum* variable specifies the Ethernet port that the MAC address is being assigned to.

Using the *priority* option, you can assign a value to the *number* variable of 0 - 7.

## Changing the MAC age time

The MAC age time sets the aging period for ports on the device, defining how long (how many seconds) a port address remains active in the address table.

To change the aging period for MAC addresses from the default of 300 seconds to 600 seconds.

```
device(config)# mac-age-time 600
```

### Syntax: [no] mac-age-time age-time

The *age-time* can be 0 or a number from 60 - 65535. The zero results in no address aging. The default is 300 (seconds).

## Disabling the MAC movement console logs

The ability to disable MAC movement syslog messages is useful to prevent logging messages appearing on the console display.

Syslog messages are generated when MAC addresses are changed and these messages display on the console port. In situations when there is a lot of MAC movement activity, you can disable these messages from the display using the following steps.

### NOTE

This task is applicable to only to Brocade Netron MLX Series devices.

1. Enter global configuration mode.

```
device# configure terminal
```

2. Disable console logs when MAC movement syslog messages are generated.

```
device(config)# no mac-move-det-syslog
```

The ability to display MAC movement messages is enabled by default. Disabling the messages removes the **mac-move-det-syslog** command from the running configuration.

The following example shows the MAC movement syslog message output when the **mac-move-det-syslog** command is enabled. Note the syslog message about the MAC address movement.

```
device# configure terminal
device(config)# mac-move-det-syslog
device(config)# show arp

Total number of ARP entries: 2
(In all VRFs)

Entries in default routing instance:
IP Address      MAC Address     Type    Age Port (Vpls-Id, Vlan)/ Vpls-Id:Peer
1  10.19.19.1    0010.9400.0606 Dynamic  1  1/24
2  172.26.67.1  0024.381c.b900 Dynamic  1  mgmt1
device(config)# exit
device#
SYSLOG: <12>Sep 25 02:43:07 IP/ARP: IP address 19.19.19.1 MAC movement detected,
changed from MAC 0010.9400.0606 / port 1/24 to MAC 0010.9400.0001 / port 1/24
```

The following example disables the MAC movement syslog message output. No syslog messages are displayed.

```
device# configure terminal
device(config)# no mac-move-det-syslog
device(config)# exit
device# show arp
Total number of ARP entries: 2
(In all VRFs)

Entries in default routing instance:
IP Address      MAC Address    Type    Age Port (Vpls-Id, Vlan)/ Vpls-Id:Peer
1  10.19.19.1    0010.9400.0001 Dynamic  1  1/24
2  172.26.67.1  0024.381c.b900 Dynamic  2  mgmt1
device#
device#
```

## Configuring static ARP entries

When you create a static ARP entry, the Brocade device automatically creates a static MAC entry.

### NOTE

To delete the static MAC entry, you must delete the static ARP entry first.

## Configuring system max values

Table 5 lists the system max values for the several system parameters of the Brocade devices.

**TABLE 5** System max values for Brocade NetIron XMR Series and Brocade MLX Series devices

Parameter	Minimum value for Brocade NetIron MLX Series	Maximum value for Brocade NetIron MLX Series	Default value for Brocade NetIron MLX Series	Minimum value for Brocade NetIron XMR Series	Maximum value for Brocade NetIron XMR Series	Default value for Brocade NetIron XMR Series
config-file-size	2097152	16777216	8388608	2097152	16777216	8388608
gre-tunnels	1	8192	256	1	8192	256
hw-flooding	0	4095	0	0	4095	8
ifl-cam	0	81920	0	0	81920	0
ip-arp	2048	131072	8192	2048	131072	8192
ip-cache	8192	2621440	655360	8192	1048576	204800
ip-filter-system	1024	102400	4096	1024	102400	4096
ip-route	4096	2506752	655360	4096	1048576	204800
ipv4-mcast-cam	0	32768	4096	0	65536	8192
ip-subnet-port	24	128	24	24	128	24
ip-vrf-route	128	655360	5120	128	450560	5120
ipv6-cache	8192	1884160	131072	8192	245760	65536
ipv6-mcast-cam	0	8192	1024	0	16384	2048
ipv6-route	4096	1884160	131072	4096	245760	65536
ipv6-vrf-route	64	98304	1024	64	16384	128
l2-acl-table-entries	64	256	64	64	256	64
mac	4000	1048576	32768	4000	2097152	131072
mgmt-port-acl-size	1	100	20	1	100	20

**TABLE 5** System max values for Brocade NetIron XMR Series and Brocade MLX Series devices (continued)

Parameter	Minimum value for Brocade NetIron MLX Series	Maximum value for Brocade NetIron MLX Series	Default value for Brocade NetIron MLX Series	Minimum value for Brocade NetIron XMR Series	Maximum value for Brocade NetIron XMR Series	Default value for Brocade NetIron XMR Series
subnet-broadcast-acl-cam	0	4096	0	0	4096	0
receive-cam	512	8192	1024	512	8192	1024
rstp	1	128	32	1	128	32
session-limit	1024	40960	8192	1024	163840	32768
spanning-tree	1	128	32	1	128	32
virtual-interface	40	4095	255	40	4095	255
vlan	2	4095	512	2	4095	512
vpls-mac	32	262144	2048	32	1000000	8192
vpls-num	512	4096	512	1024	16384	2048
ecmp-pram-block-size	8	32	32	8	32	32

**NOTE**

If Algorithmic mode is enabled, the system maximum values for ip-cache, ip-route, ipv6-cache, and ipv6-route is limited to the maximum value supported by the specific CAM profile.

**TABLE 6** System max values for Brocade NetIron CES Series, Brocade NetIron CER Series, and Brocade NetIron CER Series-RT devices

Parameter	Minimum value for Brocade NetIron CES Series	Maximum value for Brocade NetIron CES Series	Default value for Brocade NetIron CES Series	Minimum value for Brocade NetIron CER Series	Maximum value for Brocade NetIron CER Series	Default value for Brocade NetIron CER Series	Minimum value for Brocade NetIron CER Series-RT	Maximum value for Brocade NetIron CER Series-RT	Default value for Brocade NetIron CER Series-RT
config-file-size	2097152	16777216	8388608	2097152	16777216	8388608	2097152	16777216	8388608
ip-arp	2048	16384	4096	2048	16384	4096	2048	16384	4096
ip-cache	4096	32768	16384	4096	524288	290816	4096	1572864	290816
ip-filter-sys	1024	32768	4096	1024	32768	4096	1024	32768	4096
ip-route	4096	32768	16384	4096	524288	290816	4096	1572864	290816
ip-subnet-port	24	128	24	24	128	24	24	128	24
l2-acl-table-entries	64	256	64	64	256	64	64	256	64
mac	4000	131072	56320	4000	131072	56320	4000	131072	65536
mgmt-port-acl-size	1	100	20	1	100	20	1	100	20
rstp	1	128	32	1	128	32	1	128	32
session-limit	1024	32768	32768	1024	32768	32768	1024	32768	32768
spanning-tree	1	128	32	1	128	32	1	128	32
virtual-interface	40	1024	255	40	4095	255	40	4095	255
vlan	512	4095	512	2	8192	512	2	8192	512
vrf	1	16	1	1	128	16	1	128	16

**TABLE 6** System max values for Brocade NetIron CES Series, Brocade NetIron CER Series, and Brocade NetIron CER Series-RT devices (continued)

Parameter	Minimum value for Brocade NetIron CES Series	Maximum value for Brocade NetIron CES Series	Default value for Brocade NetIron CES Series	Minimum value for Brocade NetIron CER Series	Maximum value for Brocade NetIron CER Series	Default value for Brocade NetIron CER Series	Minimum value for Brocade NetIron CER Series-RT	Maximum value for Brocade NetIron CER Series-RT	Default value for Brocade NetIron CER Series-RT
ipv6-cache	1024	131072	1024	1024	131072	1024	1024	262141	8192
ipv6-route	1024	131072	1024	1024	131072	8192	1024	262141	8192
vrf-route	1024	32768	1024	1024	32768	1024	1024	1572864	1024
ip-tunnels	32	128	32	32	128	32	32	256	32

**NOTE**

Default values are the same irrespective of the software package on the Brocade NetIron CES Series and Brocade NetIron CER Series devices.

**NOTE**

The maximum FIB scalability for Brocade NetIron CER Series and Brocade NetIron CES Series has been tested using an internet route mix. When using route prefixes concentrated in a narrow prefix length range, the scalability numbers will be lower. It is important to design your network keeping this in mind.

To configure system-max values, use the following command.

**Syntax:** `[no] system-max config-file-size | gre-tunnels | ip-arp | ip-cache | ip-filter-sys | ip-route | ip-static-arp | ipv4-mcast-cam | ip-subnet-port | ip-tunnels | vrf | vrf-route | ipv6-cache | ipv6-mcast-cam | ipv6-route | l2-acl-table-entries | ifl-cam | mac | mgmt-port-acl-size | subnet-broadcast-acl-cam | receive-cam | rstp | session-limit | spanning-tree | trunk-num | virtual-interface | vlan | vpls-mac | vpls-num | ecmp-pram-block-size`

The *gre-tunnels* parameter sets the maximum number of GRE tunnels. For minimum, maximum and default values for this parameter refer to [Table 5](#).

The *config-file-size* parameter sets the allowed running and startup-config file sizes. Refer to the appropriate table for your platform. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *ifl-cam* parameter sets the maximum number of Internal Forwarding Lookup Identifiers. These are used when configuring a Local VLL for Dual Tagging. The default value for the *ifl-cam* parameter is 8K. The maximum values for this parameter are different depending on which CAM partition you have configured on your system. For minimum, maximum and default values by CAM partition for this parameter, refer to [Table 7](#).

The *ip-arp* parameter sets the maximum number of ARP entries. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *ip-cache* parameter sets the maximum size of the IP cache. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *ip-filter-sys* parameter sets the maximum number of IP ACL entries. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *ip-route* parameter sets the maximum number of IP Route entries. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

**NOTE**

There is no need to configure a system-max value for static ARP entries.

The *ip-static-arp* parameter sets the maximum number of static ARP entries. For minimum, maximum and default values for this parameter refer to [Table 5](#).

The *ipv4-mcast-cam* parameter allows you to configure the maximum CAM size for an IPv4 multicast group. For minimum, maximum and default values for this parameter refer to [Table 6](#).

The *ip-subnet-port* parameter sets the maximum number of IP subnets per port. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *vrf-route* parameter sets the maximum number of VRF routes per VRF instance. For minimum, maximum and default values for this parameter refer to [Table 5](#).

The *ipv6-cache* parameter sets the maximum size of the IPv6 cache. For minimum, maximum and default values for this parameter refer to [Table 5](#).

The *ipv6-mcast-cam* parameter allows you to configure the maximum CAM size for an IPv6 multicast group. For minimum, maximum and default values for this parameter refer to [Displaying and modifying default settings for system parameters](#) on page 30.

The *ipv6-route* parameter sets the maximum number of IPv6 routes. For minimum, maximum and default values for this parameter refer to [Table 5](#).

#### NOTE

The **system-max ipv6-route** command can be configured with a maximum value of 114688 on the Brocade NetIron MLX Series, but the Brocade device system will only support a maximum value of 114687 for IPv6 routes.

The *l2-acl-table-entries* parameter sets the maximum number of layer-2 ACL entries per ACL table. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *mac* parameter sets the maximum number of MAC entries. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *mgmt-port-acl-size* parameter sets the maximum size for a management port ACL. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *subnet-broadcast-acl-cam* parameter sets the maximum number of IP broadcast ACL CAM entries. For minimum, maximum, and default values for this parameter, refer to [Table 5](#).

The *receive-cam* parameter sets the maximum number of IP Receive ACL software CAM entries. For minimum, maximum and default values for this parameter refer to [Table 5](#).

The *rstp* parameter sets the maximum number of RSTP instances. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *session-limit* parameter sets the maximum number of sessions. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *spanning-tree* parameter sets the maximum number of spanning-tree instances. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *virtual-interface* parameter sets the maximum number of virtual interfaces. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *vlan* parameter sets the maximum number of VLANs. For minimum, maximum and default values for this parameter refer to [Table 5](#) and [Table 6](#).

The *vpls-mac* parameter sets the maximum number of VPLS MAC Entries. For minimum, maximum and default values for this parameter refer to [Table 5](#).

The *vpls-num* parameter sets the maximum number of Virtual Private LAN Services (VPLS). For minimum, maximum and default values for this parameter refer to [Table 5](#).

The *ecmp-pram-block-size* parameter is used as a limiting factor when programming ECMP nexthops (v4/v6/vpnv4/vpnv6). Even though the control plane supports up to 32 nexthops per a route, the actual number of nexthops which are programmed in HW is controlled by this command. If *system-max ecmp-pram-block-size* is configured to a value lesser than the value configured for **ip load-sharing** or *ipv6 load-sharing*, or if *ip load-sharing* or *ipv6 load-sharing* is configured to a value greater than that configured for **system-max ecmp-pram-block-size**, a warning message will be displayed. For minimum, maximum and default values for this parameter, refer to [Table 5](#).

**TABLE 7** System maxifl-cam values available by CAM profile on Brocade NetIron XMR Series and Brocade MLX Series

CAM profile	Minimum value	Maximum value	Default value
<b>Default</b>	0	57344	8192
ipv4	0	114688	8192
ipv6	0	131072	8192
l2-metro	0	114688	8192
mpls-l3vpn	0	114688	8192
mpls-vpls	0	114688	8192
multi-service	0	49152	8192
multi-service-2	0	81920	8192
vpn-vpls	0	114688	8192
ipv4-vpn	0	114688	8192
l2-metro-2	0	114688	8192
mpls-l3vpn-2	0	114688	8192
mpls-vpls-2	0	114688	8192
ipv4-ipv6	0	114688	8192
ipv4-vpls	0	114688	8192
ipv4-ipv6-2	0	81920	8192

## Configuring CAM size for an IPv4 multicast group

To configure the CAM size of an IPv4 multicast group, enter the following command.

```
device(config)# system-max ipv4-mcast-cam
```

**Syntax:** [no] system-max [ ipv4-mcast-cam ]

By default, **no system-max** parameter is configured.

The *ipv4-mcast-cam* parameter allows you to specify the maximum CAM size you want for an IPv4 multicast group.

The *decimal* parameter specifies the range that is supported for configuring the CAM size. On the Brocade NetIron XMR Series, the minimum value supported is 0, and the maximum value supported is 65536. The default value is 8192. On the Brocade NetIron MLX Series, the minimum value supported is 0, and the maximum value supported is 32768. The default value is 4096.

Upon configuration, the Brocade system will verify the input value with the amount of CAM resources that are available. If the Brocade system is unable to allocate requested space, it will display the following error message on the Brocade NetIron XMR Series and Brocade NetIron MLX Series.

```
device(config)#system-max ipv4-mcast-cam 60000
Error - IPv4 Multicast CAM (60000) exceeding available CAM resources
Total IPv4 ACL CAM: 98304(Raw Size)
IPv4 Receive ACL CAM: 16384(Raw Size)
IPv4 Source Guard CAM: 32(Raw Size)
```

```
Reserved IPv4 Rule ACL CAM: 1024(Raw Size)
Available IPv4 Multicast CAM: 80864(Raw Size) 40432(User Size)
```

If there is not enough CAM resources available to change the cam-partition profile from IPv4 to IPv6, the following message is displayed.

```
device(config)#cam-partition profile ipv4-ipv6
Error - IPv4 Receive ACL CAM (8192) exceeding available CAM resources
Total IPv4 ACL CAM: 98304(Raw Size)
IPv4 Multicast CAM: 120000(Raw Size)
IPv4 Source Guard CAM: 32(Raw Size)
Reserved IPv4 Rule ACL CAM: 1024(Raw Size)
Available IPv4 Receive ACL CAM: 0(Raw Size) 0(User Size)
Error - Failed to select this CAM profile
```

This error message is also displayed on the Brocade NetIron MLX Series.

After you issue the system-max command, with *ipv4-mcast-cam* parameter included, additional information will display on the Brocade NetIron XMR Series and Brocade NetIron MLX Series as shown in the following example.

```
device(config)#system-max ipv4-mcast-cam 60000
Reload required. Please write memory and then reload or power cycle.
Failure to reload could cause system instability on failover.
Newly configured system-max will not take effect during hitless-reload.
```

#### NOTE

You must write this command to memory and perform a system reload for this command to take effect.

## Configuring CAM size for an IPv6 multicast group

To configure the CAM size of an IPv6 multicast group, enter the following command.

```
device(config)# system-max ipv6-mcast-cam
```

**Syntax:** `[no] system-max [ ipv6-mcast-cam ]`

By default, no system-max parameter is configured.

The *ipv6-mcast-cam* parameter allows you to specify the maximum CAM size you want for an IPv6 multicast group.

The *decimal* parameter specifies the range that is supported for configuring the CAM size. On the Brocade NetIron XMR Series, the minimum value supported is 0, and the maximum value supported is 16384. The default value is 2048. On the Brocade NetIron MLX Series, the minimum value supported is 0, and the maximum value supported is 8192. The default value is 1024.

Upon configuration, the Brocade system will verify the input value with the amount of CAM resources that are available. If the Brocade system is unable to allocate requested space, it will display the following error messages on the Brocade NetIron XMR Series and Brocade NetIron MLX Series:

On the Brocade NetIron XMR Series.

```
device(config)# system-max ipv6-mcast-cam 15000
Error - IPV6 Multicast CAM (15000) exceeding available CAM resources
Total IPv6 ACL CAM: 32768(Raw Size)
Reserved IPv6 Rule ACL CAM: 1024(Raw Size)
Available IPv6 Multicast CAM: 31744(Raw Size) 3968(User Size)
```

On the Brocade NetIron MLX Series.

```
device(config)#system-max ipv6-mcast-cam 8000
Error - IPV6 Multicast CAM (8000) exceeding available CAM resources
Total IPv6 ACL CAM: 16384(Raw Size)
Reserved IPv6 Rule ACL CAM: 1024(Raw Size)
Available IPv6 Multicast CAM: 15360(Raw Size) 1920(User Size)
```

After you issue the `system-max` command, with `ipv6-mcast-cam` parameter included, additional information will display on the Brocade NetIron XMR Series and Brocade NetIron MLX Series as shown in the following example.

```
device(config)#system-max ipv6-mcast-cam 1000
Reload required. Please write memory and then reload or power cycle.
Failure to reload could cause system instability on failover.
Newly configured system-max will not take effect during hitless-reload.
```

#### NOTE

You must write this command to memory and perform a system reload for this command to take effect.

## Configuring profiles with a zero-size IPv4 or IPv6 ACL

When a profile is configured to a zero-size IPv4 or IPv6 ACL, the minimum value of 512 for IPv4, and the minimum value of 128 for IPv6 is disabled.

If the `system-max` value for multicast is configured, and you select a value of 0 for IPv4 or IPv6 ACL, the `system-max` value will be ignored. There is minimal checking for errors. The following warning message is displayed.

```
device(config)#cam-partition profile mpls-vpls-2
Warning - Changing to a profile with zero Ipv6 ACL CAM size, ignoring system-max value check and minimum-
guarantee checks.
Reload required. Please write memory and then reload or power cycle.
Failure to reload could cause system instability on failover.
Newly configured system-max will not take effect during hitless-reload.
```

#### NOTE

You must write this command to memory and perform a system reload for this command to take effect.

The `system-max` value is retained in the configuration so that it can be reused later when you want to change the CAM profile.

## Maintaining system-max configuration with available system resources

When `system-max` values are configured, the Brocade system checks for available system resources. The system resources are required in order to maintain dynamic memory allocation. `System-max` values are checked at the configuration time, and at the bootup time. If there are insufficient system resources available on the Management Module, this will cause the configuration to be rejected during card bootup. On the Interface Module, insufficient system resources will lead to failure in booting up the card.

## Configuration time

When `system-max` values are configured, the Management Module calculates the memory required to accept the value. The resulting value is checked against the Known-Available-Memory value, and calculated against the Highest Required Memory value for both the Management Module and the Interface Module.

The Known-Available-Memory is a value with the Lowest Supported Available Memory on a node. For example, if a node can accept a 1 Gigabyte LP, and a 512 MB LP, then the 512 MB LP will be used. The Highest Required Memory is a value with most amount of memory available on a node. For example, if a node has both 2 PPCR LP, and 1 PPCR LP, then the 2 PPCR LP will be used.

If the new `system-max` value is accepted, then the configuration will also be accepted. The following information will display.

```
device(config)#system-max mac 4000
Reload required. Please write memory and then reload or power cycle.
Failure to reload could cause system instability on failover.
Newly configured system-max will not take effect during hitless-reload.
```

**NOTE**

You must write this command to memory and perform a system reload for this command to take effect.

If the new system-max value is not accepted, then the configuration is rejected. The following error message is printed on the console.

```
device(config)# system-max ipv4 10000
ERROR: Configured System-max value cannot be accommodated.
```

## Bootup time

At bootup time, the Management Module will repeat the same process as done in the Configuration time. The Management Module calculates the memory required to accept the system-max configuration. The resulting value is checked against the Known-Available-Memory value for both the Management Module and the Interface Module.

After the new system-max value is configured, there are three possible configuration outcomes. The three possible configuration outcomes are described below.

1. The configuration can be accommodated, but leaves only 10% of Available Memory

In this configuration, a check is made against 90% of Available Memory. If the difference between the Required Available Memory and the Available Memory is less than 10% of Available Memory, then the configuration is accepted. The following warning message is displayed on the console if it affects the Management Module or Interface Module.

The following warning message is displayed on the Management Module.

```
WARNING: Configured System-max Leaves less than 10 percent Free Memory Available on MP.
```

The following warning message is displayed on the Interface Module.

```
WARNING: Configured System-max Leaves less than 10 percent Free Memory Available on LP.
```

A syslog message showing the required memory versus the available memory is generated, and a similar warning message is displayed on the Management Module and Interface Module as shown in the following example.

```
device# show log
...
Jan 17 22:55:55:N: WARN: Configured System-max Leaves less than 10 percent Free Memory Available on
MP (162529285 req vs 1625292800 available)
Jan 17 22:55:55:N: WARN: Configured System-max Leaves less than 10 percent Free Memory Available on
LP (162529285 req vs 1625292800 available)
```

**NOTE**

When the system is booted up again, the percent of free memory is discretionary and is only an estimate.

**NOTE**

Even if all elements are configured with the maximum allowed value, you may not see the reversion of system-max values that occur on any given Interface Module.

**NOTE**

Notifications and traps are sent with the same message.

2. The configuration can be easily accommodated.

In this configuration, the Management Module continues to use the configured system-max value, and send the same value to the installed Interface Modules.

3. The configuration cannot be accommodated.

If the configured system-max value cannot be used, the Management Module will locate the elements that can be reverted to a default value. These system-max elements will revert to a default value, and the following message will display on the console.

```
WARN: Configured System-max cannot be accommodated. Resetting revertible elements to default values.
```

A syslog message is generated, and a similar warning message is displayed on the Management Module and Interface Module as shown in the following example.

```
device# show log
...
Jan 17 22:55:55:N: WARN: Configured System-max cannot be accommodated on MP
(1625292801 req vs 1625292800 available). Resetting revertible elements to default
values.
Jan 17 22:55:55:N: WARN: Configured System-max cannot be accommodated on LP
(1625292801 req vs 1625292800 available). Resetting revertible elements to default
values.
```

#### NOTE

Once the system-max have been reverted, a user might not be able to configure any system-max until configuration for some or all of the revertible system-max elements is removed using "no system-max" CLI.

#### NOTE

Notifications and traps are sent with the same message.

The following tables show which elements are revertible (Yes or No) in each element category.

## L2 elements

TABLE 8 L2 elements

L2 elements	Revertible: yes or no
Mac	yes
Vlan	no
Spanning-tree	no
Rstp	no

## L3 elements

TABLE 9 L3 elements

L3 elements	Revertible: yes or no
Arp	no
multicast-route (for v6 only)	yes
pim-mcache	yes
ip-cache	yes
ip-route	yes
ip-subnet-port	no
virtual-interface	no

## VPLS elements

**TABLE 10** VPLS elements

VPLS elements	Revertible: yes or no
vpls-mac (MAX_VPLS_MAC_INDEX)	yes
vpls-num (MAX_VPLS_NUM_INDEX)	no

## Miscellaneous elements

**TABLE 11** Miscellaneous elements

Miscellaneous elements	Revertible: yes or no
session-limit	yes
ip-filter-sys	no
mgmt-port-acl-size	no
l2-acl-table-entries	no
ipv6-cache	yes
ipv6-route	yes
IPVRF MAX ROUTES	yes
mgmt-port-acl-size	no
receive-cam	no
IPGRE	no
LSP_ACL	no
SERVICE_LOOKUP	no
IP_SRC_GUARD_CAM	no
IPv4 MCAST CAM	no
IPv6 MCAST CAM	no
SERVER_TRUNKS	no
CONFIG_FILE_SIZE	no

## Bootup time message

At bootup time, the following warning and error message is displayed in bold. The warning message and the error message are intermittent. The warning message indicates that when the standby management module (MP) comes up, the active MP syncs the FID entries to the standby MP. If the FID sync fails, the standby MP reboots. The FID sync can fail with a timeout error message if the standby MP is busy processing, and the MP does not respond within an agreeable timeout period and retries. The FIDs are synced successfully on the subsequent reboot. The second error message indicates that when the system is rebooting the standby MP, the baseline sync cannot be completed for multicast. The baseline sync for multicast is aborted. The required state information is not replicated completely from the active MP to the standby MP when the system is rebooting.

```
device>All tasks have completed their initializations

Start code flash synchronization to standby MP.
Code flash synchronization to standby MP is done.
Standby is syncing to Active. Please do not enter anything until Sync complete message is received.
Start running config synchronization to standby MP.
Running config synchronization to standby MP is done.
Warn:alloc_and_distribute_base_fid: Sync to standby MP failed for FID 120 (0078) (err = Timeout),reboot
it(g_mp_red_wait_done 0)  <<<<<<<
Reset Standby MP
Module is up in slot 3
```



## Switch fabric fault monitoring

With this feature, you can display information about the current status of links between the switch fabric modules (SFM) and interface modules in a Brocade NetIron XMR Series or Brocade NetIron MLX Series chassis. This feature also provides log messages to the console when there is a change in the "UP" or "DOWN" status of links to the SFM and when an individual fabric element (FE) cannot be accessed by the management module. The device can also be configured to automatically shut down an SFM when failure is detected. The following sections describe the capabilities of this feature.

## Displaying switch fabric information

You can display information about the current status of links between the SFMs and interface modules in a Brocade NetIron XMR Series or Brocade NetIron MLX Series chassis using the following command. Each line represents a link between an SFM and an interface module (LP).

```
device#show sfm-links all
SFM#/FE# | FE link# | LP#/TM# | TM link# | link state
-----+-----+-----+-----+-----
 2 / 1 | 32 | 3 / 1 | 13 | UP
 2 / 1 | 31 | 3 / 2 | 01 | UP
 2 / 1 | 11 | 3 / 1 | 01 | UP
 2 / 1 | 12 | 3 / 2 | 13 | UP
 2 / 3 | 32 | 3 / 1 | 19 | UP
 2 / 3 | 31 | 3 / 2 | 07 | UP
 2 / 3 | 11 | 3 / 1 | 07 | UP
 2 / 3 | 12 | 3 / 2 | 19 | UP
 3 / 1 | 32 | 3 / 1 | 16 | UP
 3 / 1 | 31 | 3 / 2 | 04 | UP
 3 / 1 | 11 | 3 / 1 | 04 | UP
 3 / 1 | 12 | 3 / 2 | 16 | UP
 3 / 3 | 32 | 3 / 1 | 22 | UP
 3 / 3 | 31 | 3 / 2 | 10 | UP
 3 / 3 | 11 | 3 / 1 | 10 | UP
 3 / 3 | 12 | 3 / 2 | 22 | UP
WARN: LP 3 has 8 links up, less than minimum to guarantee line rate traffic forwarding
```

### Syntax: show sfm-links sfm-number | all [ errors ]

The *sfm-number* variable specifies an SFM that you want to display link information for.

The **all** option displays link information for all SFMs in the chassis.

The *errors* option only displays information for SFM links that are in the DOWN state.

The output of this command can also be filtered using an output modifier. To use an output modifier, type a vertical bar ( / ) followed by a space and one of the following parameters:

- *begin* - begin output with the first matching line
- *exclude* - exclude matching lines from the output
- *include* - include only matching lines in the output

A warning statement is sent if the number of operational links falls below the minimum threshold. This warning is displayed to warn users that the line rate traffic will not be maintained.

The **show sfm-links** command displays the following information.

**TABLE 12** CLI display of SFM link information

This field...	Displays...
SFM#	The switch fabric module number.
FE#	The FE number.
FE link#	The number of the interconnect between the SFM and the FE.

**TABLE 12** CLI display of SFM link information (continued)

This field...	Displays...
LP#	The slot number where the Interface module (LP) is installed.
TM#	The number of the traffic manager used in the link.
TM link#	The link number on the traffic manager.
link state	The link state is either: UP - In an operating condition DOWN - In a non-operational condition

## Displaying switch fabric module information

To display the state of all switch fabric modules in the chassis, enter the following command at any level of the CLI.

```
device> show module
M1 (upper): NI-MLX-MR Management Module Active
M2 (lower): NI-MLX-MR Management Module Standby (Ready State)
F1: NI-X-SF Switch Fabric Module Powered off (By Health Monitoring)
F2:
F3:
F4: NI-X-HSF Switch Fabric Module Active
...
```

### Syntax: show module

The **show module** command displays the modules currently connected to the chassis and their state. For switch fabric modules, the command shows "Active" if the module is operational or "Powered off" and the reason for the shutdown.

## Powering a switch fabric link on or off manually

To manually power on a switch fabric link, use a command such as the following.

```
device# power-on snm-link 3 3 37
```

To manually power off a switch fabric link, use a command such as the following.

```
device# power-off snm-link 3 3 37
```

**Syntax:** [no] power-on snm-link sfm-number fe-number link-number

**Syntax:** [no] power-off snm-link sfm-number fe-number link-number

## Powering a switch fabric module off automatically on failure

To configure the device to automatically power off a switch fabric module (SFM) or high speed switch fabric module (hSFM) on which an access error has been detected, enter the following command at the CONFIG level of the CLI.

```
device(config)# system-init fabric-failure-detection
```

**Syntax:** [no] system-init fabric-failure-detection

### NOTE

You must restart the device for automatic SFM shutdown to take effect.

Once you have configured automatic SFM shutdown on the device and restarted it, the management module will automatically detect access failure (see [Access failure messages](#) on page 52) and shut down the unresponsive SFM. You can restart the SFM at any time (manually, by removing and re-inserting the module, or by initiating a system restart), but if another access error is detected, the

management module will shut the SFM down again. If an SFM is automatically powered down, SFM power-off status (and the associated reason) are synced to the standby management module, and in the event of failover the standby module will keep the faulty SFM powered off.

## Auto-tune enhancement

The RAS feature set is extended with automatic monitoring and tuning of transmit and receive parameters on SERDES links between line modules and switch fabric modules that are down due to excessive CRC errors. Tuning is done on both the line module and switch fabric module i.e. both ends of the the link, at the same time.

If tuning fails on the switch fabric module then the **sysmon fe link action** configuration defines the action taken i.e. a syslog message is generated or the link is shut down and a syslog message is generated. If the link has already been tuned and goes down a second time, then the link is powered down and a syslog message generated.

Auto-tune is enabled by default on MLXe-16 and MLXe-32 chassis. This enhancement is not needed on MLXe-4 and MLXe8 chassis, because the CRC error condition does not occur on these chassis.

To disable auto-tuning on FE for slow or burst CRC errors, enter the following command:

```
device(config)# no sysmon fe link auto-tune
```

To enable auto-tuning again, use the following command:

```
device(config)# sysmon fe link auto-tune
```

### Syntax: [no] sysmon fe link auto-tune

To disable auto-tuning on TM for slow or burst CRC errors, enter the following command:

```
device(config)# no sysmon tm link auto-tune
```

To enable auto-tuning again, use the following command:

```
device(config)# sysmon tmlink auto-tune
```

### Syntax: [no] sysmon tm link auto-tune

## Switch fabric log messages

Information about the state of each switch fabric module and whether it can be accessed by the Management Module is also provided in the form of syslog messages.

### Link up/down messages

The Switch Fabric modules (SFM) in a Brocade chassis send a log message when they first become operational or when they change state between "UP" and "DOWN". The following is an example of the message sent when a link first becomes operational (UP) or when it changes state from non-operational (DOWN) to operational (UP).

```
Apr 6 10:57:20:E: Fabric Monitoring Link Up : SFM 3/FE 3/Link 37, LP 5/TM 1
```

The following is an example of the message sent when a link is detected going from operational (UP) to non-operational (DOWN).

```
Apr 6 10:56:00:E: Fabric Monitoring Link Down : SFM 3/FE 3/Link 37, LP 5/TM 1
```

Once a link has been detected as going down and "auto-tune" is disabled or "auto-tune" is enabled but the link has already been tuned (see [Auto-tune enhancement](#) on page 51), it is automatically shut down by the Multi-Service IronWare software . The following is an

example of the message sent when a link is either brought down automatically or manually using the command described in [Powering a switch fabric link on or off manually](#) on page 50.

```
Apr 6 10:56:00:E: Fabric Monitoring Link Admin Shut Down : SFM 3/FE 3/Link 37, LP 5/TM 1
```

This contents of the message are defined as described in the following.

Apr 6 10:57:20: - The time that the link changed state.

Fabric Monitoring Link Up - the link went "UP" Fabric Monitoring Link Down - the link went "DOWN"

SFM 3 - The switch fabric module (SFM) number

FE 3 - The Fabric Element number

Link 37 - The number of the interconnect between the SFM and the FE

LP 5 - The slot number where the Interface Module (LP) is installed.

TM 1 - The number of the traffic manager (TM) used in the link.

## Access failure messages

The management module attempts to access each fabric element for every poll period (1 second by default). If the number of access failures in a poll window (default 10 seconds) exceeds the threshold (3 by default), the management module sends a log message similar to the following:

```
Apr 6 20:33:57:A:System: Health Monitoring: FE access failure detected on SFM 2/FE 1
```

The contents of the message are defined as described in the following.

Apr 6 20:33:57: - the time at which the error threshold was exceeded

FE access failure detected - the management module failed to access the specified FE

SFM 2 - the switch fabric module (SFM) number

FE 1 - the Fabric Element (FE) number

If the device has been configured to shut down a switch fabric module when failure is detected (see [Powering a switch fabric module off automatically on failure](#) on page 50), the management module will shut down the failed switch fabric module, then send a log message similar to the following:

```
Oct 4 20:33:57:A:System: Health Monitoring: Switch fabric 2 powered off due to failure detection
```

The message above indicates that a failure was detected in attempting to access switch fabric module 2, and the module was powered off on October 4th at 20:33:57.

## Fabric error interrupt

Fabric error interrupts are monitored and logged for both the switch fabric module, and the Brocade MLX 24-port 10 GbE module and Brocade MLX 2-port 100 GbE module.

The following example shows a fabric error interrupt for a switch fabric module on an MP:

```
Dec 4 20:33:57: SFM 1 / FE 1 Reg offset 0x00000800 value 0x0000000c Overflow ( DCQ) Interrupt
```

The following example shows a fabric error interrupt for a slot on an LP:

```
Mar 4 20:33:57: Slot 17 FE1 Reg offset 0x00000800 value 0x0000000c Overflow ( DCQ) Interrupt
```

## Switch fabric utilization monitoring

With this feature, you can monitor the percentage of the total bandwidth used on the SFM for the timing intervals of 1 sec, 5 sec, 1 min, and 5 min. For example, to display bandwidth usage on all SFMs on the device, enter the following command.

```
device#show sfm-utilization all
SFM#2
-----+-----+-----+-----+-----
last 1 second utilization = 0.4%
last 5 seconds utilization = 0.3%
last 1 minute utilization = 0.1%
last 5 minutes utilization = 0.0%
SFM#3
-----+-----+-----+-----+-----
last 1 second utilization = 0.4%
last 5 seconds utilization = 0.4%
last 1 minute utilization = 0.1%
last 5 minutes utilization = 0.0%
```

To display bandwidth usage on one SFM, enter the following command.

```
device#show sfm-utilization 2
SFM#2
-----+-----+-----+-----+-----
last 1 second utilization = 0.4%
last 5 seconds utilization = 0.3%
last 1 minute utilization = 0.1%
last 5 minutes utilization = 0.0%
```

**Syntax:** `show sfm-utilization [ sfm-number | all ]`

The *sfm-number* variable specifies an SFM that you want to utilization information for.

The *all* option displays utilization information for all SFMs in the chassis.

## Verifying an image checksum

Use the **image-checksum** command to verify the checksum of the application, boot, or monitor images that are saved in code flash and Auxiliary Flash cards.

### NOTE

The **image-checksum** command on is not applicable to a combined application image.

To check a monitor image, use the following command.

```
device# image-checksum monitor
OK
```

**Syntax:** `[no] image-checksum file-name`

The *file-name* variable specifies the image file that you want to verify the checksum for.

The following output can be generated by this command

**TABLE 13** Output from the image-checksum command

Output	Description
File not found	The device failed to locate the specified file.
Failed to read file	The device failed to obtain the file length from the file system.
Not an image file	The specified file is not an image file.
File read failed	The specified file's actual length is different form the file length stored in the file system.

TABLE 13 Output from the image-checksum command (continued)

Output	Description
Checksum failed	The image has a checksum error.
OK	The checksum has been verified for the specified image file.

## Displaying information for an interface for an Ethernet port

To display information for a show interface for an ethernet port, enter the following command at any CLI level.

```
device# show interface ethernet 9/1
GigabitEthernet2/3 is up, line protocol is up
  STP Root Guard is disabled, STP BPDU Guard is disabled
  Hardware is GigabitEthernet, address is 0000.0098.4900 (bia 0000.0098.492a)
  Configured speed auto, actual 1Gbit, configured duplex fdx, actual fdx
  Member of VLAN 1 (untagged), 5 L2 VLANs (tagged), port is in dual mode (default      vlan), port
  state is Forwarding
  STP configured to ON, Priority is level0, flow control enabled
  Priority force disabled, Drop precedence level 0, Drop precedence force disabled
  arp-inspection-trust configured to OFF
  mirror disabled, monitor disabled
  Not member of any active trunks
  Not member of any configured trunks
  Port name is ->7.bladel.shelf1.access.aprd
  Port state change time: Jan 21 02:40:21, (0 days, 00:07:16 ago)
  MTU 1544 bytes, encapsulation ethernet
  300 second input rate: 1509512 bits/sec, 713 packets/sec, 0.15% utilization
  300 second output rate: 1992071 bits/sec, 751 packets/sec, 0.20% utilization
  712896623 packets input, 204984611768 bytes, 0 no buffer
  Received 1315502 broadcasts, 53313 multicasts, 711527808 unicasts
  0 input errors, 0 CRC, 0 frame, 0 ignored
  0 runts, 29433839 giants
  NP received 712896745 packets, Sent to TM 712839428 packets
  NP Ingress dropped 57317 packets
  796106728 packets output, 366570033985 bytes, 0 underruns
  Transmitted 2045784 broadcasts, 32330616 multicasts, 761730328 unicasts
  0 output errors, 0 collisions
  NP transmitted 796106833 packets, Received from TM 796534170 packets
```

**Syntax:** `show interface [ ethernet slot-port [ to slot-port ]]`

You can display information for all ports in a device by using the **show interface** command without options, or use the **ethernet slot-port** option to limit the display to a single port, or add the **to slot-port** option for a range of ports.

## Displaying the full port name for an Ethernet interface

To display the full port name for an ethernet interface using the CLI, enter the following command.

```
device# show interface brief slot 3
Port  Link  Port-State  Dupl Speed Trunk Tag Priori MAC          Name          Type
3/1   Up     Forward    Full 100G None No  level0 0000.0002.025c default-port
3/2   Up     Forward    Full 100G None No  level0 0000.0002.025d default-port
```

**Syntax:** `show interface brief slot/port`

If the port is logically UP (meaning not LK-DISABLE or LACP-BLOCKED or OAM-DISABLE or DOTIX-BLOCKED), then:

- If the port is untagged then the L2 Port state field indicates the STP State of Port in the untagged VLAN context.
- If the port is tagged or in dual mode (both tagged and untagged), then it is marked forwarding as a single port state cannot be determined.

In case Port is logically down, L2 Port State indicates reason for Logical Port down condition (LK-DISABLE or LACP-BLOCKED or OAM-DISABLE or DOTIX-BLOCKED)

Using the **show interface brief wide** command long port names are displayed. If the **show interface brief wide** command is not used only partial names are displayed in cases of long port names.

```

device# show interface brief wide
Port Link Port-State Speed Tag MAC Name
2/1 Up Forward 10G No 0000.00f7.0230 port-connected-to-chicago
2/2 DisabNone None No 0000.00f7.0231
2/3 DisabNone None No 0000.00f7.0232
2/4 DisabNone None No 0000.00f7.0233
Port Link Port-State Speed Tag MAC Name
mgmt1 Up Forward 100M Yes 0000.00f7.0200
Port Link Port-State Speed Tag MAC Name
lb1 Up N/A N/A N/A N/A
device#
    
```

**Syntax:** `show interface brief wide slot/port`

**TABLE 14** Display of show interface ethernet port

This field...	Displays...
<i>Module type</i> port# is <i>state</i>	The <i>module type</i> variable specifies a type of interface module, such as 10GigabitEthernet. The <i>port#</i> variable specifies the port number for the interface module. The <i>state</i> variable if the interface module is up or down.
Line protocol is <i>status</i>	The <i>status</i> variable specifies if the line protocol is up or down. If the interface is down due to Remote Fault, the reason is indicated as: "(remote fault)". If a port is down because of a Local Fault, the reason is indicated as: "(local fault)".
STP Root Guard is <i>status</i>	The <i>status</i> variable specifies if the STP Root Guard is enabled or disabled.
STP BPDU Guard is <i>status</i>	The <i>status</i> variable specifies if the STP BPDU Guard is enabled or disabled.
Hardware is <i>module type</i>	The <i>module type</i> variable specifies a type of interface module, such as #GigabitEthernet.
Address is <i>MAC- address</i>	The <i>MAC- address</i> variable specifies the MAC address of the port.
Configured speed and actual speed	The speed that the module has been configured to operate at, and the actual speed it is currently operating at.
Configured port speed and actual duplex	The port capacity that the module has been configured to operate at, and the actual speed it is currently operating at.
Member of <i>VLAN #</i> (untagged) <i>port#</i> L2 VLANS (tagged) Port is in <i>dual mode/untagged/tagged mode</i> Port state is <i>status</i>	The <i>VLAN#</i> (untagged) variable specifies a port that is a member of only 1 VLAN. The <i>port#</i> L2 VLANS (tagged) variable specifies a port that is a member of multiple ports and untagged. A port is in <i>dual- mode</i> specifies member VLAN ports as untagged and tagged. The default mode is dual-mode. The <i>status</i> variable identifies the flow of traffic as forwarding or disabled.
STP configured to <i>status</i> Priority level Flow control <i>status</i>	The <i>status</i> variable specifies if the STP is ON or OFF. The priority level assigned to the port-based VLAN. The priority level is on scale from 0-7. The default is 0. The <i>status</i> variable is enabled or disabled.
Priority force <i>status</i>	The <i>status</i> variable specifies if the priority force on a port is disabled on enabled.
Drop precedence level <i>value</i>	Identifies the TOS or DSCP value in the IPv4 or IPv6 packet header. The <i>value</i> variable specifies the drop precedence on a scale from 0-3. Packets that contain a DSCP value of 0 are least likely to be dropped and packets with a value of 3 are most likely to be dropped. The default value is 0.
Drop precedence force <i>status</i>	The <i>status</i> variable specifies the drop precedence force as enabled or disabled. Identifies the drop precedence if the force command is configured for a specific ingress port.

TABLE 14 Display of show interface ethernet port (continued)

This field...	Displays...
arp-inspection-trust configured to <i>status</i>	The <i>status</i> variable specifies if arp-inspection-trust feature is configured ON or OFF. The default trust setting for a port is untrusted.
Mirror <i>status</i>	The <i>status</i> variable specifies if the port mirror command is configured as enabled or disabled.
Monitor <i>status</i>	The <i>status</i> variable specifies if the port monitor command is configured as enabled or disabled.
Trunk membership	The <i>Trunk membership</i> variable identifies the interface module as a member of a primary or secondary port. This specifies members of an active port or not a member of an active port.
Configured trunk membership	The <i>Configured trunk membership</i> variable identifies the interface module as a member of any configured trunk or not a member of a configured trunk.
Port name	The <i>port name</i> variable identifies the name assigned to the port.
MTU # <i>bytes</i> , encapsulation ethernet	Maximum Transmission Unit (MTU) refers to the size of the largest packet or frame that a known layer can pass forward.  The # <i>bytes</i> variable refers to size of the packet or frame.
# <i>seconds</i> input rate: <i>value</i> bits/sec, <i>value</i> packets/sec, % utilization	The # <i>seconds</i> input rate refers to: <ul style="list-style-type: none"> <li>The <i>value</i> of bits received per second.</li> <li>The <i>value</i> of packets received per second.</li> <li>The % utilization specifies the port's bandwidth used by received traffic.</li> </ul>
# <i>seconds</i> output rate: <i>value</i> bits/sec, <i>value</i> packets/sec, % utilization	The # <i>seconds</i> output rate refers to: <ul style="list-style-type: none"> <li>The <i>value</i> of bits transmitted per second.</li> <li>The <i>value</i> of packets transmitted per second.</li> <li>The % utilization specifies the port's bandwidth used by transmitted traffic.</li> </ul>
<i>value</i> packets input, <i>value</i> bytes, <i>value</i> no buffer	<ul style="list-style-type: none"> <li>The <i>value</i> variable specifies the number of packets received.</li> <li>The <i>value</i> variable specifies the number of bytes received.</li> <li>The <i>value</i> no buffer variable specifies the total number of packets that have been discarded by the MAC device, due to temporary inability to store the packets before forwarding to the Network Processor (NP).</li> </ul>
Received <i>value</i> broadcasts, <i>value</i> multicasts, <i>value</i> unicasts	The <i>value</i> variable specifies the amount of traffic the interface module is receiving on broadcasts, multicasts, and unicast traffic.
<i>value</i> input errors, <i>value</i> CRC, <i>value</i> frame, <i>value</i> ignored	<ul style="list-style-type: none"> <li>The <i>value</i> input errors variable specifies the number of received packets with errors.</li> <li>The <i>value</i> CRC variable specifies the number of packets discarded by the MAC device due to detected CRC error.</li> <li>The <i>value</i> variable specifies the number of received packets with alignment errors.</li> <li>The <i>value</i> variable specifies the number of received packets that are discarded.</li> </ul> These parameters are not currently supported and will always display 0.
<i>value</i> runts, <i>value</i> giants	The <i>value</i> runts variable specifies the number of small packets that are less than 64 bytes.  The <i>value</i> giants variable specifies the number of large packets greater than 1518 bytes.  These parameters are not currently supported and will always display 0.
NP received	The number of packets received on the Network Processor (NP).
NP transmitted	The number of packets sent from the Network Processor to the Traffic Manager (TM).
NP Ingress dropped	The number of ingress packets dropped on the Network Processor.
<i>value</i> packets output <i>value</i> bytes	<ul style="list-style-type: none"> <li>The <i>value</i> variable specifies the number of transmitted packets.</li> <li>The <i>value</i> variable specifies the number of transmitted bytes.</li> </ul>
Transmitted <i>value</i> broadcasts, <i>value</i> multicasts, <i>value</i> unicasts	The <i>value</i> variable specifies the amount of traffic the interface module transmitted on broadcasts, multicasts, and unicast traffic.
<i>value</i> output errors, <i>value</i> collisions	<ul style="list-style-type: none"> <li>The <i>value</i> variable specifies the number of transmitted packets with errors.</li> </ul>

TABLE 14 Display of show interface ethernet port (continued)

This field...	Displays...
	<ul style="list-style-type: none"> <li>The <i>value</i> variable specifies the number of packets that experienced multi-access collisions.</li> </ul> These parameters are not currently supported and will always display 0.
Network Processor transmitted <i>value</i> packets	The <i>value</i> variable specifies the number of packets transmitted from the Network Processor.
Received from Traffic Manager <i>value</i> packets	The <i>value</i> variable specifies the number of packets received by the Network Processor from the Traffic Manager.

## Displaying statistics information for an Ethernet port

You can view statistical information about the traffic passing through a specified Ethernet port in one of two ways. The **monitor** commands allow you to monitor traffic statistics in real time, while the **show statistics** command provides a snapshot of the most recent traffic statistics.

### Monitoring Ethernet port statistics in real time

You can monitor Ethernet traffic statistics in real time for a single port or traffic counters for all Ethernet ports using the **monitor** commands. When you execute a **monitor** command it retrieves and displays traffic statistics once per polling interval (2 seconds by default) until you pause or stop the display. The terminal window is fully occupied by the real-time display, and the command prompt is replaced by a footer listing options for pausing, canceling or modifying the display. When real-time monitoring is canceled, the command prompt is restored and the CLI resumes normal operation.

The following considerations affect the use of the **monitor** commands:

- Real-time monitor commands can be executed via Telnet, SSH, or a console session. Because of the slower communication rate in a console session, Brocade recommends executing the **monitor** commands *only* from a Telnet or SSH session. The default poll interval for telnet and SSH is 2 seconds, but the default polling interval for a console session is 8 seconds. If you execute **monitor** commands from a console session, flickering of the display may occur.
- If the **monitor** command is executed in a console session, console debug messages will not be displayed on the console screen.
- When the **monitor** command is executed via telnet or SSH, debug messages will not be displayed during execution of the command even with a **debug destination telnet session** configuration present.
- monitor** commands, in general, display two kinds of statistics: aggregated (counted since system startup or since last cleared using a **clear** command) and delta (counted since start of this **monitor** command or since last cleared using the *c* footer option on the monitor screen).
- Resizing of the terminal window is not supported during real-time statistics display. You must stop the execution of the command before resizing the terminal window.
- Terminal display size must be at least 80 characters wide by 24 lines in order to avoid garbled or truncated display.
- Execution of the **monitor** commands is unaffected by Telnet or SSH idle timeouts; as long as the **monitor** command is running, the terminal is not idle.
- There can be a noticeable impact on CPU utilization if the polling interval (monitor refresh interval) is short and multiple sessions are simultaneously executing **monitor** commands. When monitoring takes place by way of multiple simultaneous sessions, increase the polling interval to minimize impact on the CPU. (The polling interval/refresh rate ranges from 2 to 30 seconds, with a default value of 2 seconds for SSH or telnet connections and 8 seconds for a console session.)
- When you quit the **monitor** command, the CLI command prompt will usually be displayed at the bottom of the screen. If it appears instead in the middle of the screen, clear the screen using the command *c/s* before executing further commands.

## Real-time monitoring of traffic statistics for a specific Ethernet port

To monitor traffic statistics for a specific Ethernet port, enter the following command at the Privileged EXEC level of the CLI.

```
device# monitor statistics ethernet 1/2
```

**Syntax:** `monitor statistics ethernet slot/port`

The `slot/port` variable specifies the port for which you want to display statistics.

The `monitor statistics` command uses page mode display to show a detailed, port-specific traffic statistics screen which is updated every poll interval. (In the Brocade Netron XMR Series and Brocade Netron MLX Series, this command also shows a second screen displaying network processor statistics.) You can modify the display using the commands shown in the footer. (Note that when you enter footer options they are not executed immediately but will be interpreted by the monitor engine during the next polling cycle.) The footer commands and their effects are described in the following table.

**TABLE 15** Footer commands for monitor statistics display

Footer command	Description
t	Displays the transmit/output statistics (the default) and continues the execution of the original command.
r	Displays the receive/input statistics and continues the execution of the original command.
n	Continues the execution of the command for the next available Ethernet interface. If there is no next interface available, the monitor continues to display statistics for the current interface.
p	Continues the execution of the command for the previous Ethernet interface. If there is no next interface available, the monitor continues to display statistics for the current interface.
c	Clears the current delta counters and continues the execution of the original command. To clear the aggregate counters, use the appropriate <code>clear</code> command.
f	Freezes the execution of the command; pauses retrieval and display of the statistics. While display is frozen, the only valid commands are <code>s</code> and <code>q</code> : you can restart or quit the monitor, but any other command will be ignored.
s	Restarts the execution of the command; resumes retrieval and display of the statistics.
F	Decreases the polling interval (monitor refresh interval) by one second and continues the execution of the original command with the new refresh interval. This option will decrease the refresh interval until it is equal to 2 seconds, the minimum supported refresh interval value. The default value is 2 seconds. This command is not displayed in the footer of the statistics screen.
S	Increases the polling interval (monitor refresh interval) by one second and continues the execution of the original command with the new refresh interval. This option will increase the refresh interval until it is equal to 30 seconds, the maximum supported refresh interval value. The default value is 2 seconds. This command is not displayed in the footer of the statistics screen.
q or escape or ^c	Quits the execution of the command and returns to the command prompt.
u	Brocade Netron XMR Series and Brocade Netron MLX Series only: Displays the first page of the multi-page display (page-up operation).
d	Brocade Netron XMR Series and Brocade Netron MLX Series only: Displays the second page of the multi-page display (page-down operation).

## Brocade Netron XMR Series and Brocade Netron MLX Series example

```
device# monitor statistics ethernet
4/1
```

```

                Seconds: 8          poll: 8  Time: Aug 19 16:10:59
Page 1 of 2  Interface Tx Statistics      Current      Delta
Ethernet 4/1 Tx interface statistics
Traffic statistics:
  Out Packets          17083660926          533508
  Out Octets          1093354299264          34144512
  Out Unicast Packets 17083660926          533508
  Out Multicast Packets 0                      0
  Out Broadcast Packets 0                      0
```

```

Error statistics:
  Out Errors          0          0
  Out Discards        0          0

```

```

Tx/Rx=t/r, Page1/2=u/d, Next/Prev=n/p, Clear=c :Freeze=f/s Quit=q
                Seconds: 40          poll: 8   Time: Aug 19 16:11:31
Page 2 of 2   NP       Tx Statistics          Current          Delta
Ethernet 4/1 Tx NP statistics
  Sent to MAC Packet          17085805774        2670758
  Raw Good Packet             17085805774        2670758
  IPX HW Forwarded Packet     0                  0
  Receive from TM             17085805775        2670759
  Unicast Packet              17085805774        2670758
  Broadcast Packet            0                  0
  Multicast Packet            0                  0
Error statistics :
  Bad Packet Count            0                  0

  ACL Drop                    0                  0
  Source Port Supress Drop    0                  0
  IPv4 Packet                  0                  0
  IPv6 Packet                  0                  0
  IPv4 Byte                    0                  0
  IPv6 Byte                    0                  0

```

```
Tx/Rx=t/r, Page1/2=u/d, Next/Prev=n/p, Clear=c :Freeze=f/s Quit=q
```

The previous output shows the first and second pages of the detailed traffic statistics display for Ethernet port 4/1 from a Brocade NetIron XMR Series or Brocade NetIron MLX Series, displaying transmit counters (the default).

### Brocade NetIron CES Series and Brocade NetIron CER Series example

```

device# monitor statistics ethernet
1/2

                Seconds: 26          poll: 2   Time: Aug 19 16:01:41
                Current          Delta
Ethernet 1/2 Tx interface statistics
Traffic statistics:
  In Packets          24847720          7738201
  In Octets           1590253440        495244864
  In Unicast Packets  24847720          7738201
  In Multicast Packets 0                  0
  In Broadcast Packets 0                  0

Error statistics:
  In Errors          0                  0
  In Discards        0                  0

```

```
Tx/Rx=t/r, Next/Prev=n/p, Clear=c :Freeze=f/s Quit=q
```

The previous output shows the detailed traffic statistics display for Ethernet port 1/2 from a Brocade NetIron CES Series or Brocade NetIron CER Series, displaying transmit counters (the default).

## Real-time monitoring of traffic statistics for all Ethernet ports

To monitor summary traffic data (total packets or bytes sent and received) for all Ethernet ports (displaying up to 16 ports per screen), enter the following command at the Privileged EXEC level of the CLI.

```
device# monitor interface traffic
Seconds: 248           Time: Mar 11 20:12:08
Interface traffic statistics:
      InPackets      Delta      OutPackets      Delta
e1/1          24615      4004          24308          3986
e1/2              0           0              0              0
e1/3              0           0              0              0
e1/4              0           0              0              0
e1/5              0           0              0              0
e1/6              0           0              0              0
e1/7              0           0              0              0
e1/8              0           0              1              1
e1/9              0           0              0              0
e1/10           0           0              0              0
e1/11           0           0              0              0
e1/12           0           0              0              0
e1/13           0           0              0              0
e1/14           0           0              0              0
e1/15           0           0              0              0
e1/16           0           0              0              0
Packets=p or Bytes=b, Delta=d or Rate=r, Clear=c, Next=n :Freeze=f/s Quit=q
```

**Syntax:** `monitor interface traffic [ ethernet slot/port ]`

The **monitor interface traffic** command uses page mode display to produce an updating statistics screen which is updated every poll interval and which can be modified using the commands shown at the bottom of the display. (Note that when you enter footer options they are not executed immediately but will be interpreted by the monitor engine during the next polling cycle.) Normally the display begins with the lowest numbered Ethernet port; the **ethernet slot/port** option starts the display instead with the specified port.

The footer commands and their effects are described in the following table.

**TABLE 16** Footer commands for monitor interface traffic display

Footer command	Description
p	Displays input/output packets instead of bytes and continues the execution of the original command.
b	Displays input/output bytes instead of packets and continues the execution of the original command.
d	Displays delta counters instead of rate counters and continues the execution of the original command.
r	Displays rate counters instead of delta counters and continues the execution of the original command.
c	Clears the current delta counters and continues the execution of the original command. To clear the aggregate counters, use the appropriate <b>clear</b> command.
n	Moves to the next group of interfaces and continues the execution of the original command.
f	Freezes the execution of the command; pauses retrieval and display of the statistics. While display is frozen, the only valid commands are <b>s</b> and <b>q</b> ; you can restart or quit the monitor, but any other command will be ignored.
s	Restarts the execution of the command; resumes retrieval and display of the statistics.
F	Decreases the polling interval (monitor refresh interval) by one second and continues the execution of the original command with the new refresh interval. This option will decrease the refresh interval until it is equal to 2 seconds, the minimum supported refresh interval value. The default value is 2 seconds. This command is not displayed in the footer of the statistics screen.
S	Increases the polling interval (monitor refresh interval) by one second and continues the execution of the original command with the new refresh interval. This option will increase the refresh interval until it is equal to 30 seconds, the maximum supported refresh interval value. The default value is 2 seconds. This command is not displayed in the footer of the statistics screen.
q or escape or ^c	Quits the execution of the command and returns to the command prompt.

## Displaying recent traffic statistics for an Ethernet port

To display information from the **show statistics** command for an Ethernet port, enter the following command at any CLI level.

```
device# show statistics ethernet 9/1
PORT 9/1 Counters:

210753550720
                InOctets      210753498112      OutOctets
      InPkts      1646511726      OutPkts      1646512119
InBroadcastPkts      0      OutBroadcastPkts      0
InMulticastPkts      0      OutMulticastPkts      0
InUnicastPkts      1646511726      OutUnicastPkts      1646512142
  InDiscards      0      OutDiscards      0
    InErrors      0      OutErrors      0
  InCollisions      0      OutCollisions      0
      OutLateCollisions      0
      Alignment      0      FCS      0
InFlowCtrlPkts      0      OutFlowCtrlPkts      0
    GiantPkts      0      ShortPkts      0
InBitsPerSec      3440829770      OutBitsPerSec      3440686411
InPktsPerSec      3360185      OutPktsPerSec      3360085
InUtilization      39.78%      OutUtilization      39.78%
```

### Syntax: show statistics ethernet slot/port

The *slot/port* variable specifies the port that you want to display statistics for.

This field...	Displays...
InOctets	The total number of good octets and bad octets received.
OutOctets	The total number of good octets and bad octets transmitted.
InPkts	The total number of packets received. The count includes rejected and local packets that are not transmitted to the switching core for transmission.
OutPkts	The number of good packets received. The count includes unicast, multicast, and broadcasts packets.
InBroadcastPkts	The total number of good broadcast packets received.
OutBroadcastPkts	The total number of good broadcast packets transmitted.
InMulticastPkts	The total number of good multicast packets received.
OutMulticastPkts	The total number of good multicast packets transmitted.
InUnicastPkts	The total number of good unicast packets received.
OutUnicastPkts	The total number of good unicast packets transmitted.
InDiscards	The total number of packets that were received and then dropped due to a lack of receive buffers.
OutDiscards	The total number of packets that were transmitted and then dropped due to a lack of transmit buffers.
InErrors	The total number of packets received that had Alignment errors or phy errors.
OutErrors	The total number of packets transmitted that had Alignment errors or phy errors.
InCollisions	The total number of packets received in which a Collision event was detected.
OutCollisions	The total number of packets transmitted in which a Collision event was detected.
OutLateCollisions	The total number of packets transmitted in which a Collision event was detected, but for which a receive error (Rx Error) event was not detected.
Alignment	The total number of packets received that were from 64 - 1518 octets long, but had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).
FCS	The Frame Checksum error.
InFlowCtrlPkts	The total number of ingress flow control packets. "N/A" indicates that the interface module does not support flow control statistics.

This field...	Displays...
OutFlowCtrlPkts	The total number of egress flow control packets. "N/A" indicates that interface module does not support flow control statistics.
GiantPkts	The total number of packets for which all of the following was true: <ul style="list-style-type: none"> <li>The data length was longer than the maximum allowable frame size.</li> <li>No Rx Error was detected.</li> </ul> This counter is only for 10GbE interfaces.
ShortPkts	The total number of packets received for which all of the following was true: <ul style="list-style-type: none"> <li>The data length was less than 64 bytes.</li> <li>No Rx Error was detected.</li> <li>No Collision or late Collision was detected.</li> </ul>
InBitsPerSec	The number of bits received per second.
OutBitsPerSec	The number of bits transmitted per second.
InPktsPerSec	The number of packets received per second.
OutPktsPerSec	The number of packets transmitted per second.
InUtilization	The percentage of the port's bandwidth used by received traffic.
OutUtilization	The percentage of the port's bandwidth used by transmitted traffic.

## Disabling CAM table entry aging

By default if no traffic hits a programmed flow-based content addressable memory (CAM) table entry, the CAM entry is removed from the system's CAM table. Depending on your network needs, however, you might have to disable the default behavior and force the system to retain CAM entries even when no traffic hits them. You can stop and start the CAM aging feature by using the **hw-aging** command in the global configuration mode.

**Syntax:** `hw-aging disable | enable`

The *disable* option prevents CAM entries from aging out. Even if no traffic hits a particular CAM entry, the entry remains in the CAM table.

The *enable* option returns the system to the default mode and unused CAM age out of the CAM table.

## Data integrity protection

Data integrity protection provides a way to detect and report potential problems with the internal data path of the network processor. It also allows you to tune the detection and reporting of these types of problems. In addition, a show command is provided to display the status of the system.

## Configuring Detection Parameters

Several parameters can be configured to support this data integrity protection: rolling window time frame, event thresholds for ingress and egress buffer events, and event thresholds for Control Static Random Access Memory (CSRAM) and Longest Prefix Match (LPM) memories. The configurations are applied system wide.

## Rolling Window Time Frame

Data integrity protection implements a rolling window to calculate the most recent history of errors. The rolling window time frame is the period of time error events are recorded. Data integrity protection polls for events every 500 milliseconds and updates the current window.

```
device(config)# system np rolling-window 10
```

**Syntax:** `[no] system np rolling-window window size`

The *window size* parameter sets the rolling window time frame. The allowable window time is 10 to 60 seconds. Setting to 0 seconds will disable error monitoring.

The `[no]` option returns the threshold to the default setting.

## Event Threshold Configuration

The data integrity protection implements configurable thresholds for generating a syslog and trap. There is one threshold for ingress buffer events and one threshold for egress buffer events. Once crossed, a syslog and trap will be generated.

To prevent excessive log and traps there is a 10 minute period before another syslog or trap is generated. Setting a threshold to zero disables error detection for the monitor point on all network processors.

The default threshold values are different for ingress and egress. The ingress error count is based on the errors detected on each 32-bit word. The egress error count is based on the number of packets with one or more errors.

The `system np ingress-threshold` command configures the ingress buffer error reporting threshold.

```
device(config)# system np ingress-threshold 20
```

**Syntax:** `[no] system np ingress-threshold threshold`

The *threshold* range is 0 to 120 events. Setting the threshold to 0 disables the monitor point for all network processors. The default setting is 20 events.

The `[no]` option returns the threshold to default.

The `system np egress-threshold` command configures the egress buffer error reporting threshold.

```
device(config)# system np egress-threshold 20
```

**Syntax:** `[no] system np egress-threshold threshold`

The *threshold* range is 0 to 120 events. Setting the threshold to 0 disables the monitor point for all network processors. The default setting is 3 events.

The `[no]` option returns the threshold to default.

## Configuring the threshold parameters for CSRAM

Use the `system np control-ram-threshold threshold` command to configure the CSRAM threshold parameter when monitoring low level memory events occurring within the CSRAM memory module of the network processor.

Configure the Rolling Window Time Frame. Refer to the [Rolling Window Time Frame](#) on page 63.

### NOTE

Configuring the threshold parameters for CSRAM is supported only on the Brocade NetIron CER Series and the Brocade NetIron CES Series platforms.

1. In privileged EXEC mode, issue the `configure terminal` command to enter the global configuration mode.

2. Enter the **system np** command to configure the NP error reporting threshold parameter on the device.

```
device (config)#system np
```

3. Enter the **system np control** command to configure the CSRAM error reporting threshold parameter on the device.

```
device (config)#system np control
control-ram-threshold  Configure the Control SRAM error reporting threshold
```

4. Enter the **system np control-ram-threshold *threshold*** command with the appropriate threshold parameter.

```
device (config)#system np control-ram-threshold 20
```

5. Enter the **system np control-ram-threshold 0** command to disable the monitoring of low level memory events.

```
device (config)#system np control-ram-threshold 0
```

6. Enter the **no system np control-ram-threshold *threshold*** command to reset the threshold value to default.

```
device (config)#no system np control-ram-threshold 20
```

#### NOTE

By default, the feature is enabled with default configuration values. When the default configuration values are present, the **show run** command does not display CSRAM error configuration information. The **show run** command displays CSRAM error configuration information only when a non-default value is configured or when the feature is disabled.

The following example configures the CSRAM error reporting threshold parameter to 20 events on the device.

```
device(config)#system np
control-ram-threshold  Configure the Control SRAM error reporting threshold
egress-threshold       Configure the egress buffer error reporting threshold
ingress-threshold      Configure the ingress buffer error reporting threshold
lpm-ram-threshold      Configure the LPM memory error reporting threshold
rolling-window         Configure the rolling window time frame
device(config)#system np control
control-ram-threshold  Configure the Control SRAM error reporting threshold
device(config)#system np control-ram-threshold 20
DECIMAL 0-120 events (default:10 disable: 0)
device(config)#system np control-ram-threshold 20
```

### Configuring the threshold parameters for LPM memory

Use the **system np lpm-ram-threshold *threshold*** command to configure the LPM memory threshold parameter when monitoring low level memory events occurring within the LPM memory module of the network processor.

Configure the Rolling Window Time Frame. Refer to the [Rolling Window Time Frame](#) on page 63.

#### NOTE

Configuring the threshold parameters for LPM memory is supported only on the Brocade NetIron CER Series and the Brocade NetIron CES Series platforms.

1. In privileged EXEC mode, issue the **configure terminal** command to enter the global configuration mode.
2. Enter the **system np** command to configure the NP error reporting threshold parameter on the device.

```
device (config)#system np
```

3. Enter the **system np lpm** command to configure the LPM memory error reporting threshold parameter on the device.

```
device (config)#system np lpm
lpm-ram-threshold      Configure the LPM memory error reporting threshold
```

4. Enter the **system np lpm-ram-threshold *threshold*** command with the appropriate threshold parameter.

```
device (config)#system np lpm-ram-threshold 30
```

5. Enter the **system np lpm-ram-threshold 0** command to disable the monitoring of low level memory events.

```
device (config)#system np lpm-ram-threshold 0
```

6. Enter the **no system np lpm-ram-threshold *threshold*** command to reset the threshold value to default.

```
device (config)#no system np lpm-ram-threshold 30
```

#### NOTE

By default, the feature is enabled with default configuration values. When the default configuration values are present, the **show run** command does not display LPM memory error configuration information. The **show run** command displays LPM memory error configuration information only when a non-default value is configured or when the feature is disabled.

The following example configures the LPM memory error reporting threshold parameter to 20 events on the device.

```
device(config)#system np
control-ram-threshold  Configure the Control SRAM error reporting threshold
  egress-threshold      Configure the egress buffer error reporting threshold
  ingress-threshold     Configure the ingress buffer error reporting threshold
  lpm-ram-threshold     Configure the LPM memory error reporting threshold
  rolling-window        Configure the rolling window time frame
device(config)#system np lpm
lpm-ram-threshold      Configure the LPM memory error reporting threshold
device(config)#system np lpm-ram-threshold 20
DECIMAL 0-120 events (default:10 disable: 0)
device(config)#system np lpm-ram-threshold 20
```

### Showing Status

The **show np buffer-errors** command displays the count of error events for the rolling window.

```
device# show np buffer-errors
```

Ports	Ingress		Egress	
	Current	Cumulative	Current	Cumulative
1/1- 1/24	15	37	0	0
1/25 - 1/48	0	0	0	0
2/1 - 2/2	0	0	0	0

**Syntax:** show np buffer-errors

*Displaying CSRAM error statistics*

Displays the CSRAM error statistics information for the configured ports. Each port range corresponds to one network processor.

## Syntax

```
show np control-ram-errors
```

## Modes

Privileged EXEC level mode.

## Command Output

The **show np control-ram-errors** command displays the following information:

```
device#show np control-ram-errors
```

```

CSRAM
Ports          Current Cumulative
1/1 - 1/24      0         3
2/1 - 2/2       0         0

```

Output field	Description
Ports	The ports that are configured with CSRAM threshold parameters.
Current	The current column displays the number of errors recorded in the rolling window time frame. The rolling window time frame records the most recent number of errors. Refer to the <a href="#">Rolling Window Time Frame</a> on page 63 for more information. The threshold configuration parameter is applied on the current value of the recorded error events.
Cumulative	The cumulative column displays the number of errors recorded from the time the feature was first enabled.

## Examples

The following example displays CSRAM error statistics for the packet processor.

```
device#show np control-ram-errors
```

```

CSRAM
Ports          Current Cumulative
1/1 - 1/24      0         0
2/1 - 2/2       0         0

```

## History

Release version	Command history
05.7.00	This command was introduced.

*Displaying LPM memory error statistics*

Displays the LPM memory error statistics information for the configured ports. Each port range corresponds to one network processor.

Syntax

**show np lpm-ram-errors**

Modes

Privileged EXEC level mode.

Command Output

The **show np lpm-ram-errors** command displays the following information:

```
device#show np lpm-ram-errors
```

```

LPM 0
Ports
1/1 - 1/24
2/1 - 2/2

LPM 1
Current Cumulative
0 3
0 3

LPM 2
Current Cumulative
0 3
0 3

Current Cumulative
0 3
0 3
    
```

Output field	Description
Ports	The ports that are configured with LPM memory threshold parameters.
Current	The current column displays the number of errors recorded in the rolling window time frame. The rolling window time frame records the most recent number of errors. Refer to the <a href="#">Rolling Window Time Frame</a> on page 63 for more information. The threshold configuration parameter is applied on the current value of the recorded error events.
Cumulative	The cumulative column displays the number of errors recorded from the time the feature was first enabled.

Examples

The following example displays LPM memory error statistics for the packet processor.

```
device#show np lpm-ram-errors
```

```

LPM 0
Ports
1/1 - 1/24
2/1 - 2/2

LPM 1
Current Cumulative
0 0
0 0

LPM 2
Current Cumulative
0 0
0 0

Current Cumulative
0 0
0 0
    
```

History

Release version	Command history
05.7.00	This command was introduced.



# Telemetry Solutions

---

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## About telemetry solutions

Telemetry Solutions provides a VLAN matching capability for IPv4 and IPv6 ACLs. Telemetry Solutions also includes new types of Policy-Based Routing (PBR) next-hop (network interface). You can create policies that classify network traffic into different categories based on the extended ACLs and forward each category of traffic differently, based on the configured policy. With Telemetry Solutions, the ACL match can be based on both VLAN ID and the existing Layer 3 or Layer 4 fields.

Telemetry Solutions improves the user experience with options to classify the network traffic (VLAN matching) and providing more choices for PBR forwarding. You can also utilize the **rule-name** field in the route-map to organize and extract information about PBR configurations.

## Limitations

The ACL keyword *VLAN* is only intended to be used in PBR. For ACLs that contain the *VLAN* keyword and is used as standalone ACL, the following restrictions apply:

- An ACL that contains the *VLAN* keyword cannot be applied to Virtual Interfaces (VEs).
- The *VLAN* keyword will be ignored and will have no effect if the ACL is:
  - applied to a physical interface or LAG interface
  - applied to a management interface
  - used as an IP receive ACL
  - used in ACL-based rate-limiting
- If the **set interface** command exists in a route-map and the route-map is applied to a interface, it will only permit packets from the configured VLAN unless the command **allow-all-vlan pbr** is also configured on the interface.

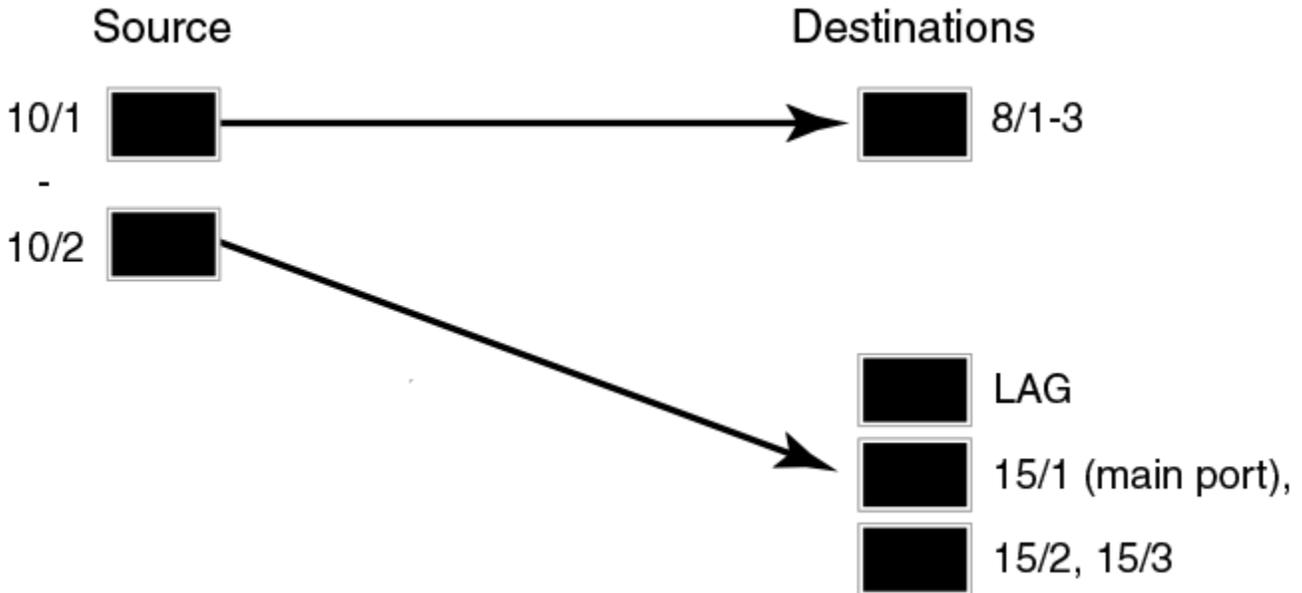
## Configuration examples

### NOTE

Telemetry can also be configured from SNMP. Refer to the *Unified IP MIB Reference guide* for more information.

## Configuration example 1

FIGURE 1 Configuration example 1



### ACL Definition

```
ip access-list extended xGW_Filter1
  permit vlan 114 udp any eq 1066 any
ipv6 access-list xGW_Filter1
  permit vlan 112 ipv6 2001:db8:200::/48 any
ip access-list extended xGW_Filter2
  permit vlan 2405 ip host any
  permit vlan 3000 ip any any
```

### ACL Association and Path Naming

```
route-map xGW_map permit 1
  rule-name xGW_path1
  match ip address xGW_Filter1
  match ipv6 address xGW_Filter1
  set next-hop-flood-vlan 2 preserve-vlan
route-map xGW_map permit 2
  rule-name xGW_path2
  match ip address xGW_Filter2
  set interface ethernet 15/1 preserve-vlan
```

### Associate Path Policy to ingress

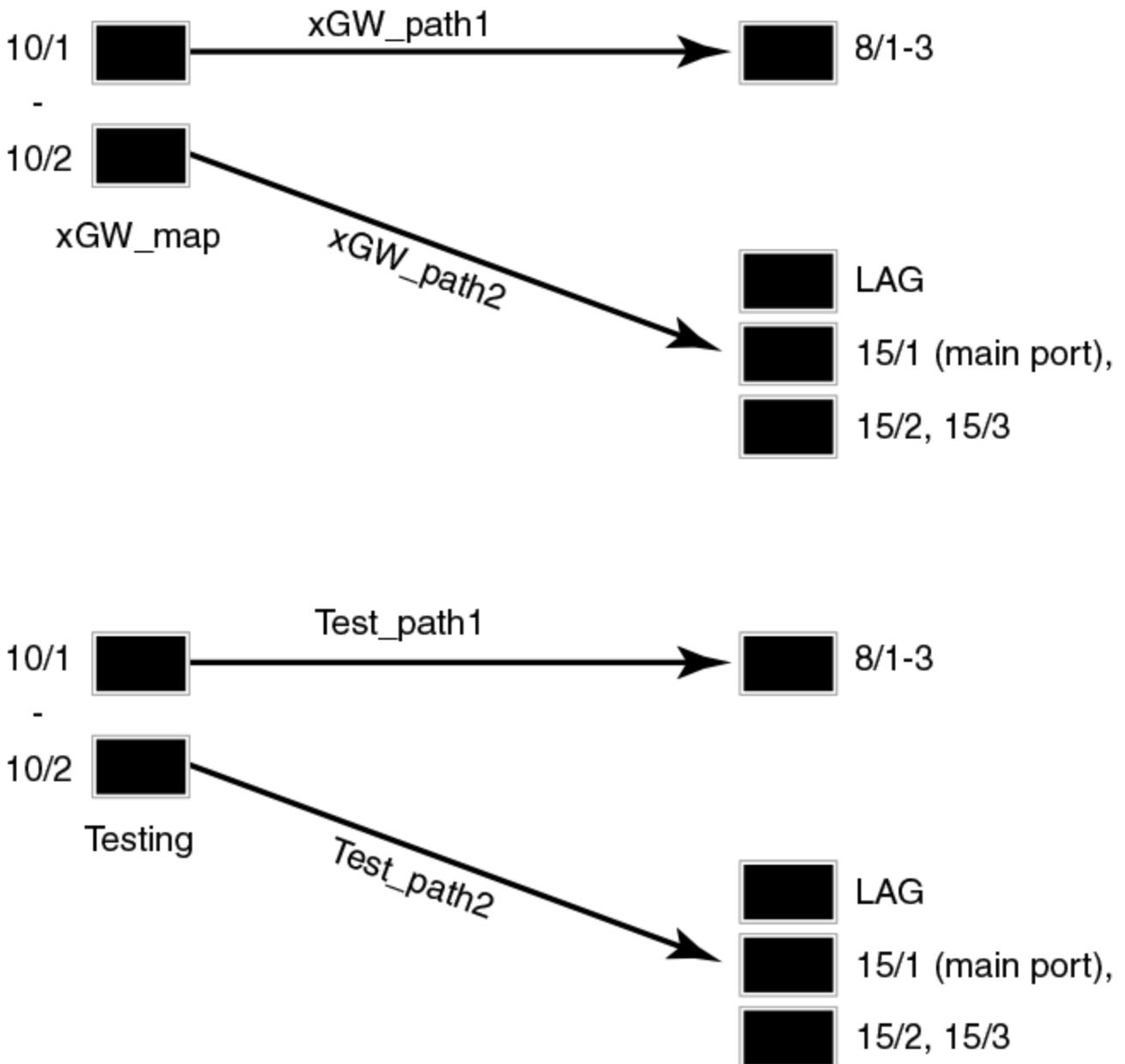
```
interface ethernet 10/1
  ip policy route-map xGW_map
  ipv6 policy route-map xGW_map
  allow-all-vlan pbr
interface ethernet 10/2
  ip policy route-map xGW_map
  allow-all-vlan pbr
```

## Egress Port Definition

```
vlan 2
  untag ethernet 8/1 to 8/3
  lag iris_view
  ports ethernet 15/1 to 15/3
  primary port 15/1
  deploy
```

## Configuration example 2

FIGURE 2 Configuration example 2



## Define Test ACL configurations

```
ip access-list extended Test_filter1
  permit vlan 112 ip host 10.100.50.1 any
  permit vlan 114 udp any eq 2075 any
ip access-list extended Test_filter2
  deny vlan 2405 ip host 10.33.44.55 any
  permit vlan 3000 ip any any
```

## Associate Test ACL with Test map/paths

```
route-map Testing permit 1
  rule-name Test_path1
  match ip address Test_filter1
  set next-hop-flood-vlan 2 preserve-vlan
route-map Testing permit 2
  rule-name Test_path2
  match ip address Test_filter2
  set interface ethernet 15/1 preserve-vlan
```

## Apply new map to Source ports

```
interface ethernet 10/1
  ip policy route-map Testing
  allow-all-vlan pbr
interface ethernet 10/2
  ip policy route-map Testing
  allow-all-vlan pbr
```

## Rebind ACL's

```
ip rebind-acl all
```

## Modify destination ports (if necessary)

```
vlan 2
  untag ethernet 8/1 to 8/3
lag iris_view
  ports ethernet 15/1 to 15/3
  primary-port 15/1
  deploy
```

## Apply production map to Source ports

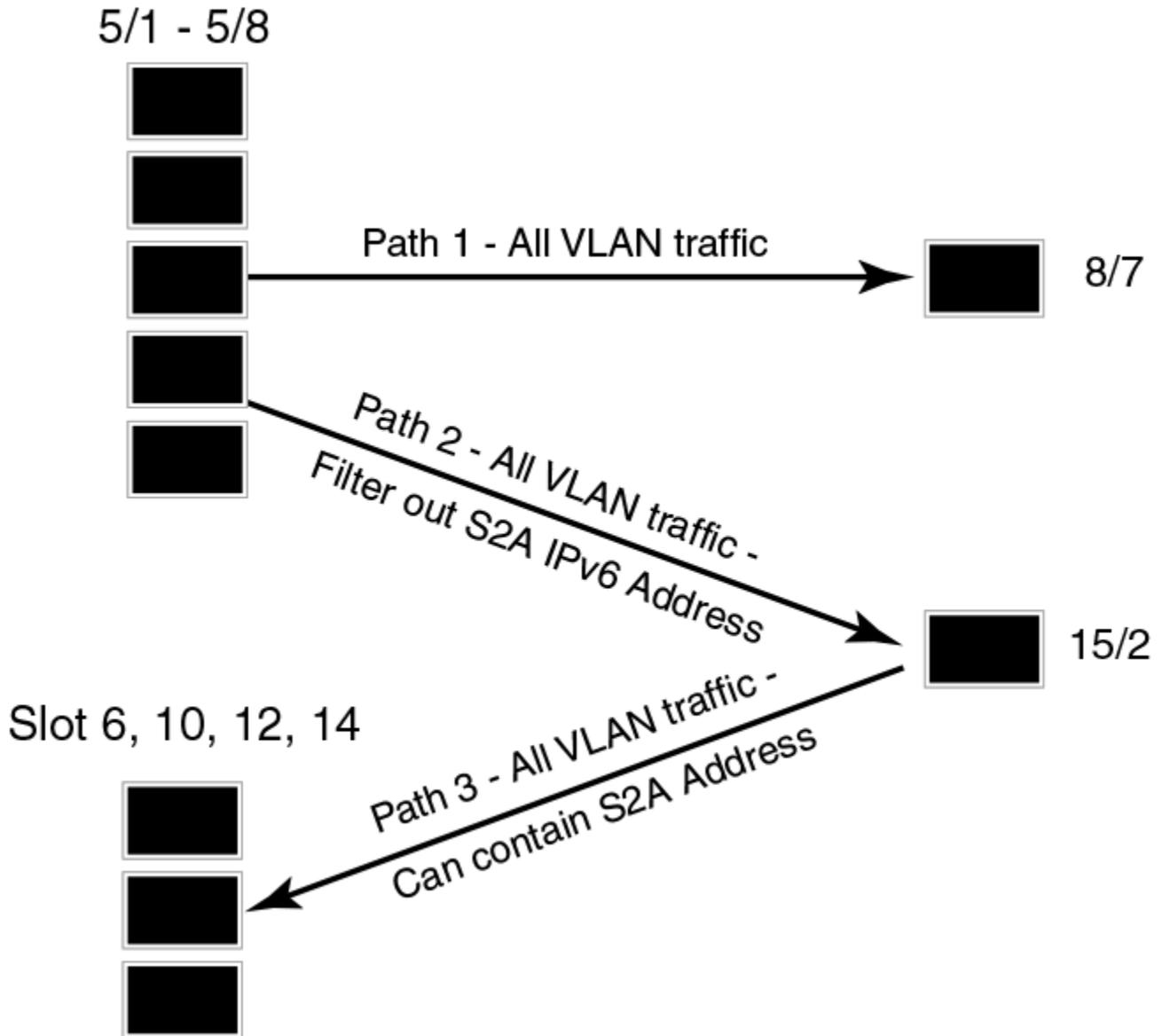
```
interface ethernet 10/1
  ip policy route-map xGW_map
  allow-all-vlan pbr
interface ethernet 10/2
  ip policy route-map xGW_map
  allow-all-vlan pbr
Rebind ACL's
  ip rebind-acl all
```

## Modify destination ports (if necessary)

```
vlan 2
  untag ethernet 8/1 to 8/3
lag iris_view
  ports ethernet 15/1 to 15/3
  primary-port 15/1
  deploy
```

## Configuration example 3

FIGURE 3 Configuration example 3



### Define ACL configurations

```

ipv6 access-list S2A_traffic
 permit vlan 2011 ipv6 2001:db8:200:1001:194:200::/96 any
 permit vlan 2012 ipv6 2001:db8:200:1001:194:200::/96 any
 permit vlan 2015 ipv6 2001:db8:200:1001:194:200::/96 any
 permit vlan 2016 ipv6 2001:db8:200:1001:194:200::/96 any
 permit vlan 2405 ipv6 2001:db8:200:1001:194:200::/96 any
 permit vlan 2435 ipv6 2001:db8:200:1001:194:200::/96 any
ipv6 access-list Non_S2A_Traffic
 permit ipv6 any any

```

```
ip access-list extended Non_S2A_Traffic
permit ip any any
```

### Associate Traffic ACL with S2A map

```
route-map S2A permit 1
  rule-name S2A_Path
  match ipv6 address S2A_Traffic
  set interface ethernet 8/7 preserve-vlan
route-map S2A permit 2
  rule-name All-Traffic
  match ip address Non_S2A_Traffic
  match ipv6 address Non_S2A_Traffic
  set next-hop-flood-vlan 2 preserve-vlan
```

### Apply S2A map to source ports

```
interface ethernet 5/1
  ip policy route-map S2A
  ipv6 policy route-map S2A
  allow-all-vlan pbr
interface ethernet 5/8
  ip policy route-map S2A
  ipv6 policy route-map S2A
  allow-all-vlan pbr
```

### Configure destination ports

```
vlan 2
  untag ethernet 8/7 ethernet 15/2
```

With this construct, S2A traffic is explicitly allowed to 8/7 and all other traffic is also sent to 8/7 and 15/2.

### Define ACL configurations

```
ipv6 access-list S2A_OtherVLAN
permit vlan 2007 ipv6 any any
permit vlan 2008 ipv6 any any
permit vlan 2009 ipv6 any any
permit vlan 2010 ipv6 any any
permit vlan 2017 ipv6 any any
permit vlan 2019 ipv6 any any
permit vlan 2009 ipv6 any any
permit vlan 2010 ipv6 any any
permit vlan 2017 ipv6 any any
permit vlan 2019 ipv6 any any
```

#### NOTE

This would include any S2A IP address packets from these VLANS.

### Associate Test ACL with Test map/paths

```
route-map OtherSlot permit 1
  rule-name S2A_OtherVLANPath
  match ipv6 address S2A_OtherVLAN
  set interface ethernet 15/2 preserve-vlan
```

### Apply other slot map to source ports on slot 6, 10, 12, 14

```
interface ethernet 6/1
  ipv6 policy route-map OtherSlot
  allow-all-vlan pbr
```

## Configuring telemetry solutions

1. Configure IPv4/IPv6 ACLs to match desired traffic.
2. Configure PBR policies to redirect traffic to desired destinations.
3. Apply the PBR policies to interfaces (physical ports, LAG ports or Virtual interfaces).
4. Use the show commands to display information about PBR configurations and operations.

### NOTE

If both IPv4 and IPv6 traffic need to be subjected to PBR, the IPv4 and IPv6 access lists must be created separately. In addition, both **ip policy route-map xGW\_map** and **ipv6 policy route-map xGW\_map** must be configured on the interface.

## Truncating packets for analysis

Truncating egress packets truncates packets to a specific size across ports before being sent to an analyzer.

Egress packets are truncated to the size required by an analysis tool, while still allowing other tools access to the entire packet data. This allows analyzer tools to process less information or packet data, thereby increasing the capacity available for analysis.

The **egress-truncate** command enables truncation of egress packets across different enabled ports in the Brocade MLX devices.

### Truncate egress packets

The **egress-truncate** command truncates egress packets across ports before being sent to an analyzer to increase analyzer processing performance.

The **egress-truncate-size** command must be configured globally to set the packet size.

Once configured globally, the **egress-truncate** command must be enabled on the specific egress ports. Once configured, the status of the **egress-truncate** command can be displayed using the **show interfaces ethernet** command.

### Configuring the egress truncate command

The following example sets the size of the truncated egress packets to 64 bytes on slot 2.

```
device(config-if-1/1)#egress-truncate-size 64 slot 2
device(config-if-1/1)#egress-truncate
```

The following are some examples of alternate configuration.

This example shows the configuration of a truncated size of 200 on all slots.

```
device(config)#egress-truncate-size 200 slot all
device(config-if-e1000-1/1)#egress-truncate
```

This example shows the configuration of a truncated size of 100 on slot 1 device 2.

```
device(config)#egress-truncate-size 100 slot 1 2
device(config-if-e1000-1/1)#egress-truncate
```

This example shows the configuration of a truncated size of 150 to all PPCRs of slot 2.

```
device(config)#egress-truncate-size 150 slot 2
device(config-if-e1000-1/1)#egress-truncate
```

## Checking truncate configuration

The configuration of the **egress-truncate** command can be checked using the following show commands.

- Show interface ethernet
- Show egress-truncate
- Show egress-truncate interface

# Remote Network Monitoring

---

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- [RMON support](#)..... 78

This chapter describes the remote monitoring features available on Brocade products:

- **Remote Monitoring (RMON) statistics** - All Brocade products support RMON statistics on the individual port level. Refer to [RMON support](#) on page 78.
- **sFlow** - sFlow collects interface statistics and traffic samples from individual interfaces on a device and exports the information to a monitoring server.

## Basic management

The following sections contain procedures for basic system management tasks.

### Viewing system information

You can access software and hardware specifics for a device.

To view the software and hardware details for the system, enter the **show version** command.

```
device# show version
```

**Syntax:** **show version**

### Viewing configuration information

You can view a variety of configuration details and statistics with the show option. The **show** option provides a convenient way to check configuration changes before saving them to flash.

The show options available will vary for the device and by configuration level.

To determine the available show commands for the system or a specific level of the CLI, enter the following command.

```
device# show ?
```

**Syntax:** **show** *option*

You also can enter "**show**" at the command prompt, then press the TAB key.

### Viewing port statistics

Port statistics are polled by default every 10 seconds.

You can view statistics for ports by entering the following **show** commands:

- show interfaces
- show configuration

### Viewing STP statistics

You can view a summary of STP statistics for the device. STP statistics are by default polled every 10 seconds.

To view spanning tree statistics, enter the **show span** command. To view STP statistics for a VLAN, enter the **span vlan** command.

## Clearing statistics

You can clear statistics for many parameters with the clear option.

To determine the available **clear** commands for the system, enter the following command.

```
device# clear ?
```

### Syntax: clear option

You also can enter "**clear**" at the command prompt, then press the TAB key.

#### NOTE

Clear commands are found at the Privileged EXEC level.

## RMON support

The RMON agent supports the following groups. The group numbers come from the RMON specification (RFC 1757):

- Statistics (RMON Group 1)
- History (RMON Group 2)
- Alarms (RMON Group 3)
- Events (RMON Group 9)

The CLI allows you to make configuration changes to the control data for these groups, but you need a separate RMON application to view and display the data graphically.

## Statistics (RMON group 1)

Count information on multicast and broadcast packets, total packets sent, undersized and oversized packets, CRC alignment errors, jabbers, collision, fragments and dropped events is collected for each port on a device.

No configuration is required to activate collection of statistics for the device. This activity is by default automatically activated at system start-up.

#### NOTE

The NetIron system provides limited MIB counters. Brocade uses "rmon\_giant" to represent oversized packet, i.e 9216 and above.

You can view a textual summary of the statistics for all ports by entering the following CLI command.

```
device(config)# show rmon statistics
Ethernet statistics 1 is active, owned by monitor
Interface 1/1 (ifIndex 1) counters
      Octets          0
      Drop events     0
      Broadcast pkts  0
      CRC alignment errors 0
      Oversize pkts   0
      Jabbers         0
      64 octets pkts  0
      128 to 255 octets pkts 0
      512 to 1023 octets pkts 0
      Packets          0
      Multicast pkts  0
      Undersize pkts  0
      Fragments       0
      Collisions      0
      65 to 127 octets pkts 0
      256 to 511 octets pkts 0
      1024 to 1518 octets pkts 0
```

**Syntax:** `show rmon statistics [ num | ethernet slot/port | management num ] | begin expression | exclude expression | include expression ]`

The *portnum* parameter specifies the port number. You can use the physical port number or the SNMP port number. The physical port number is based on the product.

- The ports are numbered according to slot and port. For example, the first port in slot 1 is 1/1. The third port in slot 7 is 7/3.

The SNMP numbers of the ports start at 1 and increase sequentially. For example, if you are using a Chassis device and slot 1 contains an 8-port module, the SNMP number of the first port in slot 2 is 9. The physical port number of the same port is 2/1.

This command shows the following information.

**TABLE 17** Export configuration and statistics

This line...	Displays...
Octets	The total number of octets of data received on the network.  This number includes octets in bad packets. This number does not include framing bits but does include Frame Check Sequence (FCS) octets.
Drop events	Indicates an overrun at the port. The port logic could not receive the traffic at full line rate and had to drop some packets as a result.  The counter indicates the total number of events in which packets were dropped by the RMON probe due to lack of resources. This number is not necessarily the number of packets dropped, but is the number of times an overrun condition has been detected.
Packets	The total number of packets received.  This number includes bad packets, broadcast packets, and multicast packets.
Broadcast pkts	The total number of good packets received that were directed to the broadcast address.  This number does not include multicast packets.
Multicast pkts	The total number of good packets received that were directed to a multicast address.  This number does not include packets directed to the broadcast address.
CRC alignment errors	The total number of packets received that were from 64 - 1518 octets long, but had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).  The packet length does not include framing bits but does include FCS octets.
Undersize pkts	The total number of packets received that were less than 64 octets long and were otherwise well formed.  This number does not include framing bits but does include FCS octets.
Fragments	The total number of packets received that were less than 64 octets long and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).  It is normal for this counter to increment, since it counts both runts (which are normal occurrences due to collisions) and noise hits.  This number does not include framing bits but does include FCS octets.
Oversize packets	The total number of packets received that were longer than 1518 octets and were otherwise well formed.  This number does not include framing bits but does include FCS octets.
Jabbers	The total number of packets received that were longer than 1518 octets and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).  <b>NOTE</b> This definition of jabber is different from the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition where any packet exceeds 20 ms. The allowed range to detect jabber is between 20 ms and 150 ms.

**TABLE 17** Export configuration and statistics (continued)

This line...	Displays...
	This number does not include framing bits but does include FCS octets.
Collisions	The best estimate of the total number of collisions on this Ethernet segment.
64 octets pkts	The total number of packets received that were 64 octets long. This number includes bad packets. This number does not include framing bits but does include FCS octets.
65 to 127 octets pkts	The total number of packets received that were 65 - 127 octets long. This number includes bad packets. This number does not include framing bits but does include FCS octets.
128 to 255 octets pkts	The total number of packets received that were 128 - 255 octets long. This number includes bad packets. This number does not include framing bits but does include FCS octets.
256 to 511 octets pkts	The total number of packets received that were 256 - 511 octets long. This number includes bad packets. This number does not include framing bits but does include FCS octets.
512 to 1023 octets pkts	The total number of packets received that were 512 - 1023 octets long. This number includes bad packets. This number does not include framing bits but does include FCS octets.
1024 to 1518 octets pkts	The total number of packets received that were 1024 - 1518 octets long. This number includes bad packets. This number does not include framing bits but does include FCS octets.

**NOTE**

The number of entries in a RMON statistics table directly corresponds to the number of ports on a system. For example, if the system is a 26 port device, there will be 26 entries in the statistics display.

## History (RMON group 2)

All active ports by default will generate two history control data entries per active device interface. An active port is defined as one with a link up. If the link goes down the two entries are automatically be deleted.

Two history entries are generated for each device:

- a sampling of statistics every 30 seconds
- a sampling of statistics every 30 minutes

The history data can be accessed and displayed using any of the popular RMON applications

A sample RMON history command and its syntax is shown below.

```
device(config)# rmon history 1 interface 1 buckets 10 interval 10 owner nyc02
```

**Syntax:** `rmon history` *entry-number* **interface** **ethernet** *slot/port* | **management** *num* **buckets** *number* **interval** *sampling-interval* **owner** *text-string*

You can modify the sampling interval and the bucket (number of entries saved before overwrite) using the CLI. In the above example, owner refers to the RMON station that will request the information.

**NOTE**

To review the control data entry for each port or interface, enter the **show rmon history** command.

## Alarm (RMON group 3)

Alarm is designed to monitor configured thresholds for any SNMP integer, time tick, gauge or counter MIB object. Using the CLI, you can define what MIB objects are monitored, the type of thresholds that are monitored (falling, rising or both), the value of those thresholds, and the sample type (absolute or delta).

An alarm event is reported each time that a threshold is exceeded. The alarm entry also indicates the action (event) to be taken if the threshold be exceeded.

A sample CLI alarm entry and its syntax is shown below.

```
device(config)# rmon alarm 1 ifInOctets.6 10 delta rising-threshold 100 1 falling threshold 50 1 owner nyc02
```

**Syntax:** **rmon alarm** *entry-number* *MIB-object.interface-num* *sampling-time* *sample-type* *threshold- type* *threshold-value* *event-number* *threshold-type* *threshold-value* *event-number* **owner** *text-string*

The *sample-type* can be absolute or delta.

The *threshold-type* can be falling-threshold or rising-threshold.

## Event (RMON group 9)

The two elements to the Event Group are the event control table and the event log table. The event control table defines the action to be taken when an alarm is reported. Defined events can be found by entering the CLI command, show event. The Event Log Table collects and stores reported events for retrieval by an RMON application.

A sample entry and syntax of the event control table is shown below.

```
device(config)# rmon event 1 description 'testing a longer string' log-and-trap public owner nyc02
```

**Syntax:** **rmon event** *event-entry* **description** *text-string* **log** | **trap** | **log-and-trap** | **owner** *rmon-station*



# Continuous System Monitor

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## Continuous system monitor overview

Continuous system monitoring (Sysmon) is implemented to monitor the overall system's health. Sysmon is a system-wide, modular monitoring service. It monitors different system components of a device to determine if those components are operating correctly.

Sysmon periodically monitors the system for defined event types such as errors on TM and FE links. Sysmon runs as a background process. It has a default policy that controls what is monitored and what actions will be taken if a fault is detected. Sysmon generates the following log outputs for the monitoring information.

- Syslog
- Sysmon internal log

### NOTE

Syslog reported Sysmon alarm messages should be reported to Brocade Technical Support.

Internal logs are generated to give more information to Brocade Technical Support when a problem occurs. The existence of internal logs doesn't mean the system is experiencing problems, or that some actions need to be taken. If Sysmon detects a failure, it will report the failure by generating the syslog messages. In some cases the failed device will be shutdown or isolated from the system. In other cases the software may attempt to recover the failed device.

Overall system performance depends on how resources are utilized. Any shortage of resources impacts the overall performance of a system. The system resource histogram feature provides detailed information on how system resources are used. It collects information on task CPU usage, buffer usage and memory usage and stores this information in internal memory.

Runtime diagnostics are a critical component of a networking system to provide maximum uptime by detecting and isolating faults, and then recovering from them. A system runtime diagnostics framework supports execution of diagnostic tests such as the port CRC error monitoring test. It manages this background diagnostic test and provides mechanisms for taking corrective action.

## Event monitoring

This section discusses the following topics:

- [Event monitoring overview](#) on page 84
- [Event types](#) on page 84
- [Displaying event information](#) on page 85

## Event monitoring overview

The Sysmon monitors a number of event types periodically. Sysmon detects errors based on polling and interrupt. Polling is reading specific hardware registers. Interrupt is an instantaneous event detection by Sysmon. Sysmon continuously monitors management processor and interface processors (also referred to as LP) via polling and interrupt methods. Once a threshold is reached, Sysmon logs the event in the internal Sysmon log and takes an action based on the event type. There are the following action types:

- Syslog: Generates a message in the Syslog
- Shutdown link: Disables the link between the TM and the FE
- SNMP trap: Generates an SNMP trap

By default, SYSMON is enabled to monitor and detect all the defined event types. The following Sysmon event types are defined and implemented:

- TM\_LINK - Monitoring TM serdes links.
- FE\_LINK - Monitoring FE serdes links.
- NP memory errors - Monitoring memory errors on interface modules.
- Port CRC errors
- LP High CPU usage

## Event types

### TM\_LINK

TM link is the link between the line card and the switch fabric module. The event type TM\_LINK monitors this link for the errors reported on the link by the TM, such as CRC, misalignment, code group error, and down links. Here is an example from Syslog.

```
Dec 29 15:31:24:W:System: ALARM:LP15/TM3 has 6 links, less than the minimum to maintain line rate
```

### FE\_LINK

FE link is the link between the line card and the switch fabric module. The event type FE\_LINK monitors this link for the errors reported on the link by the FE, such as CRC, misalignment, code group error and down links. Here is an example from Syslog.

```
Dec 29 15:31:24:W:System: ALARM:LP15/TM3 has 6 links, less than the minimum to maintain line rate
```

### NP memory errors

The NP Memory Error Monitoring event monitors memory errors on interface modules. Monitoring includes parity errors, ECC errors, overflow and underflow errors. Errors are reported as syslog messages or SNMP traps. Here is an example from Syslog.

```
Feb 23 19:27:29:E:PRAM Word 2 Parity Error on port range 3/1 - 3/2
```

For detailed information on NP memory error monitoring, refer to [NP memory error monitoring](#) on page 91.

### LP CPU high-usage

The LP CPU high-usage monitoring event monitors the CPU usage on interface modules. Monitoring is enabled for a default usage value (threshold). The CPU usage is monitored and any excursion above the threshold in a 100 ms window creates a syslog message. If the CPU usage remains above the threshold for 300 ms, a debug file is created with information relevant to identifying the cause. If the

CPU usage falls below the set threshold before the 300 ms mark, a syslog message is generated but no debug file is created. The following examples highlight the three cases.

```
SYSLOG: <14>May 15 00:19:51 Eltanin-R3 LP High CPU: LP 1. Status: Threshold EXCEEDED
```

```
SYSLOG: <14>May 15 00:19:51 Eltanin-R3 LP High CPU: LP 1. Status: Logs CAPTURED
```

```
SYSLOG: <14>May 15 00:19:51 Eltanin-R3 LP High CPU: LP 1. Status: Condition CLEARED
```

For detailed information on LP CPU High-usage monitoring, refer to [LP CPU high-usage monitoring](#) on page 92.

## Displaying event information

### Displaying internal log messages

You can use the following show commands to view the results of the monitoring activity. These show commands display information for all event types in one output.

To display the contents of the internal log, enter the following command.

```
device# show sysmon logs
INFO:May 13 07:29:54: TM Link Error: LP2/TM2/Link2 -- SNM3/FE3/Link43 (disabled)
INFO:May 13 07:29:33: FE Link Error: SNM3/FE3/Link64 -- LP4/TM1/Link2 (disabled)
```

#### Syntax: show sysmon logs

##### NOTE

The size of the internal log table is 10,000 logs.

### Clearing internal logs

To clear the internal logs, enter the following command.

```
device# clear sysmon logs
```

#### Syntax: clear sysmon logs

### Displaying current SYSMON configuration

Enter the **show sysmon configuration** command to view the current configuration for system monitoring services. Look for output similar to the following:

```
device# show sysmon config
-----+-----+-----+-----+-----+
EVENT          | ACTION          | POLL PERIOD | THERESHOLD | LOG BACK-OFF |
          |          | (SEC)      | # (PER POLL |          |
          |          |           | in #POLL) |          |
-----+-----+-----+-----+-----+
TM. Link Monitoring | SHUTDOWN-LINK | 60         | 5 in 10   | 1800         |
-----+-----+-----+-----+-----+
Port CRC Monitoring | SYSLOG         | 60         | 3 in 5    | 1800         |
-----+-----+-----+-----+-----+
FE. Link Monitoring | SHUTDOWN-LINK | 60         | 5 in 10   | 1800         |
-----+-----+-----+-----+-----+
NP Memory Error Monitoring | SYSLOG-AND-TRAP | 10        | N/A      | N/A         |
-----+-----+-----+-----+-----+
```

## Histogram information

This section discusses the following topics:

- [Histogram information overview](#) on page 86
- [Displaying CPU histogram information](#) on page 86
- [Displaying buffer histogram information](#) on page 88
- [Displaying memory histogram information](#) on page 90

## Histogram information overview

The histogram framework feature monitors and records system resource usage information. The main objective of the histogram is to record resource allocation failures and task CPU usage information. The histogram feature keeps track of task execution information, context switch history of tasks, buffer allocation failure and memory allocation failure.

The histogram information is collected and maintained internally, in a cyclical buffer. It can be reviewed to determine if resource allocation failures or task CPU usage may have contributed to an application failure.

### NOTE

Histogram information is not maintained across reboot

## Displaying CPU histogram information

The CPU histogram provides information about task CPU usage. The CPU histogram is viewed in the form of buckets i.e., task usage is divided into different interval levels called buckets. For example, the task run time is divided into buckets - bucket1(0-50ms), bucket2 (50-100ms), bucket3 (100-150ms) etc. The CPU histogram collects the task CPU usage in each bucket. This includes how many times a task run/hold time falls in each bucket, max run time and total run time for each bucket. CPU histogram information is measured for hold-time, wait-time, system timer time, and user interrupt time of the task.

- Hold time - time that the task is holding the CPU without yield.
- Wait time - time that the task is waiting for execution.
- Timer time - time that task is handling the timer routines without yielding the CPU.
- Interrupt time - time that the task is handling the user interrupt routines without yielding the CPU.

## Show commands

To display task hold time information, enter the following command:

```
device# show cpu histogram hold
HISTOGRAM CPU HISTOGRAM INFO
-----
No of Bucket      : 51
Bucket Granularity : 10 ms
Last cleared at   : 2012.07.10-07:29:20.704
No of Task        : 67
Task Name  Bkt   Bkt      No of Time  HoldTime  HoldTime      Time
           Num   Time (ms)           Total (s)  Max (ms)
-----
ip_rx      1     000-010           4   .000463     .201 2012.07.10-07:29:20.701
vlan       1     000-010           1   .000025     .025 2012.07.10-07:29:20.700
mac_mgr    1     000-010           1   .000010     .010 2012.07.10-07:29:20.701
mrp        1     000-010           1   .000025     .025 2012.07.10-07:29:20.700
erp        1     000-010           1   .000025     .025 2012.07.10-07:29:20.700
mxrp       1     000-010           1   .000009     .009 2012.07.10-07:29:20.700
rtm        1     000-010           1   .000062     .062 2012.07.10-07:29:20.700
rtm6       1     000-010           1   .000091     .091 2012.07.10-07:29:20.700
ip_tx      1     000-010           1   .000207     .207 2012.07.10-07:29:20.700
```

l2vpn	1	000-010	1	.000018	.018	2012.07.10-07:29:20.701
ospf	1	000-010	1	.000046	.046	2012.07.10-07:29:20.700
isis	1	000-010	1	.000009	.009	2012.07.10-07:29:20.700
mcast	1	000-010	1	.000017	.017	2012.07.10-07:29:20.700
ospf6	1	000-010	1	.000012	.012	2012.07.10-07:29:20.700
mcast6	1	000-010	1	.000012	.012	2012.07.10-07:29:20.700
web	1	000-010	1	.000029	.029	2012.07.10-07:29:20.700
lacp	1	000-010	1	.000013	.013	2012.07.10-07:29:20.700
loop_detect	1	000-010	1	.000009	.009	2012.07.10-07:29:20.701
cluster_mgr	1	000-010	1	.000011	.011	2012.07.10-07:29:20.701
telnet_0	1	000-010	4	.003	3	2012.07.10-07:29:20.672

**Syntax:** show cpu histogram { hold | wait | interrupt | timer } [ taskname *name* | above *threshold-value* | noclear ]

The *hold* parameter displays the task hold time histogram. The *wait* parameter displays the task wait time histogram. The *interrupt* parameter displays the task user-interrupt usage histogram. The *timer* parameter displays the task sys-timer time usage histogram.

When the *taskname name* variable is specified, the histogram information for the specified task only, is displayed. The *above threshold-value* variable specifies the display of histogram information for tasks whose maximum hold time is above the specified threshold level.

By default, task values are cleared on read. The *noclear* parameter displays information without clearing the values.

To display sequence of task execution information, enter the following command:

```
device# show cpu histogram sequence
HISTOGRAM TASK SEQUENCE INFO
-----
THRESHOLD   : 10 ms
DURATION    : 30 s
-----
Seq No Task Name      Context  HoldTime  Start Time  End Time  Date
      Max (ms)
-----
  1 snms             TASK      16 07:33:08.790 07:33:08.806 2012.07.10
  2 snms             TASK      16 07:33:08.772 07:33:08.789 2012.07.10
  3 snms             TASK      17 07:33:08.755 07:33:08.772 2012.07.10
  4 snms             TASK      16 07:23:08.790 07:23:08.806 2012.07.10
  5 snms             TASK      16 07:23:08.772 07:23:08.789 2012.07.10
  6 snms             TASK      17 07:23:08.755 07:23:08.772 2012.07.10
  7 snms             TASK      16 07:13:08.790 07:13:08.806 2012.07.10
  8 snms             TASK      16 07:13:08.772 07:13:08.789 2012.07.10
  9 snms             TASK      17 07:13:08.755 07:13:08.772 2012.07.10
 10 snms             TASK      16 07:03:08.790 07:03:08.806 2012.07.10
 11 snms             TASK      16 07:03:08.772 07:03:08.789 2012.07.10
 12 snms             TASK      17 07:03:08.755 07:03:08.772 2012.07.10
 13 snms             TASK      16 06:53:08.790 06:53:08.806 2012.07.10
 14 telnet_0        TASK      50 09:51:50.091 09:51:50.142 2012.07.05
 15 telnet_0        TASK      50 09:51:35.184 09:51:35.234 2012.07.05
 16 console         TASK      50 09:51:11.451 09:51:11.501 2012.07.05
 17 telnet_0        TASK      50 09:47:01.459 09:47:01.509 2012.07.05
 18 console         TASK      52 09:46:32.443 09:46:32.496 2012.07.05
 19 mpls            TIMER     12 09:46:32.428 09:46:32.441 2012.07.05
 20 telnet_0        TASK      54 09:46:03.018 09:46:03.072 2012.07.05
 21 telnet_0        TASK      52 09:44:31.749 09:44:31.802 2012.07.05
 22 telnet_0        TASK      50 09:44:17.984 09:44:18.034 2012.07.05
 23 telnet_0        TASK      50 09:43:43.638 09:43:43.689 2012.07.05
 34 telnet_0        TASK      12 09:43:43.623 09:43:43.636 2012.07.05
 35 telnet_0        TASK      54 09:43:20.669 09:43:20.724 2012.07.05
 36 snms            TASK      16 09:43:08.740 09:43:08.756 2012.07.05
 37 snms            TASK      16 09:43:08.723 09:43:08.740 2012.07.05
-----
```

**Syntax:** show cpu histogram sequence [ taskname *name* | above *threshold-value* | trace ]

The *sequence* parameter displays sequential task execution information. Sequential execution of task information is recorded when a task's hold time is greater than the specified threshold value. The task sequence is maintained for a specific period of time and stored in a cyclic buffer, so the oldest record is overwritten by a new record.

When the *taskname name* variable is specified, the histogram information for the specified task only, is displayed. The *above threshold-value* variable specifies the display of histogram information for tasks whose maximum hold time is above the specified threshold level.

The *trace* parameter displays high CPU condition task traces.

## Clearing task sequence information

To clear CPU histogram sequence information, enter the following command:

```
device(config)# clear cpu histogram sequence
```

**Syntax:** clear cpu histogram sequence

## Displaying buffer histogram information

The main objective of the buffer histogram is to see if there was any buffer exhaustion in the last few seconds (10-60sec). Buffer usage is collected when available buffers in the 2K buffer size pool fall below the reserved limit. The threshold limit is defined in terms of BM allocate request type.

**TABLE 18** Threshold values for different buffer allocation request types.

Buffer Pool	BM Allocate Request Type	Buffer allocated if available buffers
2K	OS, SDS, RCON	Above 0
2K	TX, RX Critical	Above 128
2K	IPC High	Above 512
2K	Data High	Above 700
2K	IPC Low	Above 850
2K	RX Low	Above 1024

## Show commands

To display buffer histogram information, enter the following command:

```
device# show bm histogram
HISTOGRAM BUFFER SEQUENCE INFO
-----
DURATION      : 60 s
SEQ IDX       : 1
TIME          : 2012.07.10-09:46:59.061
THRESHHOLD    : Below RX limit (1129)
POOL-ID  SIZE(KB)  TOTAL    FREE    IN-USE  APP-OWN
-----
      3      2      6144    1024    5120    1248
-----
Task Name          App-Owns (buffers)
-----
mac_mgr            13
ip_tx              12
rtm                14
mcast              112
console            11
ip_rx              16
rtm6               23
mcast6             46
mpls                71
nht                92
l2vpn              98
-----
```

To display the buffer allocation stack for the top three tasks (in terms of buffer ownership), enter the following command:

```
device(config)# show bm histogram trace 3
HISTOGRAM BUFFER SEQUENCE INFO
-----
DURATION : 60 s
SEQ IDX : 1
TIME : 2013.02.07-10:39:34.334
THRESHHOLD : Below IPC Critical limit (128)
POOL-ID SIZE(KB) TOTAL FREE IN-USE APP-OWN
-----
  3      2      6144 128   6016   58
-----
Task Name App-Owns (buffers)
-----
mac_mgr      3
ip_tx        6
rtm          5
mcast       12
console      1
rtm6         4
mcast6       6
mpls         1
nht          2
telnet_34    18
-----
[ Taskname : telnet_34 , AppId : 98 ]
[ Taskname : mcast , AppId : 17 ]
[
00055a38: dev_bm_get_buf_internal
000557c0: dev_bm_get_ipc_buf
00005024: xsyscall
2037791c: ipc_get_buffer
2038fe18: allocate_a_dy_sync_packet
2039120c: init_dy_sync_mgmt
20d08c18: l2mcast_metro_vpls_init_mac_entry_sync_mgmt]
[
00055a38: dev_bm_get_buf_internal
000557c0: dev_bm_get_ipc_buf
00005024: xsyscall
2037791c: ipc_get_buffer
2038fe18: allocate_a_dy_sync_packet
2039120c: init_dy_sync_mgmt
20ced240: l2mcast_init_mdb_sync_mgmt]
```

**Syntax:** `show bm histogram [ priority threshold-value | trace ]`

The *priority threshold-value* variable displays histogram information for the specified buffer priority level only. The valid range is 0-5 (0-Critical, 1-Hi Tx, 2-Hi IPC Rx, 3-Hi Data Rx, 4-Low IPC Rx, 5-Low Data Rx).

The *trace* parameter displays the buffer allocation stack of the top three tasks (in terms of buffer ownership).

## Clearing buffer histogram data

To clear the buffer histogram data, enter the following command:

```
device(config)# clear bm histogram
```

**Syntax:** `clear bm histogram`

## Low buffer syslogs

Syslog messages are generated when when available buffers fall below the 20, 10 and 5 percent buffer thresholds.

```
SYSLOG: <14>Feb 7 10:39:58 Ni-MLX-Sys-6 System: Low buffer, Available buffer goes Below 20%, Available
Buffer (2243) on MP
SYSLOG: <12>Feb 7 10:40:40 Ni-MLX-Sys-6 System: Low buffer, Available buffer goes Below 10%, Available
```

```
Buffer (1633) on MP
SYSLOG: <9>Feb 7 10:41:11 Ni-MLX-Sys-6 System: Low buffer, Available buffer goes Below 5%, Available Buffer
(1328) on MP
```

```
SYSLOG: <10>Feb 7 10:47:34 Ni-MLX-Sys-6 System: Out of buffer, Below IPC Critical limit (128) on MP
```

## Displaying memory histogram information

System memory is divided into five memory pools: OS, Shared, Global, User Private and DMA. The memory histogram keeps track of each memory allocation/deallocation request from an application. It helps to identify memory leak and memory usage across the task. It also monitors the under usage condition and reports to the system. The memory histogram is recorded when available memory goes below the threshold limit on each memory pool. The threshold limit is defined in terms of percentage of available memory (20%, 10% or 5%).

To display memory histogram information, enter the following command:

```
device# show memory histogram
HISTOGRAM MEMORY SEQUENCE INFO
-----
DURATION      : 60 s
SEQ IDX       : 1
TIME          : 2012.07.10-11:14:08.539
AVAIL MEM     : below 5 %
-----
POOL          Total Memory      Used Memory Available Memory
              (bytes)           (bytes)           (bytes)
-----
Global        2855272448         2843262976         12009472
-----
Task Name      Alloc-Number  Alloc-Size (bytes)
-----
main           1355         28486529
itc            4            645
tmr            63           10173
ip_rx          425          396453
scp            748          17995881
lpagent        63           31309
console        101          3515673
vlan           44           5814177
mac_mgr        40           2305485
mrp            26           8541
vsrp           28           8557
erp            28           8557
mxrp           26           7527
snms           192          188337
rtm            98           33724605
rtm6           109          1918717
ip_tx          151          1274437
rip            70           323733
ospf_msg_task  17           7453
telnet_0       28           7689
telnet_1       29           7817
-----
```

**Syntax:** `show memory histogram [ pool pool-id | below threshold-value ]`

The *pool pool-id* variable specifies the display of memory histogram information for a specific memory pool. The valid range for the *pool pool-id* variable is 0-3, where 0 = OS, 1 = Shared, 2 = Global and 3 = User Private. The *below threshold-value* variable specifies the display of memory histogram information when available memory falls below the specified percentage (5, 10 or 20 percent).

## Low memory syslogs

Syslog messages are generated when available memory falls below the 20, 10, and 5 percent thresholds.

```

SYSLOG: <14>Feb 7 10:50:11 Ni-MLX-Sys-6 System: Low physical memory, Pool(2-Global) below 20%, available
pool memory (225480704), physical memory (225480704) on MP
SYSLOG: <9>Feb 7 10:50:11 Ni-MLX-Sys-6 System: Low pool memory, Pool(2-Global) below 5%, available pool
memory (171204608), physical memory (171204608) on MP
SYSLOG: <12>Feb 7 10:50:12 Ni-MLX-Sys-6 System: Low physical memory, Pool(2-Global) below 10%, available
pool memory (118108160), physical memory (118108160) on MP
SYSLOG: <9>Feb 7 10:50:12 Ni-MLX-Sys-6 System: Low physical memory, Pool(2-Global) below 5%, available pool
memory (64421888), physical memory (64421888) on MP
SYSLOG: <10>Feb 7 10:50:12 Ni-MLX-Sys-6 System: Low pool memory, Pool(2-Global) below 1%, available pool
memory (28532736), physical memory (28532736) on MP
SYSLOG: <10>Feb 7 10:50:12 Ni-MLX-Sys-6 System: Low physical memory, Pool(2-Global) below 1%, available
pool memory (10731520), physical memory (10731520) on MP

```

## Clearing memory histogram data

To clear the memory histogram data, enter the following command:

```
device(config)# clear memory histogram
```

**Syntax:** clear memory histogram

## NP memory error monitoring

This sections discusses the following topics:

- [NP memory error monitoring overview](#) on page 91
- [NP memory error monitoring: basic configuration](#) on page 91

## NP memory error monitoring overview

It can be useful to know when memory errors occur on interface modules. NP memory error monitoring periodically monitors for external and internal memory errors and reports these errors as syslog messages or generates SNMP traps.

For details of specific errors that may occur on interface cards that support NP memory error monitoring, refer to [NP memory errors](#) on page 84.

## NP memory error monitoring: basic configuration

By default:

- NP memory error monitoring is enabled.
- Errors generate both a syslog message and a SNMP trap.
- The polling period time is 60 seconds.

## Configuring NP memory error monitoring

You can configure:

- The polling frequency.
- How the errors are reported.

To set the polling frequency for NP memory errors at 10 second intervals, enter the following command:

```
device(config)# sysmon np memory-errors polling-period 10
```

To configure NP memory error monitoring to generate syslog messages, use the following command:

```
device(config)# sysmon np memory-errors action syslog
```

You may want to disable error reporting if, for example, a hardware fault exists and is generating a lot of errors. To disable reporting of NP memory errors, use the following command:

```
device(config)# sysmon np memory-errors action none
```

The following example disables monitoring of memory errors on interface modules.

```
device(config)# no sysmon np memory-errors
```

The **no** form of the command specifying a *poll-interval* value restores the default polling period. For example, the following command restores the polling period to 60 seconds.

```
device(config)# no sysmon np memory-errors polling-period 1000
```

The **no** form of the command specifying the **action** as **syslog-and-trap**, **syslog**, or **trap** will remove that action. The following command removes the **syslog** action.

```
device(config)# no sysmon np memory-errors action syslog
```

The **no** form of the command specifying the **action** as **none** will restore the default action (**syslog-and-trap**). To restore the NP memory error action to **syslog-and-trap**, enter the following command:

```
device(config)# no sysmon np memory-errors action none
```

**Syntax:** `[no] sysmon np memory-errors { polling-period secs | action { syslog-and-trap | syslog | trap | none } }`

The *polling-period secs* variable specifies the frequency of polling for NP memory errors. The range is from 1 through 65535. The default value is 60 seconds.

The *action* parameter specifies the action taken when NP memory errors are detected. If the *action* parameter is set to *none*, NP memory errors are not reported. Setting the *action* parameter to *syslog* specifies the generation of a syslog message. Setting the *action* parameter to *trap* specifies the generation of a SNMP trap. If *action* is configured as *syslog* followed by configuration as *trap*, then the *action* will become *syslog-and-trap*. The default *action* is *syslog-and-trap*.

The **no** form of this command restores the default action.

#### NOTE

The *polling-period* parameter determines the interval between checks for NP memory errors. Reporting may not happen within the polling interval. It may be delayed by factors such as a high CPU load on the interface module or the management module, by low memory etc.

#### NOTE

The *action* parameter controls the generation of syslog messages or SNMP traps: they cannot be controlled by the **no snmp-server enable traps** command or the **no logging enable** command.

#### NOTE

Memory errors are detected on the interface module. Errors may not be reported if there is a communication problem between the management module and the interface module.

## LP CPU high-usage monitoring

This sections discusses the following topics:

- [LP CPU high-usage monitoring overview](#) on page 93

- [LP CPU high-usage monitoring: basic configuration](#) on page 93

## LP CPU high-usage monitoring overview

When the CPU usage on the interface card goes high, it may lead to protocol flaps, timeouts, network convergence issues, etc. While in this state, it is possible to collect some data about the state and analyze it to find the root cause leading to the high CPU usage. The system can monitor itself and collect data to a file which is exportable and easy to analyze. Use the `show sysmon logs` command to see if information has been collected.

## LP CPU high-usage monitoring: basic configuration

By default:

- LP CPU high-usage monitoring is disabled.
- When monitoring is enabled, LP CPU utilization is checked every 100 ms using a timer. Only when the LP CPU utilization remains above the specified threshold for three consecutive readings, a syslog message and a debug file are generated. You can set the threshold from 50% to 100%, the default is 80%.
- If LP CPU utilization is below the specified threshold at any of the three consecutive sampling points, the tracking logic is reset and no debug file is generated.
- If the LP CPU utilization cannot be sampled for three consecutive periods (300 ms), the system logs it as a LP CPU high-usage condition and captures data to help determine the task that caused the condition even though the CPU utilization may have been lower than the specified threshold at the sampling points.

## Configuring LP CPU high usage monitoring

You can configure:

- LP CPU usage monitoring on all or individual LPs.
- The threshold for one or more LPs.

To enable LP CPU usage monitoring on all LPs, enter the following command:

```
device(config)# sysmon lp-high-cpu enable all
```

To enable LP CPU usage monitoring on the LP for interface slot 3, enter the following command:

```
device(config)# sysmon lp-high-cpu enable 3
```

To disable LP CPU usage monitoring on all LPs, enter the following command:

```
device(config)# no sysmon lp-high-cpu enable all
```

To set the LP CPU usage threshold to 90% on all LPs for which monitoring is enabled, enter the following command:

```
device(config)# sysmon lp-high-cpu threshold 90
```

To reset the LP CPU usage threshold to the default value (80%) on all LPs for which monitoring is enabled, enter the following command:

```
device(config)# no sysmon lp-high-cpu threshold
```

## Port CRC error monitoring test

This section discusses the following topics:

- [Port CRC error monitoring overview](#) on page 94
- [Port CRC error monitoring: basic configuration](#) on page 94

## Port CRC error monitoring overview

The port CRC error monitoring test is a background diagnostic test which monitors each port and checks if the number of packets with CRC errors (MAC CRC error counter) exceeds a pre-configured limit. This limit or threshold is configured as the number of CRC errors occurring over the polling interval of the diagnostic test. If the test fails on a port for more than a configured threshold, a diagnostic action, if enabled, will be triggered. The diagnostic action can be configured to disable the port where the CRC errors exceed the configured threshold.

The threshold for diagnostic action, is configured as the ratio of the number of test failures to the number of diagnostics tests run. For example, if the threshold is set to three failures out of five diagnostic test runs, then the diagnostic action, when enabled, will be triggered if the test fails three times in five consecutive diagnostic tests.

A syslog is generated every time a port CRC error monitoring test fails. A syslog message is also generated after a port is disabled in a port CRC error diagnostic action.

### NOTE

Optionally, syslogs can be disabled, before they are logged again, for a specific number of events (refer to [Configuring 'log-backoff' for the port CRC error monitoring test](#) on page 96). This applies to the syslog which is sent after the port CRC error monitoring test fails, but not to the syslog sent after a port is disabled. When a port is disabled in the port CRC error diagnostic action, a syslog will be logged to notify the user of the port state change irrespective of this command.

## Port CRC error monitoring: basic configuration

By default the:

- Port CRC error monitoring is enabled
- Port CRC error monitoring test diagnostic action is set to **syslog** i.e. a syslog message is generated when port CRC errors exceed the configured threshold.

## Configuring the port CRC error monitoring test

1. Configure the port CRC error counter limit.
2. Configure the polling period for the test.
3. Configure the threshold to trigger diagnostic action

To configure the port CRC error counter limit to 20, enter the following command:

```
device(config)# sysmon port port-crc-test counter port-crc-counter less-than 20
```

**Syntax:** `sysmon port port-crc-test counter port-crc-counter less-than crc-count`

The variable `crc-count` specifies the port CRC error count limit for the configured polling period. The range of values is 0 through 65535. The default value is 20.

To configure the port CRC error monitoring test to run every 60 seconds, enter the following command:

```
device(config)# sysmon port port-crc-test polling-period 60
```

**Syntax:** `sysmon port port-crc-test polling-period secs`

The variable `secs` specifies the polling period in seconds. The range of values is 0 through 65535. The default value is 60 seconds.

To configure the threshold to trigger the diagnostic action, if the test fails more than three times during five continuous polls, enter the following command:

```
device(config)# sysmon port port-crc-test threshold 3 5
```

**Syntax:** `sysmon port port-crc-test threshold num-failures num-polls`

The *num-failures* variable specifies the number of failed test runs. The range of values is 1 through 31.

The *num-polls* variable specifies the number of polls (tests). The range of values is 2 through 31.

The default threshold is 3 failed test runs out of 5 polls.

### Disabling the port CRC error monitoring test

The port CRC error monitoring test is enabled by default.

To disable the port CRC error monitoring test, enter the following command:

```
device(config)# no sysmon port port-crc-test
```

To enable the test again, enter the following command:

```
device(config)# sysmon port port-crc-test
```

**Syntax:** `[no] sysmon port port-crc-test`

### Configuring the port CRC error monitoring test diagnostic action

The port CRC error monitoring test diagnostic action can be configured as:

- *none* - no action is taken.
- *port-disable* - disable the port.
- *syslog* - generate a syslog message.

The default port CRC error monitoring test diagnostic action is *syslog*.

#### NOTE

When the diagnostic action is configured as **port-disable**, a syslog message will also be generated after a port is disabled.

Table 19 lists the commands to transition between port CRC error monitoring test diagnostic action states.

**TABLE 19** Port CRC error monitoring test: diagnostic action states

Action State	none	syslog	port-disable
<b>none</b>		no sysmon port port-crc action none	sysmon port port-crc action port-disable
<b>syslog</b>	sysmon port port-crc action none		sysmon port port-crc action port-disable
<b>port-disable</b>	sysmon port port-crc action none	no sysmon port port-crc action port-disable	

To disable the port CRC error monitoring test diagnostic action, enter the following command:

```
device(config)# sysmon port port-crc-test action none
```

To set the diagnostic action to disable a port when the port CRC error limit crosses the configured threshold, enter the following command:

```
device(config)# sysmon port port-crc-test action port-disable
```

**Syntax:** `sysmon port port-crc-test action { none | syslog | port-disable }`

## Configuring 'log-backoff' for the port CRC error monitoring test

Syslog messages sent after a port CRC diagnostic test fails, can be disabled for a certain number of events. Syslog action will resume after the specified number of events.

To disable syslog for 1,000 events:

```
device(config)# sysmon port port-crc-test log-backoff 1000
```

**Syntax:** `sysmon port port-crc-test log-backoff num`

The variable *num* specifies the number of events to skip before logging syslog messages again. The range of values is 1 through 14,400.

## TM DRAM CRC error monitoring

### TM DRAM CRC error monitoring overview

The TM DRAM CRC error monitoring feature monitors CRC errors. A total of 30 ingress dram CRC errors in a minute is considered as one event. If the number of events are more than three, then the action will be taken depending on the user configuration. Threshold and number of events needed to take action are fixed and cannot be configured.

### TM DRAM CRC error monitoring: basic configuration

The basic configuration of TM DRAM CRC error monitoring is as follows.

**Syntax:** `sysmon tm ingress-dram-crc action disable-ports | none | reset-linecard | syslog`

The default configuration is `disable-ports`.

The **disable-ports** keyword disables ports for DRAM CRC errors.

The **none** keyword specifies no action.

The **reset-linecard** keyword resets line cards for DRAM CRC errors.

The **syslog** keyword adds system log messages for the DRAM CRC errors.

When **disable-ports** is configured, then all ports belonging to the affected TM are disabled.

```
Feb 18 11:46:09:A:System: LP15/TM0: all ports down due to dram crc errors
```

```
Feb 18 11:46:09:I:System: Interface ethernet 15/7, state down - ingress dram crc
```

```
Feb 18 11:46:09:I:System: Interface ethernet 15/2, state down - ingress dram crc
```

When you configure **none**, then there will be no action taken even after 3 events.

When **reset-linecard** is configured, the affected LP will be reset.

```
Feb 18 11:47:22:D:System: Module reset in slot 15, TM errors detected
```

When **syslog** is configured, only the system log message is generated at the 4th event and no other action is taken.

May 18 12:05:47:A:System: LP15/TM0: dram crc errors are detected

## Scheduled System Monitor

The system monitoring Runtime Diagnostic (RTD) framework supports scheduling in future, on-demand testing, and interface module (LP) specific testing/monitoring. These features are only for those tests that adopt the new RTD test execution framework.

Scheduled system monitor consists of the following tests:

- [Future scheduling](#) on page 97
- [On-demand testing](#) on page 97
- [Slot specific monitoring and testing](#) on page 97

## Future scheduling

System monitoring RTD framework runs tests for diagnostics periodically when the system starts or when a line card comes up. As part of the RTD framework, future scheduling supports the ability to schedule a test at some point of time in the future. This test is required in any monitoring system as the user may want to schedule a test based on the condition of the system or the available resources. Users can view the results asynchronously using CLI commands when the test is completed. Scheduling feature does not work if the test is already running in the continuous polling mode.

### NOTE

This test supports a single scheduled configuration and does not support multiple scheduling configurations.

## On-demand testing

On-demand testing is a specific test that a user runs while monitoring the system depending upon the symptoms as and when required. On-demand testing feature does not work if the test is already running in the continuous polling mode. Users can specify the number of times the test is to be run.

### NOTE

When a on-demand test is scheduled, then the user can not cancel the test before its completion.

## Slot specific monitoring and testing

This feature enables running a test on one or more specific LPs that have the same configuration. Users can specify LPs on which this test has to be run. If the user does not specify a slot, the test runs on all LPs by default. This feature helps in reducing the number of other unwanted execution of tests.

### NOTE

This test cannot be run on individual LPs with different configuration for a specific test. For example, for a port CRC test, the test cannot be scheduled at different time on different LPs, or it cannot be scheduled on one LP and run in continuous polling on other LPs.



# Operations, Administration, and Maintenance (OAM)

---

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Operations, Administration, and Maintenance (OAM) implementation refers to the tools and utilities for installing, monitoring, and troubleshooting the network.

## IEEE 802.1ag Connectivity Fault Management (CFM)

IEEE 802.1ag Connectivity Fault Management (CFM) refers to the ability of a network to monitor the health of a service delivered to customers as opposed to just links or individual bridges.

The IEEE 802.1ag CFM standard specifies protocols, procedures, and managed objects to support transport fault management. This allows for the discovery and verification of the path, through bridges and LANs, taken by frames addressed to and from specified network users and the detection, and isolation of a connectivity fault to a specific bridge or LAN.

Ethernet CFM defines proactive and diagnostic fault localization procedures for point-to-point and multipoint Ethernet Virtual Connections that span one or more links. It operates end-to-end within an Ethernet network.

## Ethernet OAM capabilities

Ethernet OAM is able to:

- Monitor the health of links (because providers and customers might not have access to the management layer)
- Check connectivity of ports
- Detect fabric failures
- Provide the building blocks for error localization tools
- Give appropriate scope to customers, providers and operators (hierarchical layering of OAM)
- Avoid security breaches

## IEEE 802.1ag purpose

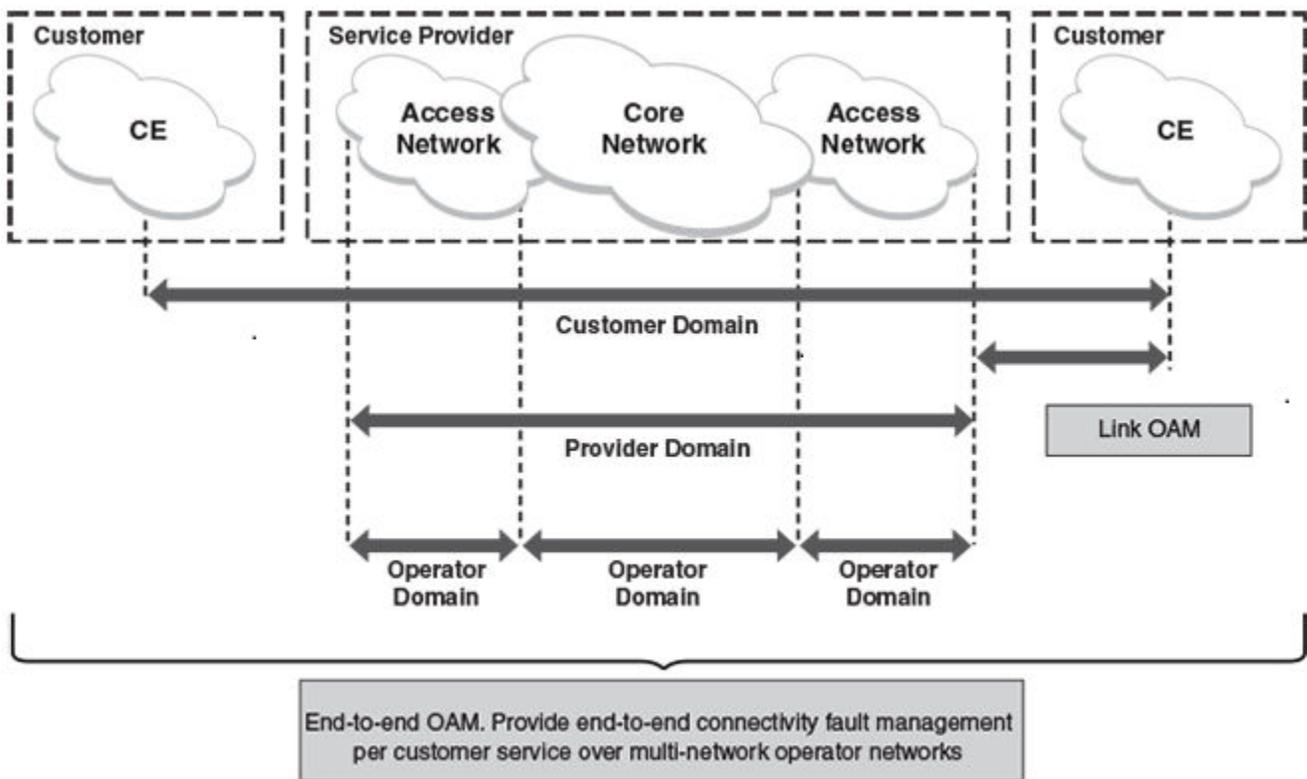
Bridges are increasingly used in networks operated by multiple independent organizations, each with restricted management access to each other's equipment. CFM provides capabilities for detecting, verifying and isolating connectivity failures in such networks.

There are multiple organizations involved in a Metro Ethernet Service: Customers, Service Providers and Operators.

Customers purchase Ethernet Service from Service Providers. Service Providers may utilize their own networks, or the networks of other Operators to provide connectivity for the requested service. Customers themselves may be Service Providers, for example a Customer may be an Internet Service Provider which sells Internet connectivity.

Operators will need minimal Ethernet OAM. Providers will need more comprehensive Ethernet OAM for themselves and to allow customers better monitoring functionality.

FIGURE 4 OAM Ethernet tools



## IEEE 802.1ag provides hierarchical network management

### Maintenance Domain (MD)

A Maintenance domain is part of a network controlled by a single operator. In Figure 4 on page 100, we have customer domain, provider domain and operator domain.

## Maintenance Domain level (MD level)

The MD levels are carried on all CFM frames to identify different domains. For example, in [Figure 4](#) on page 100, some bridges belong to multiple domains. Each domain associates a MD level.

- *Customer Level: 5-7*
- *Provider Level: 3-4*
- *Operator Level: 0-2*

## Maintenance Association (MA)

Every MD can be further divided into smaller networks having multiple Maintenance End Points (MEP). Usually MA is associated with a service instances (for example a VLAN or a VPLS).

## Maintenance End Point (MEP)

MEP is located on the edge of an MA. It defines the endpoint of the MA. Each MEP has unique ID (MEPID) within MA. The connectivity in a MA is defined as connectivity between MEPS. MEP generates Continuity Check Message and multicasts to all other MEPS in same MA to verify the connectivity.

## Maintenance Intermediate Point (MIP)

MIP is located within a MA. It responds to Loopback and Linktrace messages for Fault isolation.

# Mechanisms of Ethernet IEEE 802.1ag OAM

Mechanisms supported by IEEE 802.1ag include Connectivity Check (CC), Loopback, and Link trace. Connectivity Fault Management allows for end-to-end fault management that is generally reactive (through Loopback and Link trace messages) and connectivity verification that is proactive (through Connectivity Check messages).

## Fault detection (continuity check message)

The Continuity Check Message (CCM) provides a means to detect hard and soft faults such as software failure, memory corruption, or misconfiguration. The failure detection is achieved by each Maintenance End Point (MEP) transmitting a CCM periodically within its associated Service Instance.

As a result, MEPS also receive CCMs periodically from other MEPS. If a MEP on local Bridge stops receiving the periodic CCMs from peer MEP on a remote Bridge, it can assume that either the remote Bridge has failed or failure in the continuity of the path has occurred. The Bridge can subsequently notify the network management application about the failure and initiate the fault verification and fault isolation steps either automatically or through operator command.

A CCM requires only N transmissions within its member group, where N is the number of members within the member group. In other words, if a Virtual Bridge LAN Service has N members, only N CCMs need to be transmitted periodically - one from each.

Continuity Check (CC) messages are periodic hello messages multicast by a MEP within the maintenance domain, at the rate of X; X can be 3.3 milliseconds (ms), 10ms, or 100ms, 1 second, 1 minute, or 10 minutes. All Maintenance association Intermediate Points (MIPs) and MEPS in that domain will receive it but will not respond to it. The receiving MEPS will build a MEP database that has entities of the format. MEPS receiving this CC message will catalog it and know that the various maintenance associations (MAs) are functional, including all intermediate MIPs.

### NOTE

The Brocade Netron CES does not support sub-second values.

CCMs are not directed towards any specific; rather they are multicast across the entire point-to-point or multipoint service on a regular basis. Accordingly, one or more service flows, including the determination of MAC address reachability across a multipoint network, are monitored for connectivity status with IEEE 802.1ag.

## Fault verification (Loopback messages)

A unicast Loopback Message is used for fault verification. To verify the connectivity between MEP and its peer MEP or a MIP, the Loopback Message is initiated by a MEP with a destination MAC address set to the MAC address of either a Maintenance association Intermediate Point (MIP) or the peer MEP. The receiving MIP or MEP responds to the Loopback Message with a Loopback Reply.

A Loopback message helps a MEP identify the precise fault location along a given MA. A Loopback message is issued by a MEP to a given MIP along an MA. The appropriate MIP in front of the fault will respond with a Loopback reply. The MIP behind the fault will not respond. For Loopback to work, the MEP must know the MAC address of the MIP to ping.

## Fault isolation (Linktrace messages)

Linktrace mechanism is used to isolate faults at Ethernet MAC layer. Linktrace can be used to isolate a fault associated with a given Virtual Bridge LAN Service. It should be noted that fault isolation in a connectionless (multi-point) environment is more challenging than a connection oriented (point-to-point) environment. In case of Ethernet, fault isolation can be even more challenging since a MAC address can age out when a fault isolates the MAC address. Consequently a network-isolating fault results in erasure of information needed for locating the fault.

A Linktrace Message uses a set of reserved multicast MAC address. The Linktrace Message gets initiated by a MEP and traverses hop-by-hop and each Maintenance Point (a MEP or MIP) along the path intercepts this Linktrace Message and forwards it onto the next hop after processing it until it reaches the destination MEP. The processing includes looking at the destination MAC address contained in the Linktrace Message.

Each MP along the path returns a unicast Linktrace Reply back to the originating MEP. The MEP sends a single LTM to the next hop along the trace path; however, it can receive many Linktrace Responses from different MPs along the trace path and the destination MEP as the result of the message traversing hop by hop. As mentioned previously, the age-out of MAC addresses can lead to erasure of information at MIPs, where this information is used for the Linktrace mechanism. Possible ways to address this behavior include:

- Carrying out Linktrace following fault detection or verification such that it gets exercised within the window of age-out.
- Maintaining information about the destination MEP at the MIPs along the path using CCMs.
- Maintaining visibility of path at the source MEPs through periodic LTMs.

Linktrace may also be used when no faults are apparent in order to discover the routes normally taken by data through the network. In the rare instances during network malfunctions where Linktrace cannot provide the information needed to isolate a fault, issuing Loopback Messages to MPs along the normal data path may provide additional useful information.

The Linktrace message is used by one MEP to trace the path to another MEP or MIP in the same domain. It is needed for Loopback (Ping). All intermediate MIPs respond back with a Link trace reply to the originating MEP. After decreasing the TTL by one, intermediate MIPs forward the Link trace message until the destination MIP or MEP is reached. If the destination is a MEP, every MIP along a given MA responds to the originating MEP. The originating MEP can then determine the MAC address of all MIPs along the MA and their precise location with respect to the originating MEP.

## Configuring IEEE 802.1ag CFM

## Enabling or disabling CFM

To enable or disable the CFM protocol globally on the devices and enter into the CFM Protocol Configuration mode, enter a command such as the following.

```
device(config)#cfm-enable
device(config-cfm)#
```

**Syntax:** `[no] cfm-enable`

The **no** form of the command disables the CFM protocol.

## Creating a Maintenance Domain

A Maintenance Domain is the network or the part of the network for which faults in connectivity are to be managed. A Maintenance Domain consists of a set of Domain Service Access Points.

A Maintenance Domain is, or is intended to be, fully connected internally. A Domain Service Access Point associated with a Maintenance Domain has connectivity to every other Domain Service Access Point in the Maintenance Domain, in the absence of faults.

Each Maintenance Domain can be separately administered.

The **domain-name** command in CFM protocol configuration mode creates a maintenance domain with a specified level and name and enters the Specific Maintenance Domain mode specified in the command argument.

```
device(config-cfm)#domain-name VPLS-SP level 4
device(config-cfm-md-VPLS-SP)#
```

**Syntax:** `[no] domain-name name [ id md-id ] [ level level ]`

The *name* variable specifies the domain name. The *name* is case-sensitive.

The **id** *md-id* parameter is the Maintenance Domain Index. It is an optional parameter. The range is 1 - 4090.

The **level** *level* parameter sets the domain level in the range 0 - 7. When the domain already exists, the **level** argument is optional. The levels are.

- Customer's Domain Levels: 5 - 7
- Provider Domain Levels: 3 - 4
- Operator Domain Levels: 0 - 2

The **no** form of the command removes the specified domain from the CFM Protocol Configuration mode.

## Setting Maintenance Domain parameters

### Creating Maintenance Associations

The Maintenance Association Identifier is unique over the domain. If the Maintenance Association Identifier is globally unique, then that domain is global. CFM can detect connectivity errors only for a list of MEPs with unique MAIDs.

The **ma-name** command, in Maintenance Domain mode, creates a maintenance association within a specified domain. The **ma-name** command changes the Maintenance Domain mode to a Specific Maintenance Association mode.

```
device(config-cfm-md-VPLS-SP)# ma-name ma_1 vlan-id 30 priority 4
device(config-cfm-md-VPLS-SP-ma-ma_1)#
```

**Syntax:** `[no] ma-name name [ id ma-id ] [ esi esi-id ] [ vlan-id vlan-id ] [ vpls-id vpls-id ] [ priority priority ]`

The **ma-name** *name* parameter specifies the maintenance association name. The NAME attribute is case-sensitive.

The **id** *ma-id* is the Maintenance Association Index. It is an optional parameter. The range is 1 - 4090.

The *esi-id* specifies a unique ESI identifier of the maintenance association. In case of creating a MA a ESI ID should be set. This option is available only on platforms that support the Ethernet Service Instance (ESI) framework.

The *vlan-id* specifies a unique VLAN identifier of the maintenance association in the range 1-4090. In case of creating a MA a VLAN ID should be set.

The *vpls-id* specifies a unique VPLS identifier of the maintenance association. In case of creating a MA, a VPLS ID should be set.

The *priority* parameter specifies the priority of the CCM messages, sent by MEPS, in the range 0-7. When the maintenance association is already created, the *priority* argument is optional.

The **no** form of the command removes the created MA.

## Tag-type configuration

For the NetIron CES, the following two VLAN tag-types are allowed that can be configured globally:

- *tag1* applies to customer edge ports (CVLAN) by default.
- *tag2* applies to provider-network, backbone-edge, and backbone-network port types (SVLAN and BVLAN) by default.

### NOTE

The *tag1* and *tag2* are independent of port-types, so the system can be configured to use *tag1* for SVLAN, BVLAN and *tag2* for CVLAN.

## Configuring tag-types

You can set the ISID value using a separate command similar to NetIron XMR.

**Syntax:** **[no] tag-value isid num**

You can configure CVLAN, SVLAN, and BVLAN tag-types as shown below.

```
device(config)# tag-value tag1 8100
device(config)# tag-value tag2 9100
device(config)# tag-type cvlan tag1 svlan tag2 bvlan tag2
```

**Syntax:** **[no] tag-value num**

**Syntax:** **tag-type tag-n**

The *num* parameter specifies the value assigned to the tag. The default value for *tag1* is 0x8100 and for *tag2* is 0x88a8.

The *tag-n* parameter can be either *tag1* or *tag2*.

Tag type can be changed from a default value to a specific port as shown in the following example.

```
device(config-if-e1000-1/1)# tag-type tag2 ethernet 1/1
device(config-if-e1000-1/1)# tag-type tag1 ethernet 1/2
```

**Syntax:** **tag-type tagid ethernet interface\_id**

The *tagid* parameter can be either **tag1** or **tag2**.

The *interface\_id* parameter specifies the Ethernet slot and port ID.

## Restrictions

The tag-type has the following restrictions:

- CVLAN and SVLAN cannot have the same tag-type.
- SVLAN and BVLAN must have the same tag-type.
- Port-type must be set to the default to configure the port-level tag-type.

## Configuring a CCM interval for a Maintenance Association (MA)

The **ccm-interval** command sets the time interval between two successive Continuity Check messages (CCMs) that are sent by MEPs in the specified Maintenance Domain. The default value is 10 seconds.

```
device(config-cfm)#domain name VPLS-SP level 4
device(config-cfm-md-VPLS-SP)#ma-name ma_1 vlan-id 30 priority 3
device(config-cfm-md-VPLS-SP-ma-ma_1)#ccm-interval 10-second
device(config-cfm-md-VPLS-SP-ma-ma_1)#
```

**Syntax:** `[no] ccm-interval [ 1-second | 1-minute | 10-second | 10-minute | 3.3-ms | 10-ms | 100-ms ]`

The **1-second** parameter sets the time interval between two successive CCM packets to 1 second.

The **1-minute** parameter sets the time interval between two successive CCM packets to 1 minute.

The **10-second** parameter sets the time interval between two successive CCM packets to 10 seconds.

The **10-minute** parameter sets the time interval between two successive CCM packets to 10 minutes.

The **3.3-ms** parameter sets the time interval between two successive CCM packets to 3.3 milliseconds.

The **10-ms** parameter sets the time interval between two successive CCM packets to 10 milliseconds.

The **100-ms** parameter sets the time interval between two successive CCM packets to 100 milliseconds.

## Configuring local ports

The **mep** command, in Maintenance Association mode, adds local ports as MEP to a specific maintenance association. If configuring a CFM packet to a "down" MEP, it will need to be sent out on the port on which it was configured. If configuring a CFM packet to an "up" MEP, it will need to be sent to the entire VLAN for multicast traffic, and unicast traffic will need to be sent to a particular port according to the MAC table.

Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity:

- The list of MEPs configured with identical values for MA ID defines an MA.
- Each Bridge has its own Maintenance Association managed object for an MA.
- Each individual MEP is configured with a ID that is unique within that MA.
- Each MEP is associated with a Service Access Point that provides access to a single service instance.

### NOTE

When configuring 802.1ag over VPLS, if the VPLS endpoint is deleted from the configuration, the MEP configuration is deleted under CFM without warning.

To add local ports to an upstream MEP, enter commands such as the following.

```
device(config-cfm)# domain name VPLS-SP level 4
device(config-cfm-md-VPLS-SP)# ma-name ma_1 vlan-id 30 priority 3
device(config-cfm-md-VPLS-SP-ma_1)# mep 1 up port eth 2/1
device(config-cfm-md-VPLS-SP-ma_1)#
```

**Syntax:** `[no] mep mep-id [ up | down ] [ vlan vlan-id port ethernet slot/port | port ethernet slot/port ]`

The **mep-id** parameter specifies the maintenance end point ID (mandatory) in the range *1-8191*.

The *up* parameter sets the MEP direction away from the monitored VLAN.

The *down* parameter sets the MEP direction towards the monitored VLAN.

The *vlan-id* parameter specifies the VLAN end-points. It is configured only for MAs associated with VPLS and not configured for MAs with a VLAN.

The *port-id* parameter specifies the target interface on which it is used.

The **no** form of the command removes the specified MEPs.

## Configuring Remote MEPs

The **remote-mep** command is used to configure the remote MEP's you are expecting. If a remote MEP is not specified, the remote MEP database is built based on the CCM. If one remote MEP never sends CCM, the failure can not be detected.

```
device(config-cfm-md-VPLS-SP)# ma-name ma_1 vlan-id 30
device(config-cfm-md-VPLS-SP-ma_1)# remote-mep 1 to 120
device(config-cfm-md-VPLS-SP-ma_1)#
```

**Syntax:** **[no] remote-mep** *mep-id* [*to mep-id*]

The *mep-id* parameter specifies the maintenance end point ID (mandatory) in the range *1-8191*.

The **no** form of the command removes the specified remote MEPs.

## Setting the Remote Check Start-Delay

When configuring the remote MEPs range, you can set a wait time before the MEPs come up and the CCM check operation is started. The default is set to 30 seconds.

```
device(config)# cfm-enable
device(config-cfm)# rmep-check start-delay 120
device(config-cfm)#
```

**Syntax:** **[no] rmep-check start-delay** *seconds*

The *seconds* parameter is the wait time interval before the CCM check is started. The range is 10 - 600 seconds.

## Specifying MIP creation policy

The **mip-policy** command, in Maintenance Association mode, specifies the conditions in which MIPs are automatically created on ports.

### NOTE

MIP functionality of 802.1ag over VPLS with sub-second timer will have all the configuration restrictions of the VPLS CPU-protection.

A MIP can be created on a port and VLAN, only when explicit or default policy has been defined for them. For a specific port and VLAN a MIP will be created at the lowest of the levels. Additionally, the level created should be the next higher than the MEP level defined for these port and VLAN.

```
device(config-cfm)# domain name VPLS-SP level 4
device(config-cfm-md-VPLS-SP)# ma-name ma_1 vlan-id 30
device(config-cfm-md-VPLS-SP-ma_1)# mip-policy explicit
device(config-cfm-md-VPLS-SP-ma_1)#
```

**Syntax:** **[no] mip-policy** [**explicit** | **default**]

Use the **explicit** explicit parameter to specify that explicit MIPs are configured only if a MEP exists on a lower MD Level.

Use the **default** parameter to specify that MIPs will always be created.

The **no** form of the command restores the default Policy.

## Y.1731 performance management

The Y.1731 feature provides the following performance monitoring capability for point-to-point links as defined in ITU-T Rec Y.1731:

- Two-way Frame Delay Measurement (ETH-DM)
- Two-way Frame Delay Measurement Variation

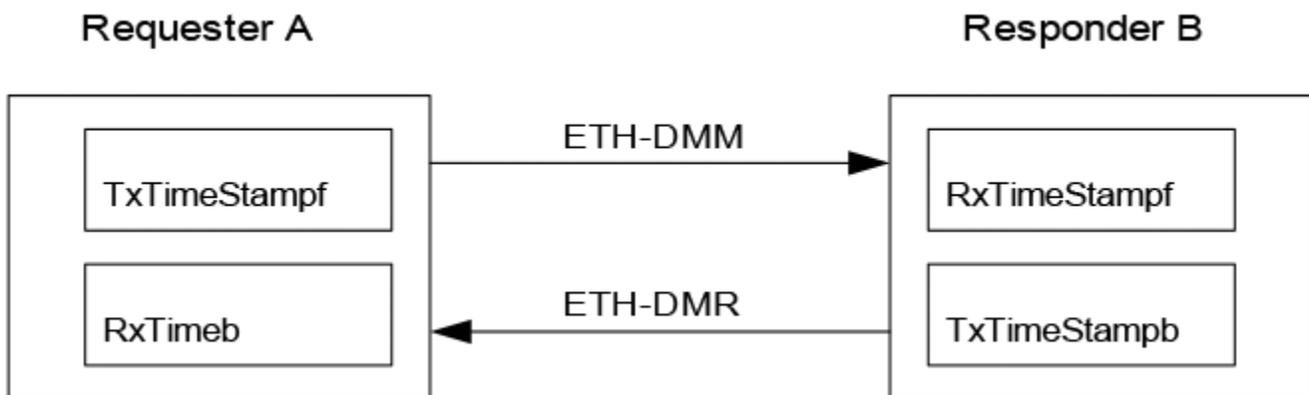
### NOTE

One-way ETH-DM is not supported in this release of the Multi-Service IronWare.

## About Y.1731

Figure 5 shows an ETH-DM requester and responder.

FIGURE 5 ETH-DM requester and responder.



ETH-DM packets are transmitted, received and processed by LP CPU and are timestamped by the hardware on transmit and receive path.

An ETH-DM packet contains 4 timestamps for measuring the round-trip delay.

Requester A, transmits ETH-DMM packets with TxTimeStamptf (timestamp at the transmission time of the packet).

Responder B, responds with an ETH-DMR packet using two timestamps to account for its processing time: RxTimeStamptf (Timestamp at the time of receiving the DMM packet) and TxTimeStamptb (timestamp at the time of transmitting the DMR packet).

Upon receiving an ETH-DMR packet, requester A stamps the packet with RxTimeb (timestamp at the time the DMR packet is received).

Frame Delay = (RxTimeb - TxTimeStamptf) - (TxTimeStamptb - RxTimeStamptf)

## This release provides Y.1731 support for the following:

- VLANs

- VPLS—Both VC-mode tagged and raw
- VLL—Both tagged and raw modes
- Up and Down MEPs for VLANs, VPLS, and VLL
- Over LAG ports—The active primary port of the trunk would be used to transmit ETH-DM frames in case of down MEP
- Through 802.1ag MIPs—MIP would behave as a transient node for ETH-DM frames

### Configuration considerations:

When using Y.1731, consider the following:

- ETH-DM is reliable only if the transmitted DM frame (DMM) and received DM reply (DMR) are on the same line processor (LP). In the event that they are different, results will not be accurate.
- Maximum frame-delay that can be measured is 4 seconds. If a DMR packet is received with a delay greater than 4 seconds, the packet is discarded and ignored.
- ETH-DM does not gather path data. To determine which path the DM applies to, use the `cfm linktrace domain` command, since ETH-DM frames follow the same path.
- One-way ETH-DM is not supported in this release of the Multi-Service IronWare.

### Configuring Y.1731 performance monitoring

Use the `cfm delay_measurement domain` command to issue the delay measurement. If the number of delay measurement frame is greater than 16, then the last 16 delay measurement replies are printed.

You can issue the `cfm delay measurement` command from different sessions if they are for different `src-mepps`. However, if it is for same `src-mep`, it only completes one session at a time.

```
device# cfm delay_measurement domain md2 ma ma2 src-mep 3 target-mep 2
Y1731: Sending 10 delay_measurement to 0000.00f7.3931, timeout 1000 msec
Type Control-c to abort
Reply from 0000.00f7.3931: time= 32.131 us
Reply from 0000.00f7.3931: time= 31.637 us
Reply from 0000.00f7.3931: time= 32.566 us
Reply from 0000.00f7.3931: time= 34.052 us
Reply from 0000.00f7.3931: time= 33.376 us
Reply from 0000.00f7.3931: time= 31.501 us
Reply from 0000.00f7.3931: time= 33.016 us
Reply from 0000.00f7.3931: time= 32.537 us
Reply from 0000.00f7.3931: time= 32.492 us
Reply from 0000.00f7.3931: time= 32.552 us
sent = 10 number = 10 A total of 10 delay measurement replies received.
Success rate is 100 percent (10/10)
=====
Round Trip Frame Delay Time : min = 31.501 us avg = 32.586 us max = 34.052 us
Round Trip Frame Delay Variation : min = 45 ns avg = 839 ns max = 1.875 us
=====
```

**Syntax:** `cfm delay_measurement domain domain-name ma ma-name src-mep mep-id target-mep mep-id [ timeout timeout ] [ number number ]`

The `domain domain-name` parameter specifies the maintenance domain to be used for a delay measurement message. The `domain-name` attribute is case-sensitive.

The `ma ma-name` parameter specifies the maintenance association to be used for a delay measurement message. The `ma-name` attribute is case-sensitive.

The `src-mep mep-id` parameter specifies the source mep-id in the range 1-8191.

The **target-mep** *mep-id* parameter specifies the destination mep-id in the range 1-8191.

The **number** *number* parameter specifies the number of delay\_measurement messages to be sent. The range is 1-1000. The default value is 10. This is an optional parameter.

The **timeout** *timeout* parameter specifies the timeout used to wait for previous delay\_measurement reply before sending the next delay\_measurement message. The range is 1-4 seconds. The default value is 1second. This is an optional parameter.

If a **delay\_measurement** reply is received before the timeout, then the next delay measurement frame is sent immediately after processing the delay measurement reply. However, if the **delay measurement** reply is not received within the specified timeout, then the next **delay measurement** frame will be sent.

## Y.1731 show commands

Use the **show cfm statisticdelay\_measurement domain** command to display delay measurement statistics. If the command is issued again, the output is replaced with the new values.

```
device#show cfm statistics delay_measurement domain md2 ma ma2 rmep-id 2
Domain: md2 Level: 7
Maintenance association: ma2 VLAN ID: 2 Priority: 7
=====
Round Trip Frame Delay Time : min = 31.501 us   avg = 32.586 us   max = 34.052 us
Round Trip Frame Delay Variation : min = 45 ns    avg = 839 ns     max = 1.875 us
=====
```

Port Used to transmit delay\_measurement: 2/2

Number of delay\_measurement frames Used to calculate Statistics: 10

**Syntax:** **show cfm statistics delay\_measurement domain** *domain-name* **ma** *ma-name* **rmep** *rmep-id*

The **domain** *domain-name* parameter specifies the maintenance domain to be used for a delay measurement message. The *domain-name* attribute is case-sensitive.

The **ma** *ma-name* parameter specifies the maintenance association to be used for a delay measurement message. The *ma-name* attribute is case-sensitive.

The **rmep** *rmep-id* parameter specifies the remote mep id to be used for a delay measurement message.

## Sample configuration

- MEP configuration (prerequisite for ETH-DM to work).

Requester-A :

```
device(config)#cfm-enable
device(config-cfm)# domain-name md2 level 7
device(config-cfm-md-md2)# ma-name ma2 vlan-id 2 priority 7
device(config-cfm-md-md2-ma-ma2)# mep 3 down port ethe 2/2
device(config-cfm-md-md2-ma-ma2)#
Responder-B:
device(config)#cfm-enable
device(config-cfm)# domain-name md2 level 7
device(config-cfm-md-md2)# ma-name ma2 vlan-id 2 priority 7
device(config-cfm-md-md2-ma-ma2)# mep 2 down port ethe 2/2
device(config-cfm-md-md2-ma-ma2)#
```

- Issue the **cfm delay\_measurement** command.

```
device# cfm delay_measurement domain md2 ma ma2 src-mep 3 target-mep 2
Y1731: Sending 10 delay_measurement to 0000.00f7.3931, timeout 1000 msec
Type Control-c to abort
```

```

Reply from 0000.00f7.3931: time= 32.131 us
Reply from 0000.00f7.3931: time= 31.637 us
Reply from 0000.00f7.3931: time= 32.566 us
Reply from 0000.00f7.3931: time= 34.052 us
Reply from 0000.00f7.3931: time= 33.376 us
Reply from 0000.00f7.3931: time= 31.501 us
Reply from 0000.00f7.3931: time= 33.016 us
Reply from 0000.00f7.3931: time= 32.537 us
Reply from 0000.00f7.3931: time= 32.492 us
Reply from 0000.00f7.3931: time= 32.552 us
sent = 10 number = 10 A total of 10 delay measurement replies received.
Success rate is 100 percent (10/10)
=====
Round Trip Frame Delay Time      : min = 31.501 us  avg = 32.586 us  max = 34.052 us
Round Trip Frame Delay Variation : min = 45 ns    avg = 839 ns   max = 1.875 us
=====

```

- Issue the **show cfm statistic delay\_measurement domain** command.

```

device#show cfm statistics delay_measurement domain md2 ma ma2 rmep-id 2
Domain: md2 Level: 7
Maintenance association: ma2 VLAN ID: 2 Priority: 7
=====
Round Trip Frame Delay Time : min = 31.501 us  avg = 32.586 us  max = 34.052 us
Round Trip Frame Delay Variation : min = 45 ns    avg = 839 ns   max = 1.875 us
=====
Port Used to transmit delay_measurement: 2/2
Number of delay_measurement frames Used to calculate Statistics: 10

```

## CFM monitoring and show commands

### Sending linktrace messages

The **cfm linktrace domain** command sends a linktrace message to a specified MEP in the domain. Enter a command such as the following to send a linktrace message to a specified MEP in the domain.

```

device# cfm linktrace domain VPLS-SP ma ma_1 src-mep 21 target-mep 1 timeout 10 ttl 4
Linktrace to 0000.00fb.5378 on Domain VPLS-SP, level 4: timeout 10ms, 4 hops
-----
Hops      MAC                Ingress      Ingress Action  Relay Action
          Forwarded          Egress       Egress Action   Nexthop
-----
  1      0000.00e2.6ea0
          Forwarded                5/4             EgrOK
  2      0000.00fb.5378
          Not Forwarded            7/2             IgrOK           RLY_HIT
Destination 0000.00fb.5378 reached

```

**Syntax:** [no] **cfm linktrace domain** *name* **ma** *ma-name* **src-** *mep mep-id* **target-mip** *HH:HH:HH:HH:HH:HH* | **target-mep** *mep-id* [**timeout** *timeout*] [**ttl** *TTL*]

The **domain** *name* parameter specifies the maintenance domain to be used for a linktrace message. The *name* attribute is case-sensitive.

The **ma** *ma-name* parameter specifies the maintenance association to be used for a linktrace message. The *ma-name* attribute is case-sensitive.

The **src-mep** *mep-id* parameter specifies the Source ID in the range 1 - 8191.

The **target-mip** *HH:HH:HH:HH:HH:HH* parameter specifies the MAC-address of the MIP linktrace destination.

The **target-mep** *mep-id* parameter specifies the Destination ID of the linktrace destination.

The **timeout** *timeout* parameter specifies the time to wait for a linktrace reply. The range is 1 - 30 seconds.

The **tll** *TTL* parameter specifies the initial TTL field value in the range 1 - 64. The default is 8 seconds.

## Sending loopback messages

The **cfm loopback domain** command, sends a loopback message to a specific MIP in a specified domain.

```
device#cfm loopback domain VPLS-SP ma ma_1 src-mep 2 target-mep 1 timeout 10 number 10
cfm: Sending 10 Loopback to 0000.00fb.5378, timeout 10 msec
Type Control-c to abort
Reply from 0000.00fb.5378: time=1ms
Reply from 0000.00fb.5378: time<1ms
A total of 10 loopback replies received.
Success rate is 100 percent (10/10), round-trip min/avg/max=0/0/1 ms.
```

**Syntax:** [no] **cfm loopback domain** *name* **ma** *ma-name* **src-mep** *mep-id* { **target-mip** *HH:HH:HH:HH:HH:HH* | **target-mep** *mep-id* }  
[ **number** *number* ] [ **timeout** *timeout* ]

The **domain** *name* parameter specifies the maintenance domain to be used for a linktrace message. The *name* attribute is case-sensitive.

The **ma** *ma-name* parameter specifies the maintenance association to be used for a linktrace message. The *ma-name* attribute is case-sensitive.

The **src-mep** *mep-id* parameter specifies the Source ID in the range 1-8191.

The **dst-mip** *HH:HH:HH:HH:HH:HH* parameter specifies the MAC address of the MIP linktrace destination.

The **target-mep** *mep-id* parameter specifies the Destination ID in the range 1-8191.

The **number** *number* parameter specifies the number of loopback messages to be sent.

The **timeout** *timeout* parameter specifies the timeout used to wait for linktrace reply.

## Displaying CFM configurations

The **show cfm** command, displays the current configuration and status of CFM. For the **show cfm** command to take effect, CFM should first be enabled in Protocol Configuration mode.

```
device#show cfm
Domain: md2
Index: 1
Level: 6
Maintenance association: ma2
Ma Index: 1
CCM interval: 10000 ms
VLAN ID: 2
Priority: 6
MEP   Direction  MAC                PORT
====  =====  =====
  3   DOWN      0000.00f7.3831   ethe 2/2
```

**Syntax:** **show cfm** [ **domain** *name* ] [ **ma** *ma-name* ]

The **domain** *name* parameter specifies a domain for display. By default, all defined domains are shown.

The **ma** *ma-name* parameter specifies the maintenance association name. By default, all defined domains are shown.

**TABLE 20** Show CFM output descriptions

This field...	Displays...
Domain	The Domain is the network or the part of the network for which faults in connectivity are displayed.
Index	The Domain Index.
Level	The level is the domain level in the range 0-7. The levels can be: <ul style="list-style-type: none"> <li>• Customer's MD levels: 5 - 7</li> <li>• Provider's MD levels: 3 - 4</li> <li>• Operator's MD levels: 0 - 2</li> </ul>
Maintenance Association	The maintenance association name.
Ma Index	The Maintenance Association Index.
CCM interval	The time interval between two successive Continuity Check messages (CCMs) that are sent by MEPs in the specified Maintenance Domain.
VLAN ID	The VLAN identifier of the maintenance association.
VPLS ID	The VPLS identifier of the maintenance association.
Priority	The priority of the CCM messages, sent by MEPs, in the range 0-7.
MEP	The maintenance end point ID
Direction	Displays the direction the MEP was sent:  Up - The MEP direction away from the monitored VLAN.  Down - The MEP direction is towards the monitored VLAN.
MAC	Displays the associated MAC Address.
PORT	Displays the associated port.
MIP	Displays the associated MIP
VLAN	Displays the associated VLAN.

The show cfm brief show a summary of the configured MEPs and RMEPs.

```
device#show cfm brief
Domain: md2
Index: 1
Level: 6  Num of MA: 1
  Maintenance association: ma2
  MA Index: 1
  CCM interval: 10000 ms
  VLAN ID: 2
  Priority: 6
  Num of MEP: 1          Num of RMEP: 1
  rmepstart: 0 rmepfail: 0 rmepok 1
```

**Syntax:** show cfm [ domain *name* ] [ ma *ma-name* ] brief

**TABLE 21** Show cfm brief output description

This field...	Displays...
Domain	The Domain is the network or the part of the network for which faults in connectivity are displayed.
Index	The Domain Index.
Level	The level is the domain level in the range 0-7. The levels can be: <ul style="list-style-type: none"> <li>• Customer's MD levels: 5 - 7</li> <li>• Provider's MD levels: 3 - 4</li> <li>• Operator's MD levels: 0 - 2</li> </ul>
Maintenance Association	The maintenance association name.
Ma Index	The Maintenance Association Index.

**TABLE 21** Show cfm brief output description (continued)

This field...	Displays...
CCM interval	The time interval between two successive Continuity Check messages (CCMs) that are sent by MEPs in the specified Maintenance Domain.
VLAN ID	The VLAN identifier of the maintenance association.
VPLS ID	The VPLS identifier of the maintenance association.
Priority	The priority of the CCM messages, sent by MEPs, in the range 0-7.
Numof MEP	The number of MEPs configured.
Num of RMEP	The number of remote MEPs configured
remepstart	The number of RMEPs in the start state.
rmepfail	The number of RMEPs that have failed.
rmepok	The number of RMEPs in an OK state.

## Displaying connectivity statistics

The **show cfm connectivity** command, displays connectivity statistics for the remote database. For the **show cfm connectivity** command to take effect, CFM should first be enabled in the Protocol Configuration mode.

```

device#show cfm connectivity
Domain: md2 Index: 1
Level: 6
Maintenance association: ma2
MA Index: 1
CCM interval: 10000 ms
VLAN ID: 2
Priority: 6
RMEP  MAC                VLAN/PEER          AGE      PORT      SLOTS
====  =====
  2    0000.00f7.3931      2              20      2/2      2

```

### Syntax: show cfm connectivity

**TABLE 22** Show CFM connectivity output descriptions

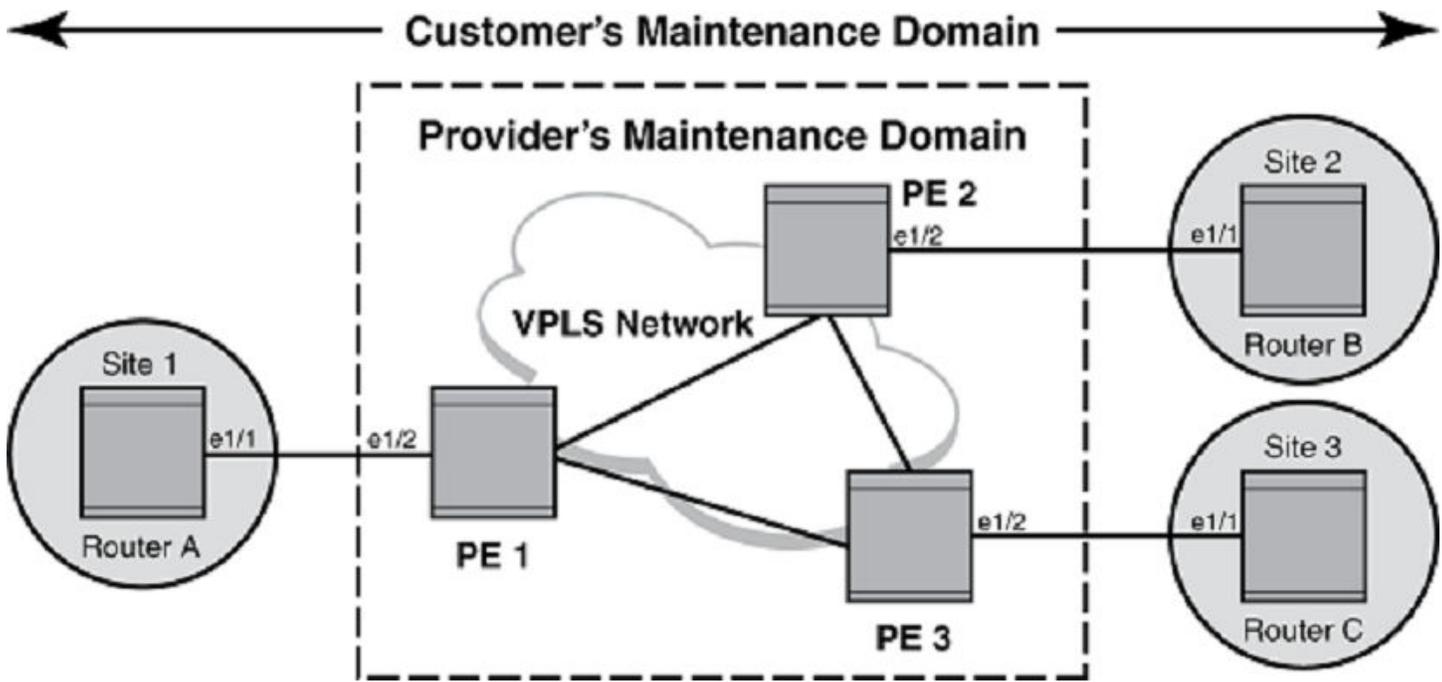
This field...	Displays...
Domain	The Domain is the network or the part of the network for which faults in connectivity are displayed.
Index	The Domain Index.
Level	The level is the domain level in the range 0-7. The levels can be: <ul style="list-style-type: none"> <li>Customer's MD levels: 5 - 7</li> <li>Provider's MD levels: 3 - 4</li> <li>Operator's MD levels: 0 - 2</li> </ul>
Maintenance association	The maintenance association name.
Ma Index	The Maintenance Association Index.
CCM interval	The time interval between two successive Continuity Check messages (CCMs) that are sent by MEPs in the specified Maintenance Domain.
VPLS ID	The VPLS identifier of the maintenance association.
Priority	The priority of the CCM messages, sent by MEPs, in the range 0-7.
RMEP	The remote maintenance end point ID
MAC	Displays the associated MAC Address.
VLAN or VC	VLAN ID or VC label learned from the CCM packet. VC label is in hexadecimal format.
Age	Uptime since RMEP discovery or from last age out

TABLE 22 Show CFM connectivity output descriptions (continued)

This field...	Displays...
PORT	Displays the associated port.
SLOTMASK	Mask of slots that are receiving CCM packets which are used for multi-slot trunks. For example a value of 0005 indicates Slots 1 and 3.

## Sample configuration for a customer's domain

FIGURE 6 Sample configuration



### Configuring Router A

CFM configuration steps for Router A are listed below.

1. To enable CFM, enter the following command.

```
RouterA(config)#cfm-enable
```

2. Create a maintenance domain with a specified name **CUST\_1** and level 7.

```
RouterA(config-cfm)#domain-name CUST_1 level 7
```

3. Create a maintenance association within a specified domain of **vlan-id 30** with a priority 3.

```
RouterA(config-cfm-md-CUST_1)#ma-name ma_5 vlan-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages to **10-seconds**.

```
RouterA(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

5. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port **1/1** to a specified maintenance association.

```
RouterA(config-cfm-md-CUST_1-ma-ma_5)#mep 2 down vlan 30 port ethe 1/1
```

## Configuring Router B

CFM configuration steps for Router B are listed below.

1. To enable CFM for VPLS, enter the following command.

```
RouterB(config)#cfm-enable
```

2. Create a maintenance domain with a specified name **CUST\_1** and level **7**.

```
RouterB(config-cfm)#domain-name CUST_1 level 7
```

3. Create a maintenance association within a specified domain of **vlan-id 30** with a priority **5**.

```
RouterB(config-cfm-CUST_1)#ma-name ma_5 vlan-id 30 priority 5
```

4. Set the time interval between successive Continuity Check Messages to **10-seconds**.

```
RouterB(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

5. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port **1/1** as MEP to a specified maintenance association.

```
RouterB(config-cfm-md-CUST_1-ma-ma_5)#mep 2 down vlan 30 port ethe 1/1
```

## Configuring Router C

CFM configuration steps for Router C are listed below.

1. To enable CFM for VPLS, enter the following command.

```
RouterC(config)#cfm-enable
```

2. Create a maintenance domain with a specified name **CUST\_1** and level **7**.

```
RouterC(config-cfm)#domain-name CUST_1 level 7
```

3. Create a maintenance association within a specified domain of **vlan-id 30** with a priority **4**.

```
RouterC(config-cfm-CUST_1)#ma-name ma_5 vlan-id 30 priority 4
```

4. Set the time interval between successive Continuity Check Messages to **10-seconds**.

```
RouterC(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

5. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port **1/1** as MEP to a specified maintenance association.

```
RouterC(config-cfm-md-CUST_1-ma-ma_5)#mep 1 down vlan 30 port ethe 1/1
```

## Configuring CFM using Provider Bridges

Below is an example for configuring CFM when using Provider Bridges configurations as in the figure on [Sample configuration for a customer's domain](#) on page 114.

### Configuring Router A

CFM configuration steps for Router A are listed below.

1. Create the port-based VLAN that contains the tagged interface that you want to use by entering the following commands.

```
device(config)# vlan30
device(config-vlan-30)# tagged ethe 1/1
```

2. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

3. Create a maintenance domain with a specified name **CUST\_1** and level **7**.

```
device(config-cfm)#domain-name CUST_1 level 7
```

4. Create a maintenance association within a specified ESI **Site1vlan30**, and a **vlan-id 30** with a priority **3**.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 esi Site1vlan30 vlan-id 30 priority 3
```

5. Set the time interval between successive Continuity Check Messages to **10-seconds**.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

6. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port 1/1 to a specified maintenance association.

```
device(config-cfm-md-CUST_1-ma-ma_5)#mep 2 down port ethe 1/1
```

7. To configure the hostname as **RouterA**, enter a command such as the following.

```
device(config)#hostname RouterA
```

8. Configure interface ethernet 1/1 as the custom-edge by entering the following commands.

```
device(config)#interface ethernet 1/1
device(config-if-e10000-1/1)#port-type customer-edge
device(config-if-e10000-1/1)enable
device(config-if-e10000-1/1)end
```

### Configuring Router B

CFM configuration steps for Router B are listed below.

1. Create the port-based VLAN that contains the tagged interface that you want to use by entering the following commands.

```
device(config)# vlan30
device(
config-vlan-30)# tagged ethe 1/1
```

2. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

3. Create a maintenance domain with a specified name **CUST\_1** and level **7**.

```
device(config-cfm)#domain-name CUST_1 level 7
```

4. Create a maintenance association within a specified ESI **Site2vlan30**, and a **vlan-id 30** with a priority **3**.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 esi Site2vlan30 vlan-id 30 priority 3
```

5. Set the time interval between successive Continuity Check Messages to **10-seconds**.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

6. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port 1/2 to a specified maintenance association.

```
device(config-cfm-md-CUST_1-ma-ma_5)#mep 2 down port ethe 1/2
```

7. To configure the hostname as **RouterB**, enter a command such as the following.

```
device(config)#hostname RouterB
```

8. Configure interface ethernet 1/1 as the customer-edge by entering the following commands.

```
device(config)#interface ethernet 1/1
device(config-if-e10000-1/1)#port-type customer-edge
device(config-if-e10000-1/1)enable
device(config-if-e10000-1/1)end
```

## Configuring Router C

CFM configuration steps for Router C are listed below.

1. Create the port-based VLAN that contains the tagged interface that you want to use by entering the following commands.

```
device(config)# vlan30
device(
config-vlan-30)# tagged ethe 1/1
```

2. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

3. Create a maintenance domain with a specified name **CUST\_1** and level **7**.

```
device(config-cfm)#domain-name CUST_1 level 7
```

4. Create a maintenance association within a specified ESI **Site3vlan30**, and a **vlan-id 30** with a priority **3**.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 esi Site3vlan30 vlan-id 30 priority 3
```

5. Set the time interval between successive Continuity Check Messages to **10-seconds**.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

6. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port 1/2 to a specified maintenance association.

```
device(config-cfm-md-CUST_1-ma-ma_5)#mep 2 down port ethe 1/2
```

- To configure the hostname as **RouterC**, enter a command such as the following.

```
device(config)#hostname RouterC
```

- Configure interface ethernet 1/1 as the **custome-edge** by entering the following commands.

```
device(config)#interface ethernet 1/1
device(config-if-e10000-1/1)#port-type customer-edge
device(config-if-e10000-1/1)enable
device(config-if-e10000-1/1)end
```

## Provider Bridge Brocade1

- Create the port-based VLAN that contains the tagged interface that you want to use by entering the following commands.

```
device(config)# vlan30
device(config-vlan-30)# tagged ethe 1/1
```

- Create the ESI Brocade **vlan300** as an encapsulated SVLAN with the ESI client **Site1vlan30** by entering the following commands.

```
device(config)esi Brocadevlan300 encapsulation svlan#
device(config)#esi-client Site1vlan30
```

- Add the port-based **VLAN300** that contains the tagged interfaces that you want to use by entering the following commands.

```
device(config)# vlan300
device(config-vlan-300)# tagged ethe 1/1 ethe 1/3
```

- To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

- Create a maintenance domain with a specified name **CUST\_1** and level **5**.

```
device(config-cfm)#domain-name CUST_1 level 5
```

- Create a maintenance association within a specified ESI **Site1vlan30**, and a **vlan-id 30** with a priority **3**.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 esi Site1vlan30 vlan-id 30 priority 3
```

- Set the time interval between successive Continuity Check Messages to **10-seconds**.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

- Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port **1/2** as MEP to a specified maintenance association.

```
device(config-cfm-md-CUST_1-ma-ma_5)#mep 4 up port ethe 1/2
```

- To configure the hostname as device, enter a command such as the following.

```
device(config)#hostname Brocade
```

- Configure interface ethernet **1/1** as the **provider network** by entering the following commands.

```
device(config)#interface ethernet 1/1
device(config-if-e10000-1/1)#port-type provider-network
device(config-if-e10000-1/1)enable
device(config-if-e10000-1/1)end
```

- Configure interface ethernet 1/2 as the **customer-edge** by entering the following commands.

```
device(config)#interface ethernet 1/2
device(config-if-e10000-1/2)#port-type custommer-edge
device(config-if-e10000-1/2)enable
device(config-if-e10000-1/2)end
```

- Configure interface ethernet 1/3 as the **provider network** by entering the following commands.

```
device(config)#interface ethernet 1/3
device(config-if-e10000-1/3)#port-type provider-network
device(config-if-e10000-1/3)enable
device(config-if-e10000-1/3)end
```

## Provider Bridge Brocade2

- Create the port-based **VLAN300** that contains the tagged interfaces that you want to use by entering the following commands.

```
device(config)# vlan300
device(config-vlan-300)# tagged ethe 1/1 ethe 1/3
```

- To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

- Create a maintenance domain with a specified name **CUST\_1** and level **5**.

```
device(config-cfm)#domain-name CUST_1 level 5
```

- Create a maintenance association within a specified ESI **Site2vlan30**, and a **vlan-id 30** with a priority **3**.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 esi Site2vlan30 vlan-id 30 priority 3
```

- Set the time interval between successive Continuity Check Messages to **10-seconds**.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

- Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port 1/2 as MEP to a specified maintenance association.

```
device(config-cfm-md-CUST_1-ma-ma_5)#mep 5 up port ethe 1/2
```

- To configure the hostname as device1, enter a command such as the following.

```
device(config)#hostname device1
```

- Configure interface ethernet 1/1 as the **provider network** by entering the following commands.

```
device(config)#interface ethernet 1/1
device(config-if-e10000-1/1)#port-type provider-network
device(config-if-e10000-1/1)enable
device(config-if-e10000-1/1)end
```

- Configure interface ethernet 1/2 as the **customer-edge** by entering the following commands.

```
device(config)#interface ethernet 1/2
device(config-if-e10000-1/2)#port-type custommer-edge
device(config-if-e10000-1/2)enable
device(config-if-e10000-1/2)end
```

10. Configure interface ethernet **1/3** as the **provider network** by entering the following commands.

```
device(config)#interface ethernet 1/3
device(config-if-e10000-1/3)#port-type provider-network
device(config-if-e10000-1/3)enable
device(config-if-e10000-1/3)end
```

## Provider Bridge Brocade3

1. Create the port-based VLAN that contains the tagged interface that you want to use by entering the following commands.

```
device(config)# vlan30
device(config-vlan-30)# tagged ethe 1/2
```

2. Create the ESI device **vlan300** as an encapsulated SVLAN with the ESI client **Site3vlan30** by entering the following commands.

```
device(config)#esi Brocade3vlan300 encapsulation svlan
device(config)#esi-client Site3vlan30
```

3. Add the port-based **VLAN300** that contains the tagged interfaces that you want to use by entering the following commands.

```
device(config)# vlan300
device(config-vlan-300)# tagged ethe 1/1 ethe 1/3
```

4. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

5. Create a maintenance domain with a specified name **CUST\_1** and level **5**.

```
device(config-cfm)#domain-name CUST_1 level 5
```

6. Create a maintenance association within a specified ESI **Site3vlan30**, and a **vlan-id 30** with a priority **3**.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 esi Site3vlan30 vlan-id 30 priority 3
```

7. Set the time interval between successive Continuity Check Messages to **10-seconds**.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

8. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port **1/2** as MEP to a specified maintenance association.

```
device(config-cfm-md-CUST_1-ma-ma_5)#mep 6 up port ethe 1/2
```

9. To configure the hostname as **Brocade3**, enter a command such as the following.

```
device(config)#hostname Brocade3
Configure interface ethernet 1/1
as the provider network
by entering the following commands:
device(config)#interface ethernet 1/1
device(config-if-e10000-1/1)#port-type provider-network
device(config-if-e10000-1/1)enable
device(config-if-e10000-1/1)end
```

10. Configure interface ethernet **1/2** as the **customer-edge** by entering the following commands.

```
device(config)#interface ethernet 1/2
device(config-if-e10000-1/2)#port-type custommer-edge
```

```
device(config-if-e10000-1/2) enable
device(config-if-e10000-1/2) end
```

11. Configure interface ethernet 1/3 as the **provider network** by entering the following commands.

```
device(config)#interface ethernet 1/3
device(config-if-e10000-1/3)#port-type provider-network
device(config-if-e10000-1/3) enable
device(config-if-e10000-1/3) end
```

## Displaying the connectivity status in a customer's domain

The following output are for 3 VPLS CEs. The 3 CEs are monitoring Ethernet LAN service in VLAN 30. The Ethernet SP is providing transport service for the customer's VLAN 30 through VPLS which is transparent to customer. The customer is only concerned about RMEPs from remote sites.

```
device#show cfm connectivity
Domain: CUST_1 Level: 7
Maintenance association: ma_5
CCM interval: 10000 ms
VLAN ID: 30
Priority: 3
RMEP  MAC                VLAN/PEER      AGE  PORT  SLOTS
====  =====
400   0000.00e2.8a00         30           879  1/2  1,
200   0000.00f5.e500         30          1550  1/2  1,
device#show cfm connectivity
Domain: CUST_1 Level: 7
Maintenance association: ma_5
CCM interval: 10000 ms
VLAN ID: 30
Priority: 5
RMEP  MAC                VLAN/PEER      AGE  PORT  SLOTS
====  =====
400   0000.00e2.8a00         30           898   1/3  1,
100   0000.00e2.b400         30          1569   1/3  1,
device#show cfm connectivity
Domain: CUST_1 Level: 7
Maintenance association: ma_5
CCM interval: 10000 ms
VLAN ID: 30
Priority: 4
RMEP  MAC                VLAN/PEER      AGE  PORT  SLOTS
====  =====
200   0000.00f5.e500         30           907   1/4  1,
100   0000.00e2.b400         30           904   1/4  1,
```

## Sample configuration for a customer domain using MPLS VLL

The topology inside an MPLS networks can be managed by using LSP ping and LSP trace route to detect and diagnose LSP failures. CFM packets are Ethernet packets with well know CFM etype and are not shown in the MPLS cloud. Therefore, the topology inside MPLS cannot be managed by the CFM protocol. However, you can use CFM to monitor the health of a VPLS or VLL instances.

FIGURE 7 Sample configuration

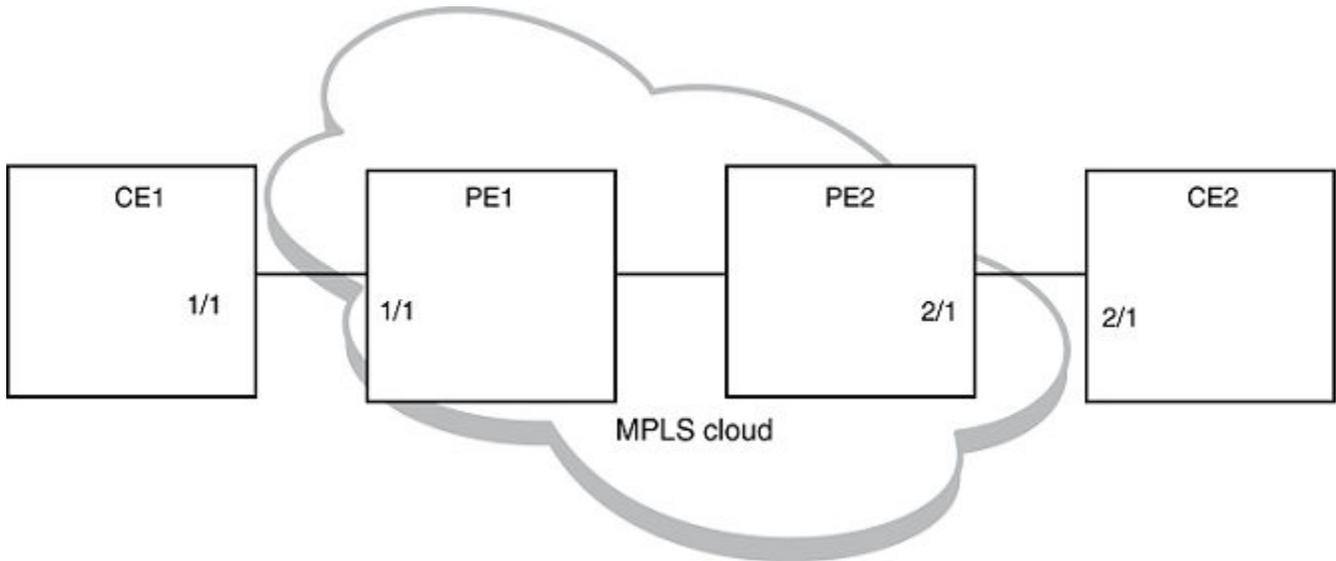


Figure 7 shows a deployment scenario where CE1 and CE2 are customer devices and PE1 and PE2 are provider routers. Port 1/1 on PE1 and port 2/1 on PE2 are VLL-end points. Port 1/1 on PE1 is connected to port 1/1 on CE1 and port 2/1 on PE2 is connected to port 2/1 on CE2.

## Achieving end-to-end connectivity between CE1 and CE2

To achieve end-to-end connectivity between CE1 and CE2, configure DOWN MEP on 1/1 and 2/1. PE1 and PE2 acts as MIP. The configuration for this is as follows.

### Configuring CE1

1. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name CUST\_1 and level 7.

```
device(config-cfm)#domain-name CUST_1 level 7
```

3. Create a maintenance association within a specified domain of vlan-id 30 with a priority 3.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 vlan-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages. The default is 10-seconds.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

5. Configure a MEP on port 1/1 and vlan 30.

```
device(config-cfm-md-CUST_1-ma-ma_5)#mep 1 down vlan 30 port ethe 1/1
```

6. Configure a remote-mep.

```
device(config-cfm-md-CUST_1-ma-ma_5)#remote-mep 2 to 2
```

## Configuring CE2

1. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name CUST\_1 and level 7.

```
device(config-cfm)#domain-name CUST_1 level 7
```

3. Create a maintenance association within a specified domain of vlan-id 30 with a priority 3.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 vlan-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages. The default is 10-seconds.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

5. Configure a MEP on port 2/1 and vlan 30.

```
device(config-cfm-md-CUST_1-ma-ma_5)#mep 2 down vlan 30 port ethe 2/1
```

6. Configure a remote-mep.

```
device(config-cfm-md-CUST_1-ma-ma_5)#remote-mep 1 to 1
```

## MPLS Configurations on PE1

Before configuring CFM on PE1, the MPLS Configuration on PE1 must be done.

Enter the following commands to configure VLL peers from PE1 to PE 2.

1. To create a VLL instance, enter commands such as the following.

```
device(config)#router mpls
device(config-mpls)vll pe1-to-pe2 30
```

2. To specify a VLL peer, enter a command such as the following.

```
device(config-mpls-vll)vll-peer 10.1.1.2
```

3. To specify an un-tagged endpoint for a VLL instance, enter the following commands.

```
device(config-mpls-vll)untagged ethe 1/1
```

Tagged ports are configured under a VLAN ID.

4. To specify a tagged endpoint for a VLL instance, enter the following commands.

```
device(config-mpls-vll)vlan 30
device(config-mpls-vll-vlan)tagged ethe 1/1
```

## IEEE 802.1ag Configuration on PE1

If the VLL configuration is not done prior to configuring the maintenance association, then the maintenance association is not allowed.

1. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name CUST\_1 and level 7.

```
device(config-cfm)#domain-name CUST_1 level 7
```

3. Create a maintenance association within a specified domain of vll-id 30 with a priority 3.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 vll-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages. The default is 10-seconds.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

In the above configuration, a MIP (Maintenance Intermediate Point) is created by default on the VLL port. You can also configure an explicit MIP on PE1. In that case, MIP is created on the VLL-port if there is a MEP (Maintenance End Point) created on the port at some lower Maintenance Domain Level.

5. To configure an explicit MIP on PE1, enter the following command.

```
device(config-cfm-md-CUST_1-ma-ma_5)# mip-creation explicit
```

6. To change back to default use the following command.

```
device(config-cfm-md-CUST_1-ma-ma_5)# mip-creation default
```

## MPLS Configurations on PE2

Before configuring CFM on PE2, MPLS is configured on PE2.

Use the following steps to configure VLL peers from PE2 to PE 1.

1. To create a VLL instance, enter commands such as the following.

```
device(config)#router mpls
device(config-mpls)vll pe2-to-pe1 30
```

2. To specify a VPLS peer enter a command such as the following.

```
device(config-mpls-vll)vpls-peer 10.1.1.1
```

3. To specify an un-tagged endpoint for a VLL instance, enter the following commands.

```
device(config-mpls-vll)untagged ethe 2/1
```

Tagged ports are configured under a VLAN ID.

4. To specify a tagged endpoint for a VLL instance, enter the following commands.

```
device(config-mpls-vll)vlan 30
device(config-mpls-vll-vlan)tagged ethe 2/1
```

## IEEE 802.1ag Configurations on PE2

If the VLL configuration is not done prior to configuring the maintenance association, then the maintenance association is not allowed.

1. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name CUST\_1 and level 7.

```
device(config-cfm)#domain-name CUST_1 level 7
```

3. Create a maintenance association within a specified domain of vll-id 30 with a priority 3.

```
device(config-cfm-md-CUST_1)#ma-name ma_5 vll-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages. The default is 10-seconds.

```
device(config-cfm-md-CUST_1-ma-ma_5)#ccm-interval 10-second
```

In the above configuration, MIP is created by default on the VLL-endpoint. You can also configure an explicit-mip on PE2. In that case, MIP is created on the VLL-port if there is a MEP is created on the endpoint at some lower MD Level.

5. To configure an explicit-mip on PE2, enter the following command.

```
device(config-cfm-md-CUST_1-ma-ma_5)# mip-creation explicit
```

6. To change back to default use the following command.

```
device(config-cfm-md-CUST_1-ma-ma_5)# mip-creation default
```

## Verifying connectivity using IEEE 802.1ag

Once CE1,CE2,PE1 and PE2 are configured, you can determine the end-to-end connectivity by looking at the remote-mep status by using the following show commands.

```
device#show cfm connectivity
Domain: CUST_1 Level: 7
Maintenance association: ma_5
CCM interval: 10000 ms
VLAN ID: 30
Priority: 3
RMEP MAC          VLAN/PEER      AGE      PORT      SLOTS
=====
2  0000.00e2.8a00  30          879      1/2      1,
```

```
device#show cfm connectivity domain CUST_1 ma ma_5 rmep-id 2
Domain: CUST_1 Level: 7
Maintenance association: ma_5 VLAN ID: 30 Priority: 3
CCM interval: 10
RMEP MAC          PORT  Oper   Age   CCM   RDI   Port  Intf  Intvl
Seq
=====
2  0000.00e2.8a00  1/1   OK    26000 2600  N     0    0    N     N=
```

**Syntax:** `show cfm connectivity [ domain name ] [ ma ma-name ]`

The **domain** *name* parameter displays the specific domain information. By default, all defined domains are shown.

The **ma** *ma-name* parameter specifies the maintenance association name. By default, all defined domains are shown.

**TABLE 23** Show CFM connectivity output descriptions

This field...	Displays...
Domain	The Domain is the network or the part of the network for which faults in connectivity are displayed.
Level	The level is the domain level in the range 0-7. The levels can be: <ul style="list-style-type: none"> <li>• Customer's MD levels: 5 - 7</li> <li>• Provider's MD levels: 3 - 4</li> <li>• Operator's MD levels: 0 - 2</li> </ul>

**TABLE 23** Show CFM connectivity output descriptions (continued)

This field...	Displays...
Maintenance association	The maintenance association name.
CCM interval	The time interval between two successive Continuity Check messages (CCMs) that are sent by MEPs in the specified Maintenance Domain.
VPLS ID	The VPLS identifier of the maintenance association.
Priority	The priority of the CCM messages, sent by MEPs, in the range 0-7.
RMEP	The remote maintenance end point ID
MAC	Displays the associated MAC Address.
VLAN/VC	VLAN ID or VC label learned from the CCM packet. VC label is in hexadecimal format.
Age	Uptime since RMEP discovery or from last age out
PORT	Displays the associated port.
SLOTMASK	Mask of slots that are receiving CCM packets which are used for multi-slot trunks. For example a value of 0005 indicates Slots 1 and 3.

## Verifying connectivity in a VLL network using IEEE 802.1ag Loopback

You can manually monitor the status of a VLL peer using IEEE 802.1ag CFM Loopback (MAC ping) as shown below.

```
device#cfm loopback domain CUST_1 ma ma_5 src-mep 1 target-mep 2
DOT1AG: Sending 10 Loopback to 0000.00e2.8a00, timeout 10000 msec
Type Control-c to abort
Reply from 0000.00e2.8a00: time=3ms
Reply from 0000.00e2.8a00: time<1ms
Reply from 0000.00e2.8a00: time<1ms
Reply from 0000.00e2.8a00: time<1ms
Reply from 0000.00e2.8a00: time=38ms
Reply from 0000.00e2.8a00: time<1ms
A total of 10 loopback replies received.
Success rate is 100 percent (10/10), round-trip min/avg/max=0/4/38 ms.
```

**Syntax:** `[no] cfm linktrace domain name ma ma-name src- mep mep-id target-mip HH:HH:HH:HH:HH:HH | target-mep mep-id`  
`[ timeout timeout ] [ ttl TTL ]`

The **domain name** parameter specifies the maintenance domain to be used for a linktrace message. The *name* attribute is case-sensitive.

The **ma ma-name** parameter specifies the maintenance association to be used for a linktrace message. The *ma-name* attribute is case-sensitive.

The **src-mep mep-id** parameter specifies the Source ID in the range 1 - 8191.

The **target-mip HH:HH:HH:HH:HH:HH** parameter specifies the MAC-address of the MIP linktrace destination.

The **target-mep mep-id** parameter specifies the ID of the linktrace destination.

The **timeout timeout** parameter specifies the time to wait for a linktrace reply. The range is 1 - 30 seconds.

The **ttl TTL** parameter specifies the initial TTL field value in the range 1 - 64. The default is 8 seconds.

## Verifying Connectivity in a VLL Network Using IEEE 802.1ag Linktrace

You can manually monitor the status of a VLL peer using IEEE 802.1ag CFM Loopback (MAC Ping) as shown below.

**Syntax:** `[no] cfm loopback domain name ma ma-name src-mep mep-id { target-mip HH:HH:HH:HH:HH:HH | target-mep mep-id } [ number number ] [ timeout timeout ]`

The **domain name** parameter specifies the maintenance domain to be used for a linktrace message. The *name* attribute is case-sensitive.

The **ma ma-name** parameter specifies the maintenance association to be used for a linktrace message. The *ma-name* attribute is case-sensitive.

The **src-mep mep-id** parameter specifies the Source ID in the range 1-8191.

The **target- mip HH:HH:HH:HH:HH:HH** parameter specifies the MAC address of the MIP linktrace destination.

The **target-mep mep-id** parameter specifies the Destination ID in the range 1-8191.

The **number number** parameter specifies the number of loopback messages to be sent.

The **timeout timeout** parameter specifies the timeout used to wait for linktrace reply.

If the linktrace and loopback to target-mep 2 fails, then the linktrace can be done on the MIPs on PE1 and PE2 to know the exact failure.

## Deployment scenario with PEs functioning as DOWN MEP

It is also possible to configure DOWN MEP on VLL end-points. For example, in [Sample configuration for a customer domain using MPLS VLL](#) on page 121, the DOWN MEP can be configured to monitor the connectivity between CE1 and PE1 or to monitor the connectivity between CE2 and PE2.

## Configuring CE1

1. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name CUST\_2 and level 6.

```
device(config-cfm)#domain-name CUST_2 level 6
```

3. Create a maintenance association within a specified domain of vlan-id 30 with a priority 3.

```
device(config-cfm-md-CUST_2)#ma-name ma_6 vlan-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages. The default is 10-seconds.

```
device(config-cfm-md-CUST_2-ma-ma_6)#ccm-interval 10-second
```

5. Configure a MEP on port 1/1 and vlan 30.

```
device(config-cfm-md-CUST_2-ma-ma_6)#mep 3 down vlan 30 port ethe 1/1
```

6. Configure a remote-mep.

```
device(config-cfm-md-CUST_1-ma-ma_5)#remote-mep 4 to 4
```

## Configuring PE1

The MPLS-VLL configuration is the same as shown in the previous deployment scenario. If the VLL configuration is not done prior to configuring maintenance association, the MA configuration will not be allowed. Also the port and vlan in the MEP configuration should exist in the VLL configuration prior to MEP configuration, otherwise it is not allowed. The port in the MEP configuration can be either a tagged or untagged port already present in the VLL configuration.

1. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name CUST\_2 and level 6.

```
device(config-cfm)#domain-name CUST_2 level 6
```

3. Create a maintenance association within a specified domain of vll-id 30 with a priority 3.

```
device(config-cfm-md-CUST_2)#ma-name ma_6 vll-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages. The default is 10-seconds.

```
device(config-cfm-md-CUST_2-ma-ma_6)#ccm-interval 10-second
```

5. Configure a MEP on port 1/1 and vlan 30.

```
device(config-cfm-md-CUST_2-ma-ma_6)#mep 4 down vlan 30 port ethe 1/1
```

To monitor the connectivity between CE-1 and PE-1, you can use the **show cfm connectivity** commands as mentioned in the previous scenario. You can also use the **loopback** or **linktrace** commands on CE-1 or PE-1.

## Deployment scenario with PEs functioning as UP MEP

UP MEPs can also be configured on PEs. This monitors connectivity of VLL end points.

### Configuring PE1

The MPLS-VLL configuration is the same as shown in the previous deployment scenario. If the VLL configuration is not done prior to configuring maintenance association, the MA configuration would not be allowed. Also the port and vlan in the MEP configuration should exist in VLL configuration prior to MEP configuration, otherwise it will not be allowed. The port in the MEP configuration can be either a tagged or untagged port already present in VLL configuration.

1. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name PROVIDER\_1 and level 4.

```
device(config-cfm)#domain-name PROVIDER_1 level 4
```

3. Create a maintenance association within a specified domain of vll-id 30 with a priority 3.

```
device(config-cfm-md-PROVIDER_1)#ma-name ma_8 vll-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages. The default is 10-seconds.

```
device(config-cfm-md-PROVIDER_1-ma-ma_8)#ccm-interval 10-second
device(config-cfm-md-PROVIDER_1-ma-ma_8)#mep 6 up vlan 30 port ethe 1/1
```

### Configuring PE2

The configuration on PE1 is similar to the PE1 configuration.

1. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name PROVIDER\_1 and level 4.

```
device(config-cfm) #domain-name PROVIDER_1 level 4
```

3. Create a maintenance association within a specified domain of vll-id 30 with a priority 3.

```
device(config-cfm-md-PROVIDER_1) #ma-name ma_8 vll-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages. The default is 10-seconds.

```
device(config-cfm-md-PROVIDER_1-ma-ma_8) #ccm-interval 10-second
device (config-cfm-md-PROVIDER_1-ma-ma_8) #mep 7 up vlan 30 port ethe 2/1
```

To monitor the connectivity between PE1 and PE2, you could use the **"show cfm connectivity"** commands as mentioned in the previous scenario. Also you could use either loopback or linktrace on PE1 or PE2.

## Configuring PE2

1. To enable CFM, enter the following command.

```
device(config) #cfm-enable
```

2. Create a maintenance domain with a specified name PROVIDER\_1 and level 4.

```
device(config-cfm) #domain-name PROVIDER_1 level 4
```

3. Create a maintenance association within a specified domain of vll-id 30 with a priority 3.

```
device(config-cfm-md-PROVIDER_1) #ma-name ma_8 vll-id 30 priority 3
```

4. Set the time interval between successive Continuity Check Messages. The default is 10-seconds.

```
device(config-cfm-md-PROVIDER_1-ma-ma_8) #ccm-interval 10-second
```

5. Configure MEP 4 down on port 1/1 and vlan 30

```
device(config-cfm-md-CUST_2-ma-ma_6) #mep 4 down vlan 30 port ethe 1/1
```

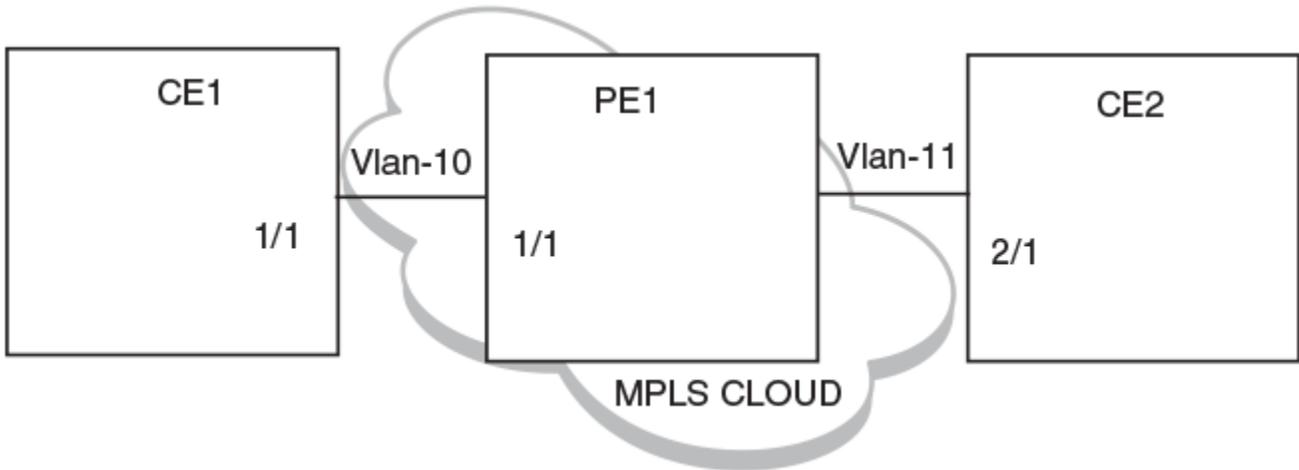
To monitor the connectivity between PE-1 and PE-2, we could use **"show cfm connectivity"** commands as mentioned in the previous scenario. Also we could use either loopback or linktrace on PE-1 or PE-2.

## IEEE 802.1ag with VLL-LOCAL

In the case of IEEE 802.1ag over VLL-LOCAL, the PE acts as a MIP and VLL does VLAN translation. As shown in the figure below, MEP is configured on vlan-10 on CE1 and vlan-11 on CE2. On PE1, MIP is configured on VLL-LOCAL and which has vlan-10, port 1/1 and vlan-11, port 2/1 configured as end points.

UP MEP would not be allowed for VLL-Local.

FIGURE 8 IEEE 802.1ag over VLL-LOCAL



### MPLS configurations on PE1

Before configuring CFM on PE1 we need to do MPLS Configuration on PE1.

Enter the following commands to configure VLL peers from PE1 to PE 2.

1. To create a VLL instance, enter commands such as the following.

```
device(config)#router mpls
device(config-mpls)vll-local test1
```

2. To specify an un-tagged endpoint for a VLL instance, enter the following commands.

```
device(config-mpls-vll-test1)untagged ethe 1/1
```

Tagged ports are configured under a VLAN ID.

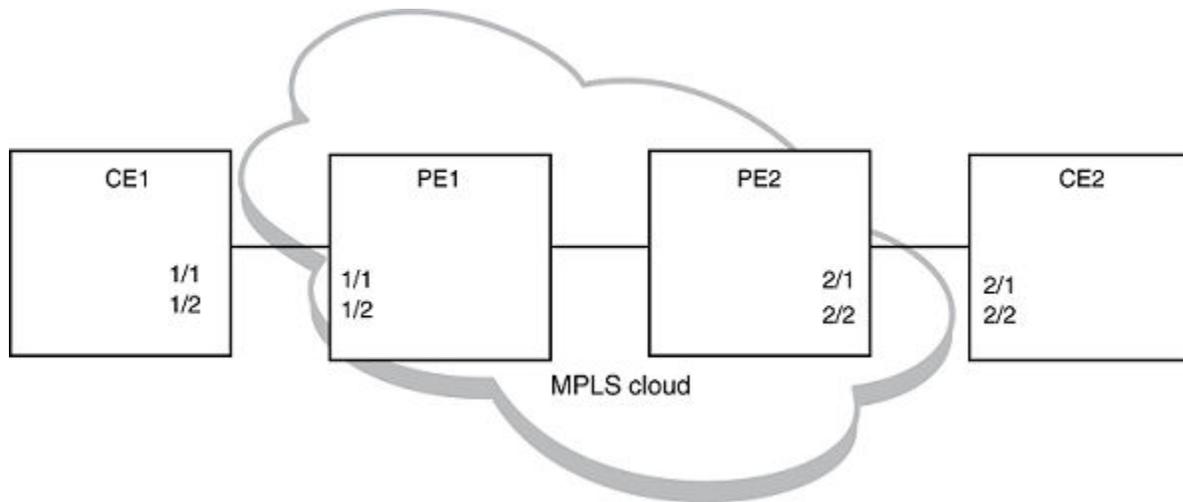
3. To specify a tagged endpoint for a VLL instance, enter the following commands.

```
device(config-mpls-vll-test1)vlan 30
device(config-mpls-vll-vlan)tagged ethe 1/1
```

As in the previous case, to monitor the connectivity between CE1 and CE2, you can use the **show cfm connectivity** command as mentioned in the previous scenario. You can also use either loopback or linktrace on CE1 or CE2.

## LAG-support for IEEE 802.1ag-over-vll

FIGURE 9 IEEE 802.1ag over VLL scenerio



As shown in the previous figure, you can have MEP configuration over a LAG port. On CE1 and CE2 DOWN MEP is configured on VLAN and on PE1 and PE2 DOWN or UP MEP would be configured, depending on what to monitor.

The configuration and monitoring of MEPs is similar as mentioned in the previous examples.

## Deletion of VLL

### NOTE

Deletion of VLL would cause the deletion of Maintenance Association and corresponding MEPs on that MA.

## Sub-second timer support

The **ccm-interval** command sets the time interval between two successive Continuity Check messages (CCMs) that are sent by MEPs in the specified Maintenance Domain. The default value is 10 seconds. There is support for sub-second timers 3.3 ms, 10 ms and 100 ms. As in the case of VLAN and VPLS, for sub-second timers pbif hardware assist is used to transmit and process the CCM packets.

### NOTE

The sub-second timer functionality is not supported on VLL-Local. The sub-second timer functionality is not supported on NetIron CES devices

## Hitless upgrade support

Hitless upgrade support for IEEE 802.1ag over VLL is similar to IEEE 802.1ag hitless upgrade support for VLAN or VPLS.

## Monitoring the status of devices in a VPLS network in a Provider's Maintenance Domain

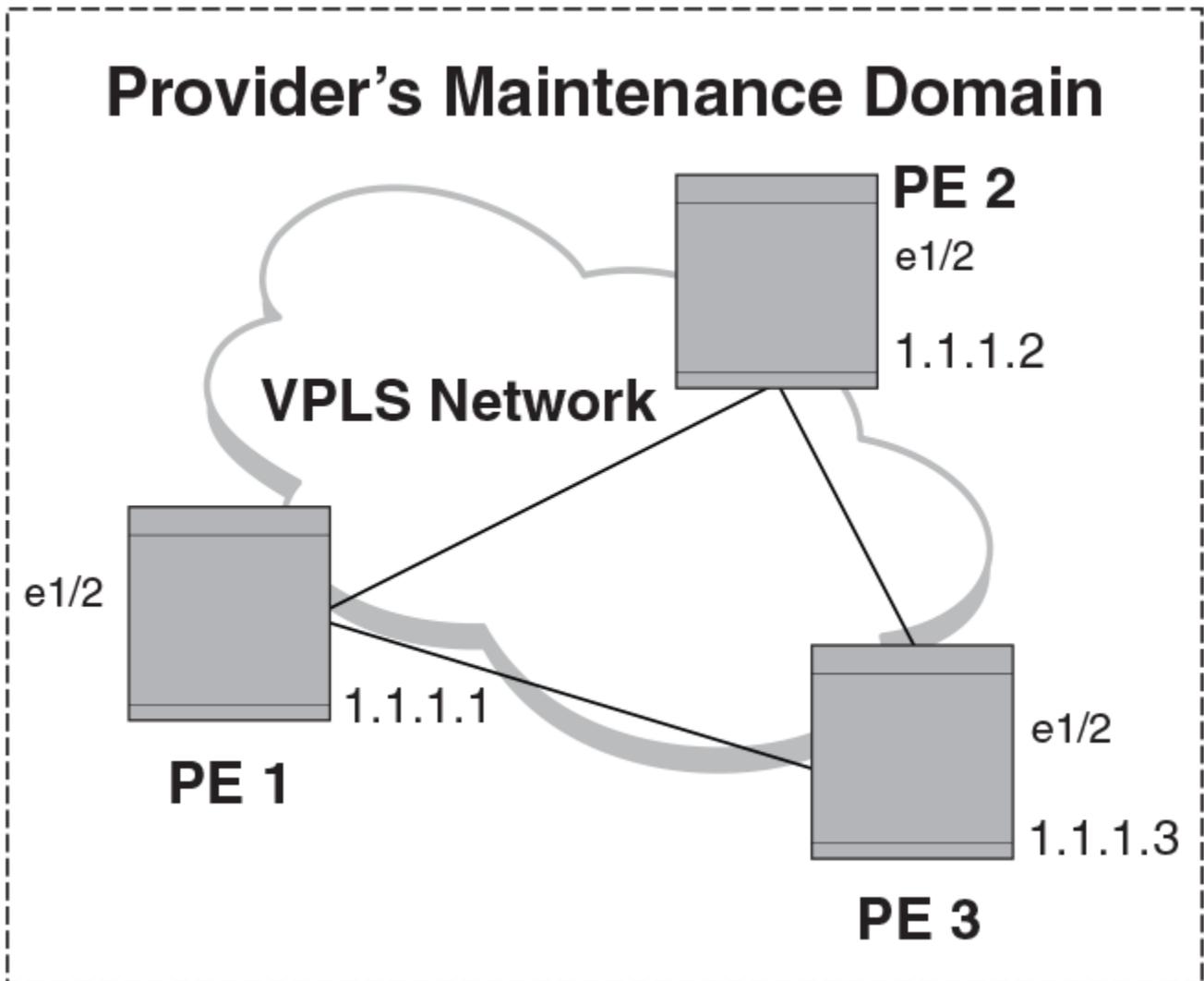
CFM provides capabilities to detect, verify, and isolate connectivity failures.

**NOTE**

When configuring 802.1ag over VPLS, if the VPLS endpoint is deleted from the configuration, the MEP configuration is deleted under CFM without warning.

In the [Figure 10](#), CFM is applied over a VPLS network; ports 1/2 and 1/3 are customer facing networks; and port 1/1 is an uplink to a VPLS cloud.

FIGURE 10 VPLS cloud with CFM enabled



## Configuring PE 1

1. To enable CFM for VPLS, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name **VPLS-SP** and level **4**.

```
device(config-cfm)#domain-name VPLS-SP level 4
```

3. Create a maintenance association within a specified domain of **vpls-id 1** with a priority **3**.

```
device(config-cfm-md-VPLS-SP)#ma-name ma_1 vpls-id 1 priority 3
```

4. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port **1/2** as MEP to a specified maintenance association.

```
device(config-cfm-md-VPLS-SP-ma-ma_1)#mep 1 up vlan 30 port ethe 1/2
```

## MPLS configurations

Enter the following commands to configure VPLS peers from PE 2 to PE3.

1. To create a VPLS instance, enter commands such as the following.

```
device(config)#router mpls
device(config-mpls)#vpls 1 1
```

2. To specify two remote VPLS peers within a VPLS instance, enter a commands such as the following.

```
device(config-mpls-vpls-1)#vpls-peer 10.1.1.2
device(config-mpls-vpls-1)#vpls-peer 10.1.1.3
```

3. Tagged ports are configured under a VLAN ID. To specify a tagged endpoint for a VPLS instance, enter the following commands.

```
device(config-mpls-vpls-1)#vlan 30
device(config-mpls-vpls-1-vlan-30)#tagged ethe 1/2 to 1/3
```

## Configuring PE 2

CFM configuration steps for Router 2 are listed below.

1. To enable CFM, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name **VPLS-SP** and level **4**.

```
device(config-cfm)#domain-name VPLS-SP level 4
```

3. Create a maintenance association within a specified domain of **vpls-id 1** with a priority **3**.

```
device(config-cfm-VPLS-SP)#ma-name ma_1 vpls-id 1 priority 3
```

4. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port **1/2** as MEP to a specified maintenance association.

```
device(config-cfm-md-VPLS-SP-ma-ma_1)#mep 2 up vlan 30 port ethe 1/2
```

## MPLS configurations

Enter the following commands to configure VPLS peers from PE1 to PE 3.

1. To create a VPLS instance, enter commands such as the following.

```
device(config)#router mpls
device(config-mpls)vpls 1 1
```

2. To specify two remote VPLS peers within a VPLS instance, enter a command such as the following.

```
device(config-mpls-vpls-1)vpls-peer 10.1.1.1
device(config-mpls-vpls-1)vpls-peer 10.1.1.3
```

Tagged ports are configured under a VLAN ID. To specify a tagged endpoint for a VPLS instance, enter the following commands.

```
device(config-mpls-vpls-1)vlan 30
device(config-mpls-vpls-1-vlan-30)tagged ethe 1/2
```

## Configuring PE 3

CFM configuration steps for PE 3 are listed below.

1. To enable CFM for VPLS, enter the following command.

```
device(config)#cfm-enable
```

2. Create a maintenance domain with a specified name **VPLS-SP** and level **4**.

```
device(config-cfm)#domain-name VPLS-SP level 4
```

3. Create a maintenance association within a specified domain of **vpls-id 1** with a priority **3**.

```
device(config-cfm-md-VPLS-SP)#ma-name ma_1 vpls-id 1 priority 3
```

4. Configuring a MED for each of the Domain Service Access Points of a service instance creates a MA to monitor the connectivity. Add ethernet port 1/2 as MEP to a specified maintenance association.

```
device(config-cfm-md-VPLS-SP-ma-ma_1)#mep 3 up vlan 30 port ethe 1/2
```

## MPLS configurations

Enter the following commands to configure VPLS peers from Router 1 to Router 2.

1. To create a VPLS instance, enter commands such as the following.

```
device(config)router mpls
device(cconfig-mpls)vpls 1 1
```

2. To specify two remote VPLS peers within a VPLS instance, enter a command such as the following.

```
device(config-mpls-vpls-1)vpls-peer 10.1.1.1
device(config-mpls-vpls-1)vpls-peer 10.1.1.2
```

3. Tagged ports are configured under a VLAN ID. To specify a tagged endpoint for a VPLS instance, enter the following commands.

```
device(config-mpls-vpls-1)vlan 30
device(config-mpls-vpls-1-vlan-30)tagged ethe 1/2
```

## Verifying connectivity in a VPLS network using IEEE 802.1ag

To display VPLS IEEE 802.1ag connectivity, enter the following commands.

```
device#show cfm domain VPLS-SP
Domain: VPLS-SP
Level: 4
Maintenance association: ma_1
CCM interval: 10
VPLS ID: 1
Priority: 3
MEP      Direction  MAC                      PORT
====      =====  =====
1        UP          0000.00e3.8210         ethe 1/3
```

**Syntax:** `show cfm [ domain name ] [ ma ma-name ]`

The **domain** *name* parameter displays the specific domain information. By default, all defined domains are shown.

The **ma** *ma-name* parameter specifies the maintenance association name. By default, all defined domains are shown.

**TABLE 24** Output for show CFM domain command

This field...	Displays...
Domain	The Domain is the network or the part of the network for which faults in connectivity are displayed.
Level (Maintenance Domain)	The level is the domain level in the range 0-7. The levels can be: <ul style="list-style-type: none"> <li>Operator's MD levels: 0 - 2</li> <li>Provider's MD levels: 3 - 4</li> <li>Customer's MD levels: 5 - 7</li> </ul>
Maintenance association	The maintenance association name.
CCM interval	The time interval between two successive Continuity Check messages (CCMs) that are sent by MEPs in the specified Maintenance Domain.
VLAN ID	The VLAN identifier of the maintenance association.
VPLS ID	The VPLS identifier of the maintenance association.
Priority	The priority of the CCM messages, sent by MEPs, in the range 0-7.
MEP	The maintenance end point ID
Direction	Displays the direction the MEP was sent: Up - The MEP direction away from the monitored VLAN. Down - The MEP direction is towards the monitored VLAN.
MAC	Displays the associated MAC Address.
PORT	Displays the associated port.

The **show cfm connectivity** command, displays connectivity statistics for the remote database. For the **show cfm connectivity** command to take effect, CFM should first be enabled in the Protocol Configuration mode.

```
device#show cfm connectivity
Domain: VPLS-SP Level: 4
Maintenance association: ma_1
CCM interval: 10
VPLS ID: 1
Priority: 3
RMEP      MAC          VLAN/VC AGE   PORT  SLOTMASK
====      =====  =====  =====  =====
4  0000.00e2.d80a  00f00a1  2157    0008
2  0000.00e2.b560  00f00a0  2597    0008
device#show cfm connectivity domain VPLS-SP ma ma_1 rmep-id 2
Domain: VPLS-SP Level: 4
Maintenance association: ma_1 VPLS ID: 1 Priority: 3
```

```

CCM interval: 10
RMEP   MAC                PORT   Oper Age CCM  RDI Port  Intf  Intvl Seq
=====  =====  =====  =====  =====  =====  =====  =====  =====  =====
      2  0000.00e2.b560    00f00a0  OK   26000 2600   N     0     0     N     N

```

**Syntax:** `show cfm connectivity [ domain NAME] [ ma MA NAME]`

The **domain** *NAME* parameter displays information for a specific domain. By default, all defined domains are shown.

The **ma** *MA NAME* parameter specifies the maintenance association name. By default, all defined domains are shown.

**TABLE 25** Output for show CFM connectivity command

This field...	Displays...
Domain	The Domain is the network or the part of the network for which faults in connectivity are displayed.
Level	The level is the domain level in the range 0-7. The levels can be: <ul style="list-style-type: none"> <li>Customer's MD levels: 0 - 2</li> <li>Provider's MD levels: 3 - 4</li> <li>Operator's MD levels: 5 - 7</li> </ul>
Maintenance association	The maintenance association name.
CCM interval	The time interval between two successive Continuity Check messages (CCMs) that are sent by MEPs in the specified Maintenance Domain.
VLAN ID	The VLAN identifier of the maintenance association.
VPLS ID	The VPLS identifier of the maintenance association.
Priority	The priority of the CCM messages, sent by MEPs, in the range 0-7.
RMEP	The remote maintenance end point ID
MAC	Displays the associated MAC Address.
PORT	Displays the associated port.
Oper State	Defines the state of the port attached to the MEP. Possible values OK and Fail
Age Val	Age of the operational state of the port.
CCM Count	Displays the total number of Continuity Check messages (CCMs) that are sent.
RDI	Remote Defect Indicator
Port Status	The status of a port
Intf Status	The status of the interface
Intvl Error	Displays Y if there has been an interval error and N if no interval errors have been detected.
Seq Error	Displays Y if there has been a sequence error and N if no sequence errors have been detected.

## Verifying connectivity in a VPLS network using IEEE 802.1ag Loopback

You can manually monitor the status of VPLS peers using IEEE 802.1ag CFM Linktrace (MAC traceroute) and CFM Loopback (MAC Ping) as shown below.

**Syntax:** `[no] cfm linktrace domain name ma ma-name src-mep mep-id target-mip HH:HH:HH:HH:HH:HH | target-mep mep-id [ timeout timeout] [ ttl TTL ]`

The **domain** *name* parameter specifies the maintenance domain to be used for a linktrace message. The *name* attribute is case-sensitive.

The **ma** *ma-name* parameter specifies the maintenance association to be used for a linktrace message. The *name* attribute is case-sensitive.

The **src-mep** *mep-id* parameter specifies the Source ID in the range 1-8191.

The **target-mip** *HH:HH:HH:HH:HH:HH* parameter specifies the MAC-address of the MIP linktrace destination.

The **target-mep** *mepid* parameter specifies the ID of the linktrace destination.

The **timeout** *timeout* parameter specifies the timeout used to wait for linktrace reply. The default value is *1-30* seconds.

The **tll** *TTL* parameter specifies the initial TTL field value in the range *1-64*.The default is 8 seconds.

**Syntax:** `[no] cfm loopback domain name ma ma-name scr-mep mep-id { target-mip HH:HH:HH:HH:HH:HH | target-mep mep-id } [ number number ] [ timeout timeout ]`

The **domain** *name* parameter specifies the maintenance domain to be used for a linktrace message. The *name* attribute is case-sensitive.

The **ma** *ma-name* parameter specifies the maintenance association to be used for a linktrace message. The *ma-name* attribute is case-sensitive.

The **src-mep** *mep-id* parameter specifies the Source ID in the range *1-8191*.

The **target-mip** *HH:HH:HH:HH:HH:HH* parameter specifies the MAC address of the MIP linktrace destination.

The **target-mep** *mep-id* parameter specifies the Destination ID in the range *1-8191*.

The **number** *number* parameter specifies the number of loopback messages to be sent.

The **timeout** *timeout* parameter specifies the timeout used to wait for linktrace reply.

You have to configure MAs with different MD levels to monitor the different endpoints with different

#### NOTE

You have to configure MAs with different MD levels to monitor the different endpoints with different VLAN IDs in the same VPLS instance.

## Syslog message

If CFM is configured, a syslog message will be generated when remote MEPs change their states or if there are service cross connections.

## Sample Syslog Messages

```
device#
SYSLOG: Jan  7 11:22:55:<9>Router2, DOT1AG: Remote MEP 4 in Domain VPLS-SP, MA ma_1 aged out
SYSLOG: Jan  7 11:23:13:<9>Router2, DOT1AG: Remote MEP 4 in Domain VPLS-SP, MA ma_1 become UP state
```

When a failure is detected within a VPLS cloud, use LSP Ping and Traceroute. Refer to [LSP ping and traceroute](#) on page 154 for additional information.

## Support for IEEE 802.1ag CFM for Provider Bridges (PB) and Provider Backbone Bridges (PBB)

The device support the following single tagging and double tagging cases:

- MEP (up/down) and MIP on C-VLANs
- MEP (up/down) and MIP on S-VLANs - The ability to change tag-type 88a8 to S-VLANs

**The Brocade NetIron CES Series supports both of the above capabilities in the following scenarios:**

- MEP (up/down) and MIP on C-VLANs

- MEP (up/down) and MIP on S-VLANs -The ability to change tag-type 88a8 to S-VLANs
  - MEP on C-VLANs (extended to both default ESI and non-default ESI)

**NOTE**

The C-VLAN may be a child of another ESI or could be "stand-alone".

- - MEP on S-VLANs in an ESI

**NOTE**

The S-VLAN may be a child of another ESI or could be "stand-alone"

- MIP on standalone C-VLANs and stand-alone S-VLANs on a device (i.e. C-VLANs that are not a client of another ESI or S-VLANs that are not a client of another ESI).

### The following configurations are not supported on the Brocade NetIron CES Series devices:

- Handling MIP on a C-VLAN that is a client of an S-VLAN
- Handling MIP/MEP on a B-VLAN
- Handling MIP on an S-VLAN that is a client of a B-VLAN

### 802.1ag over PBB sub-second timer support

**NOTE**

The sub-second timer functionality is not supported on NetIron CES devices.

The **ccm-interval** command sets the time interval between two successive Continuity Check messages (CCMs) that are sent by MEPs in the specified Maintenance Domain. The default value is 10 seconds. There is support for sub-second timers 3.3 ms, 10 ms and 100 ms. The ISID CFM can be used in PBB networks and CFM monitoring between Backbone Edge Bridges.

The sub-second CCM interval is supported for the following scenarios:

- 802.1ag over Regular Vlan
- 802.1ag over ESI VLAN
- 802.1ag over VPLS

The following messages are supported for sub-second CCM interval:

- Loop Back Message and Reply (LBM, LBR)
- Link Trace Message and Reply (LTM, LTR)
- Delay Measurement Message and Reply (DMM, DMR)

### Sub-second timer sample configuration

**CER1**

```
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
device(config-cfm-md-customer)#ma-name admin vlan 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 100-ms
device(config-cfm-md-customer-ma-admin)#mep 1 down port ethe 1/13
```

**CER2**

```
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
```

```
device(config-cfm-md-customer)#ma-name admin vlan 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 100-ms
```

### CER3

```
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
device(config-cfm-md-customer)#ma-name admin vlan 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 100-ms
device(config-cfm-md-customer-ma-admin)#mep 1 down port ethe 1/13
```

## IEEE 802.3ah EFM-OAM

The IEEE 802.3ah Ethernet in the First Mile (EFM) is supported on the NetTron devices.

The IEEE 802.3ah Ethernet in the First Mile (EFM) standard specifies the protocols and Ethernet interfaces for using Ethernet over access links as a first-mile technology and transforming it into a highly reliable technology.

Using the Ethernet in the First Mile solution, the user will gain broadcast Internet access, in addition to services, such as Layer 2 transparent LAN services, Voice services over Ethernet Access networks, and Video and multicast applications, reinforced by security and Quality of Service control in order to build a scalable network.

The in-band management specified by this standard defines the operations, administration and maintenance (OAM) mechanism needed for the advanced monitoring and maintenance of Ethernet links in the first mile. The OAM capabilities facilitate network operation and troubleshooting. Basic 802.3 frames convey OAM data between two ends of the physical link. EFM OAM is optional and can be disabled on each physical port.

OAM initiatives are classified into three layers: transport, connectivity and service. The transport layer is the collection of forwarding entities and interconnected segments that form a multi-hop Ethernet network, and provide connectivity between devices. The transport layer OAM is specified by the IEEE 802.3ah (Clause 57) and provides single-link OAM capabilities. When OAM is present, two connected OAM sub-layers exchange protocol data units (OAMPDUs). OAM PDUs are standard-size frames that can be sent at a maximum rate of 10 frames per second. This limitation is necessary for reducing the impact on the usable bandwidth. It is possible to send each frame several times in order to increase the probability of reception. A combination of the destination MAC address, the Ethernet type/length field and Subtype allow distinguishing OAM PDU frames from other frames.

OAM functionality is designed to provide reliable service assurance mechanisms for both provider and customer networks.

The IEEE 802.3ah EFM standard offers an opportunity to create the operations, OAM sub-layer within the data-link layer of the OSI protocol stack. The data-link layer provides utilities for monitoring and troubleshooting Ethernet links.

## Possible applications

The data-link layer OAM is targeted at last-mile applications and service providers can use it for demarcation point OAM services.

Ethernet Last Mile applications require robust infrastructure that is both passive and active. 802.3ah OAM aims to solve validation and testing problems in such an infrastructure.

Using the Ethernet demarcation service providers can additionally manage the remote device without utilizing an IP layer. This can be done by using link-layer SNMP counters, request and reply, loopback testing and other techniques.

## EFM- OAM protocol

The functionality of the OAM-EFM can be summarized under the following categories:

**Discovery:** Discovery is the mechanism to detect the presence of an OAM sublayer on the remote device. During the discovery process, information about OAM entities, capabilities and configuration are exchanged.

Link monitoring: This process is used to detect link faults and to provide information about the number of frame errors and coding symbol errors.

Remote fault detection: Provides a mechanism for an OAM entity to convey error conditions to its peer via a flag in the OAMPDUs.

Remote loopback: This mechanism is used to troubleshoot networks and to isolate problem segments in a large network by sending test segments.

## Discovery

This is the first phase of the EFM-OAM. At this phase, EFM-OAM identifies network devices along with their OAM capabilities. The Discovery process relies on the Information OAMPDUs (discussed below). During discovery, the following information is advertised through the TLVs within periodic Information OAMPDUs:

- OAM configuration (capabilities): Advertises the capabilities of the local OAM entity. Using this information, a peer can determine what functions are supported and accessible (e.g. loopback capability).
- OAM mode: This is conveyed to the remote OAM entity. The mode can be either active or passive, and can also be used to determine device's functionality.
- OAMPDU configuration: This includes maximum OAMPDU size to delivery. In combination with the limited rate of ten frames/sec this information can be used to limit the bandwidth allocated to OAM traffic.

## Timers

- Two configurable timers control the protocol, one determining the rate at which OAMPDUs are to be sent, and the second controlling the rate at which OAMPDUs are to be received to maintain the adjacency between devices.
- An additional 1-second non-configurable timer is used for error aggregation, which is necessary for the Link Monitoring Process to generate link quality events.
- The timer should generate PDUs in the range of 1s - 10sec. The default value is 1sec.
- The Hold timer should assume the peer is dead if no packet is received for a period of 1s to 10s. The default value is 5 seconds.

## Flags

- Included in every OAMPDU is a flags field, which contains, besides other information, the status of the discovery process. There are three possible values for the status:
  - Discovering: Discovery is in progress.
  - Stable: Discovery is completed. Once aware of this, the remote OAM entity can start sending any type of OAMPDU.
  - Unsatisfied: When there are mismatches in the OAM configuration that prevent OAM from completing the discovery, the discovery process is considered unsatisfactory and cannot continue.

## Process overview

The discovery process allows a local Data Terminating Entity (DTE) to detect OAM on a remote DTE. Once OAM support is detected, both ends of the link exchange state and configuration information (such as mode, PDU size, loopback support, etc.). If both DTEs are satisfied with the settings, OAM is enabled on the link. However, the loss of a link or a failure to receive OAMPDUs for five seconds may cause the discovery process the start over again.

DTEs may either be in active or passive mode. Active mode DTEs instigate OAM communications and can issue queries and commands to a remote device. Passive mode DTEs generally wait for the peer device to instigate OAM communications and respond to, but do not instigate, commands and queries. Rules of what DTEs in active or passive mode can do are discussed in the following sections.

## Rules for active mode

A DTE in Active mode:

- Initiates the OAM Discovery process
- Sends Information PDUs
- May send Event Notification PDUs
- May send Variable Request/Response PDUs.
- May send Loopback Control PDUs.

## Exceptions:

- Does not respond to Variable Request PDUs from DTEs in Passive mode.
- Does not react to Loopback Control PDUs from DTEs in Passive mode.

## Rules for passive mode

A DTE in Passive mode:

- Waits for the remote device to initiate the Discovery process
- Sends Information PDUs
- May send Event Notification PDUs
- May respond to Variable Request PDUs
- May react to received Loopback Control PDUs
- Is not permitted to send Variable Request or Loopback Control OAMPDUs

## Link monitoring process

The Link Monitoring Process is used for detecting and indicating link faults under a variety of circumstances. Link monitoring uses the Event Notification OAMPDU, and sends events to the remote OAM entity when there are problems detected on the link. The error events defined in the standard are:

- Errored Symbol Period (errored symbols per second): the number of symbol errors that occurred during a specified period exceeded a threshold. These are coding symbol errors (for example, a violation of 4B/5B coding).
- Errored Frame (errored frames per second): the number of frame errors detected during a specified period exceeded a threshold.
- Errored Frame Period (errored frames per N frames): the number of frame errors within the last N frames has exceeded a threshold.
- Errored Frame Seconds Summary (errored secs per M seconds): the number of errored seconds (one second intervals with at least one frame error) among the last M seconds has exceeded a threshold.

Since 802.3ah OAM does not guarantee the delivery of OAMPDUs, the Event Notification OAMPDU (discussed in the OAMPDU section below) can be sent multiple times to reduce the probability of losing notifications. A sequence number is used to recognize duplicate events. The Link Monitoring Process operates for all the links on which EFM OAM is enabled.

## Remote failure indication

Faults in Ethernet that are caused by slowly deteriorating quality are more difficult to detect than completely disconnected links. A flag in the OAMPDU allows an OAM entity to send failure conditions to its peer. The failure conditions are defined as follows:

- Link Fault: The Link Fault condition is detected when the receiver loses the signal. This condition is sent once per second in the Information OAMPDU.
- Dying Gasp: This condition is detected when the receiver goes down. The Dying Gasp condition is considered as unrecoverable. Conditions for dying gasp:
  - Reload or reset from MP
  - Interface disable (admin shutdown)
  - Link-OAM disable on interface (deconfiguration)
  - Crash on the box
- Device power down (incidental or deliberate).
- Critical Event: When a critical event occurs, the device is unavailable as a result of malfunction, and it is to be restarted by the user. The critical events can be sent immediately and continually.

When the dying gasp or critical event occurs, the device driver will call a special API in the EFMOAM implementation.

The link fault applies only when the physical sublayer is capable of independent transmission and reception.

When a link receives no signal from its peer at the physical layer (for example, if the peer's laser is malfunctioning), the local entity sets this flag to let the peer know that its transmit path is inoperable. The link-down API will be called by the device driver in order to notify the remote device of the link fault.

Since the above conditions are severe, when they are set in the flag, the OAMPDU is not subject to normal rate limiting policy.

## Remote loopback

An OAM entity can put its remote entity into loopback mode using a loopback control OAMPDU. This helps users ensure quality of links during installation or when troubleshooting. In loopback mode, each frame received is transmitted back on that same port except for OAMPDUs and pause frames. The periodic exchange of OAMPDUs must continue while in the loopback state to maintain the OAM session. The loopback command is acknowledged by responding with an Information OAMPDU with the loopback state indicated in the state field. This allows to estimate if a network segment can satisfy an SLA.

## Enabling and disabling EFM-OAM

The link-oam command, in Protocol Configuration mode, enables and disables the EFM-OAM protocol and enters into the EFM-OAM Protocol Configuration mode. The link-oam disable and enable command resets all link-oam parameters to default values.

By default, EFM-OAM is disabled.

To enable EFM-OAM, enter a command such as the following:

```
device(config)link-oam
device(config-link-oam)#enable
```

**Syntax:** [no] link-oam

**Syntax:** enable

The **no** form of the command sets the 802.3ah EFM-OAM to the disabled state.

## Specifying the timeout value

The timeout command is a hold down timer that specifies the number of seconds before it declares that the other side has stopped sending OAMPDUs.

```
device(config-link-oam) #timeout 10
```

**Syntax:** [no] timeout *value*

The **no** form of the command restores the default value of 5 OAMPDUs.

The *value* parameter specifies the number of seconds before declaring the remote as down. in the range of *1-10*.

## Specifying the PDU rate

To set the number of PDUs to be transmitted per second, use the `pdu-rate` command. The default value is 1.

```
device(config-link-oam) #pdu-rate 10
```

**Syntax:** `[no] pdu-rate value`

The *value* parameter specifies the number of PDUs in the range of *1-10*.

The **no** form of the command restores the default value of 1.

## Enabling and disabling the EFM-OAM state on the specified interface

The **ethernet** *slot/port* command in Interface Configuration mode, enables and disables EFM-OAM on the specified interface and sets its mode to active or passive.

When both peers are in passive mode (abnormal configuration), the information from "Remote Status" is not updated anymore and it may be inaccurate. By default, port state is disabled.

```
device(config-link_oam) # ethernet 2/1 active
```

**Syntax:** `[no] ethernet slot/port { active | passive | remote-failure }`

When **active** mode is specified, the device can send OAMPDU packets over this port in order to initiate an EFM-OAM discovery process. For the discovery process to be initiated the EFM-OAM protocol must have been enabled.

When **passive** mode is specified, the device cannot use this port to send OAMPDU packets, but can respond if it receives OAMPDUs from remote.

When **remote-failure** mode is specified, the device will be set for the remote-failure action. The **no** form of the command sets the 802.3ah EFM-OAM to the disabled state.

The **no** form of the command sets the 802.3ah EFM-OAM to the disabled state.

## Enabling an interface to accept remote loopback

### NOTE

OAM remote loopback is supported only on the NetIron CES and NetIron CER platform and not supported on NetIron XMR and NetIron MLX platforms.

The **ethernet** *slot/port* `allow-loopback` command, in Interface Configuration mode, is used to enable the interface to respond to a loopback request from the remote. This is used for loopback traffic analysis.

```
device(config-link-oam) #ethernet 2/1 allow-loopback
```

**Syntax:** `[no]ethernet slot/port allow-loopback`

The **no** form of the command doesn't allow the interface to respond to the loopback request from the remote.

## Defining remote failure actions

By default, on receipt of a remote failure message, the device will only log the event. This can be changed to block an interface on receipt of a remote failure message. The commands below display the three events that the protocol supports.

```
device(config-link-oam)#ethernet 2/1 remote-failure dying-gasp action block-interface
device(config-link-oam)#ethernet 2/1 remote-failure critical-event action block-interface
device(config-link-oam)#ethernet 2/1 remote-failure link-fault action block-interface
```

**Syntax:** `[no]ethernet slot/port remote-failure dying-gasp | link-fault | critical-event action block-interface`

The **no** form of the command returns to default state of logging.

## Forcing the EFM-OAM remote interface into loopback

The **link-oam remote-loopback ethernet slot/port start/stop** command starts and stops the remote loopback on the remote node.

```
device# link-oam remote-loop-back ethernet 1/1 start
```

**Syntax:** `[no]link-oam remote loopback ethernet slot/portstart/stop`

## Display information

The following show commands will display OAM information.

### Displaying OAM information

To show OAM information on all OAM enabled ports, enter a command such as the following:

```
device#show link-oam info
Ethernet Link Status   OAM Status   Mode   Local Stable   Remote Stable
1/1      up           up          active   satisfied     satisfied
1/2      up           up          passive  satisfied     satisfied
1/3      up           up          active   satisfied     satisfied
1/4      up           init        passive  unsatisfied   unsatisfied
1/5      down        down        passive  unsatisfied   unsatisfied
1/6      down        down        passive  unsatisfied   unsatisfied
1/7      down        down        passive  unsatisfied   unsatisfied
```

### Displaying detailed information from a specific port

To show detailed OAM information, enter a command such as the following:

**Syntax:** `show link-oam info detail ethernet all | slot/port`

To show detailed OAM information on a specific ethernet port, enter a command such as the following:

**Syntax:** `show link-oam info detail [ all | ethernet slot/port ]`

### Displaying OAM statistics

To show OAM statistics, enter a command such as the following:

**Syntax:** `show link-oam statistics`

### Displaying detailed OAM statistics

To show detailed OAM statistics, enter a command such as the following:

```
device#show link-oam statistics detail
OAM statistics for Ethernet port: 1/1
Tx statistics
```

```

information OAMPDUs:          587
loopback control OAMPDUs:    0
variable request OAMPDUs:    0
variable response OAMPDUs:   0
unique event notification OAMPDUs: 0
duplicate event notification OAMPDUs: 0
oranziation specific OAMPDUs: 0
link-fault records:         0
critical-event records:     0
dying-gasp records:        0
Rx statistics
information OAMPDUs:          442
loopback control OAMPDUs:    0
variable request OAMPDUs:    0
variable response OAMPDUs:   0
unique event notification OAMPDUs: 0
duplicate event notification OAMPDUs: 0
oranziation specific OAMPDUs: 0
unsupported OAMPDUs:         0
link-fault records:         0
critical-event records:     0
dying-gasp records:        0
discarded TLVs:            0
unrecognized TLVs:         0
OAM statistics for Ethernet port: 1/2
Tx statistics
information OAMPDUs:          440
loopback control OAMPDUs:    0
variable request OAMPDUs:    0
variable response OAMPDUs:   0
unique event notification OAMPDUs: 0
duplicate event notification OAMPDUs: 0
oranziation specific OAMPDUs: 0
link-fault records:         0
critical-event records:     0
dying-gasp records:        0
Rx statistics
information OAMPDUs:          441
loopback control OAMPDUs:    0
variable request OAMPDUs:    0
variable response OAMPDUs:   0
unique event notification OAMPDUs: 0
duplicate event notification OAMPDUs: 0
oranziation specific OAMPDUs: 0
unsupported OAMPDUs:         0
link-fault records:         0
critical-event records:     0
dying-gasp records:        0
discarded TLVs:            0
unrecognized TLVs:         0

```

To show detailed OAM statistics, enter a command such as the following:

**Syntax:** `show link-oam statistics detail ports [ all | ethernet slot/port ]`

This field...	Displays...
Ethernet Port	Indicates if the ethernet port that EFM-OAM is enabled on.
Link Status	Indicates if the physical link is operational or any fault is detected on the link.
OAM Status	Indicates the status of OAM on the link between the local and remote DTEs. The status is enabled if OAM client is satisfied with local and remote settings.
Mode	Indicates if the DTE is in active or passive modes. Active DTEs can start the discovery process and passive ones can only respond.
Local Stable	Indicates the reception of the remote DTE state information and is satisfied with the remote OAM settings.
Remote Stable	Indicates the reception of the local DTE state information at the remote DTE and is satisfied with the local OAM settings.

## Ping

Ping is a tool that helps you to verify the Internet connectivity at the IP level. The **ping** command sends an Internet Control Message Protocol (ICMP) echo request to the IP address or selected hostname.

### Executing ping

The **ping** command, in the (Enable) mode, pings another device from the device. The device supports IP ping, which you can use to test connectivity to remote hosts. Ping sends an echo request packet to an address and waits for a reply.

The device can execute multiple ping commands at the same time. If you can connect to the device via the console, or through an inbound telnet or SSH session, it should be possible to initiate a ping. This applies to all versions of the ping command described below. The device can also resolve multiple DNS queries simultaneously, which allows multiple ping commands with the **hostname** option to be executed at the same time.

To initiate the device to ping to a target device with the IP address of 10.22.2.33, enter a command such as the following.

```
device# ping 10.22.2.33
```

**Syntax:** **ping** *ip address* | *hostname* | **vrf** *instance-name* [ **source** *ip address* ] [ **count** *num* ] [ **timeout** *msec* ] [ **tll** *num* ] [ **size** *byte* ] [ **quiet** ] [ **numeric** ] [ **no-fragment** ] [ **verify** ] [ **data** *1-to-4 bytehex* ] [ **brief** ]

The required parameter is the IP address or the host name of the device.

The **vrf** *instance-name* parameter specifies a VPN routing/forwarding instance as the origin of the ping packets.

The **source** *ip addr* parameter specifies an IP address to be used as the origin of the ping packets.

The **count** *num* parameter specifies how many ping packets the device sends. You can specify from *1 - 4294967296*. The default is 1.

The **timeout** *msec* parameter specifies how many milliseconds the device waits for a reply from the pinged device. You can specify a timeout from *1 - 4294967296* milliseconds. The default is 5000 (5 seconds).

The **tll** *num* parameter specifies the maximum number of hops. You can specify a TTL from 1 - 255. The default is 64.

The **size** *byte* parameter specifies the size of the ICMP data portion of the packet. This is the payload and does not include the header. You can specify from *0 - 9170*. The default is 16.

The **no-fragment** parameter turns on the "do not fragment" bit in the IP header of the ping packet. This option is disabled by default.

The **quiet** parameter hides informational messages such as a summary of the ping parameters sent to the device and instead displays only messages indicating the success or failure of the ping. This option is disabled by default.

The **verify** parameter verifies that the data in the echo packet (the reply packet) is the same as the data in the echo request (the ping). By default the device does not verify the data.

The **data** *1 - 4 byte hex* parameter lets you specify a specific data pattern for the payload instead of the default data pattern, "abcd", in the packet's data payload. The pattern repeats itself throughout the ICMP message (payload) portion of the packet.

#### NOTE

For numeric parameter values, the CLI does not check that the value you enter is within the allowed range. If you exceed the range for a numeric value, the software rounds the value to the nearest valid value.

The **brief** keyword causes ping test characters to be displayed. The following ping test characters are supported:

!Indicates that a reply was received.

. Indicates that the network server timed out while waiting for a reply.

U Indicates that a destination unreachable error PDU was received.

I Indicates that the user interrupted ping.

## Executing ping VRF

### NOTE

The Ping utilities have been enhanced by adding the **ping vrf** command in release O2.1.00 to help with management of Layer 3 VPNs.

The **ping vrf** command lets you test a specific VPN connection. To use this option, enter the following command.

**Syntax:** `ping vrf vrf-name ip-address`

The *vrf-name* parameter is the name of the VRF that you want to conduct a ping to.

The *ip-address* parameter is the IP address containing the VRF that you want to conduct a ping to.

## Executing ping IPv6

The **ping ipv6** command allows you to verify the connectivity from a device to an IPv6 device by performing an ICMP for IPv6 echo test. As with IPv4, multiple IPv6 ping commands can be executed simultaneously by the device.

For example, to ping a device with the IPv6 address of 2001:db8:847f:a385:34dd::45 from the device, enter the following command.

```
device# ping ipv6 2001:db8:847f:a385:34dd::45
```

**Syntax:** `ping ipv6 ipv6-address | hostname | vrf instance-name [ outgoing-interface [ eth slot/port | ve number ] ] [ source ipv6-address ] [ count number ] [ timeout milliseconds ] [ ttl number ] [ size bytes ] [ quiet ] [ numeric ] [ no-fragment ] [ verify ] [ data 1-to-4 bytehex ] [ brief ]`

The required parameter is the IPv6 address or the host name of the device. The *ipv6-address* parameter specifies the address of the target device. You must specify this address in hexadecimal using 16-bit values between colons, or specify a host name using an ASCII string.

The **vrf instance-name** parameter specifies a VPN routing/forwarding instance as the origin of the ping packets.

The **outgoing-interface** keyword specifies a physical interface over which you can verify connectivity. If you specify a physical interface, such as an Ethernet interface, you must also specify the port number of the interface. If you specify a virtual interface, such as a VE, you must specify the number associated with the VE.

### NOTE

This option is applicable only when the destination IPv6 address is a link local address.

Specify **ethernet slot/port**.

The **source ipv6-address** parameter specifies an IPv6 address to be used as the origin of the ping packets.

The **count number** parameter specifies how many ping packets the sends. You can specify from 1 - 4294967296. The default is 1.

The **timeout milliseconds** parameter specifies how many milliseconds the waits for a reply from the pinged device. You can specify a timeout from 1 - 4294967296 milliseconds. The default is 5000 (5 seconds).

The **ttl number** parameter specifies the maximum number of hops. You can specify a TTL from 1 - 255. The default is 64.

The **size bytes** parameter specifies the size of the ICMP data portion of the packet. This is the payload and does not include the header. You can specify from 0 - 9150. The default is 16.

The **no-fragment** keyword turns on the "don't fragment" bit in the IPv6 header of the ping packet. This option is disabled by default.

The **quiet** keyword hides informational messages such as a summary of the ping parameters sent to the device and instead only displays messages indicating the success or failure of the ping. This option is disabled by default.

The **verify** keyword verifies that the data in the echo packet (the reply packet) is the same as the data in the echo request (the ping). By default the device does not verify the data.

The **data 1 - 4 byte hex** parameter lets you specify a specific data pattern for the payload instead of the default data pattern, "abcd", in the packet's data payload. The pattern repeats itself throughout the ICMP message (payload) portion of the packet.

#### NOTE

For parameters that require a numeric value, the CLI does not check that the value you enter is within the allowed range. Instead, if you do exceed the range for a numeric value, the software rounds the value to the nearest valid value.

The **brief** keyword causes ping test characters to be displayed. The following ping test characters are supported:

! Indicates that a reply was received.

. Indicates that the network server timed out while waiting for a reply.

U Indicates that a destination unreachable error PDU was received.

I Indicates that the user interrupted ping.

## Trace route

The trace route tool works by sending ICMP echo packets with varying IP Time-to-Live (TTL) values to the destination.

You can use IP traceroute to identify the path that packets take through the network on a hop-by-hop basis. The command output displays all network layer devices, such as routers, through which the traffic passes on its way to the destination.

The device can execute simultaneous **traceroute** commands from multiple inbound telnet or SSH sessions. Multiple simultaneous traceroutes from Web and SNMP, however are not allowed. The device can also resolve multiple DNS queries simultaneously, which allows multiple **traceroute** commands with the *hostname* option to be executed at the same time.

#### NOTE

Traceroute commands in outbound telnet sessions run on the remote telnet server and not on the local device.

## Executing traceroute

The **traceroute** command, in the (Enable) mode, displays the routing path from the routing switch to the destination IP address as soon as the information is received. Traceroute requests display all responses to a given TTL. In addition, if there are multiple equal-cost routes to the destination, the device displays up to three responses by default.

#### NOTE

When executed in IPv4, the traceroute command does not display the IP address of the GRE tunnel interface path.

```
device> traceroute 10.33.4.7 minttl 5 maxttl 5 timeout 5
```

**Syntax:** `traceroute host-ip-addr [ maxttl value ] [ minttl value ] [ numeric ] [ timeout value ] [ source-ip ip addr ]`

The **maxttl value** parameter is the maximum TTL (hops) value: Possible value is 1 - 255. The default is 30 seconds.

The **minttl value** parameter is the minimum TTL (hops) value: Possible value is 1 - 255. The default is 1 second.

The **numeric** parameter lets you change the display to list devices by IP address instead of by name.

The **timeout value** parameter specifies the possible values. Possible value range is 1 - 120. Default value is 2 seconds.

The **source-ip** *ip addr* parameter specifies an IP address to be used as the origin for the traceroute.

## Executing traceroute VRF

In the (Enable) mode, the **traceroute vrf** command functions like the standard **traceroute** command but requires you to specify a VRF table name. The **traceroute vrf** command must be used when the route to the destination is associated with a VRF table.

```
device# traceroute vrf blue 10.10.10.10
```

**Syntax:** **traceroute vrf** *vrf-name**ip-address*

The *vrf-name* parameter is the name of the VRF for you want are running the traceroute.

The *ip-address* parameter is the IP address containing the VRF that you want to conduct a traceroute to.

## Executing traceroute IPv6

The **traceroute ipv6** command traces a path from a device that supports IPv6 to an IPv6 host.

The CLI displays trace route information for each hop as soon as the information is received. Traceroute requests display all responses to a minimum TTL of 1 second and a maximum TTL of 30 seconds. In addition, if there are multiple equal-cost routes to the destination, the device displays up to three responses.

To trace the path from the device to a host with an IPv6 address of 2001:db8:349e:a384::34, enter the following command.

```
device> traceroute ipv6 2001:db8:349e:a384::34
```

**Syntax:** **traceroute ipv6** *ipv6-address*

The *ipv6-address* parameter specifies the address of an IPv6 host. You must specify this address in hexadecimal using 16-bit values between colons.

## Trace-I2 protocol

**Trace-I2** traces introduces a new proprietary protocol that traces the traffic path to a specified device in a VLAN. Also, it can be used to probe all reachable paths to all devices in a VLAN. It does the following:

- Traces a particular IP, MAC or hostname in a VLAN.
- Probes the entire Layer 2 topology.
- Displays the input or output ports of each hop in the path.
- Displays the round trip travel time of each hop.
- Displays hops in a VLAN that form a loop.
- Displays each hop's Layer 2 protocol such as STP, RSTP, 802.1w, SSTP, metro ring, or route-only.

The resulting trace displays a report that provides information about a packet's path to a device, such as hop and port information and travel time. It also can locate any Layer 2 loop in a VLAN. The probed Layer 2 information is discarded when a new **trace-I2** command is issued again.

For each hop in the path, trace-I2 displays its input/output port, L2 protocols of the input port, and the microsecond travel time between hop and hop. It also prints out the hops which form a loop, if any. Displaying L2 topology lets a user easily obtain information of all hops.

## Configuration considerations

The configuration considerations are as follows:

- Trace-l2 is enabled on the Brocade devices. It can be used to trace traffic only to devices.
- The devices that will participate in the trace-l2 protocol must be assigned to a VLAN and all devices on that VLAN must be Brocade devices that support the trace-l2 protocol.
- Brocade devices, as well as other vendor devices, that do not support the trace-l2 protocol, simply forward trace-l2 packets without a reply. Hence, these devices are transparent to the trace-l2 protocol.
- The destination for the packet with the trace-l2 protocol must be a device that supports the trace-l2 protocol and the destination cannot be a client, such as a personal computer, or devices from other vendors.

## Tracing a traffic path

The trace-l2 protocol is enabled on a VLAN. You can trace the traffic path of a packet by entering a command such as the following.

```
device(config)#trace-l2 vlan 10 2.2.2.2
```

**Syntax:** [no] trace-l2 vian *vlan-id destination-address*

The *destination address* can be a MAC address, an IP address, or a host. You can enter the destination-address in one of the following formats:

- HHHH.HHHH.HHHH - Destination MAC address
- A.B.C.D - Destination IP address
- ASCII string - destination host name

If a destination address is not specified or the destination does not exist, trace-l2 collects L2 topology information which can be displayed by issuing a **trace-l2 show** command. The command displays the following information.

```
trace-l2 reply vlan 2 from e26, 10.1.1.2, total round trip = 814 microsec
hop input output IP and/or MAC address microsec comment
 1 e28 e25 10.1.1.4 0000.003F.c400 316 e28: ring 11
 2 e15 e13 10.1.1.1 0000.0057.0d00 235 e15: ring 11
 3 e27 10.1.1.2 0000.0057.2500 263 e27: ring 11
```

In the output above, the last hop is the destination. Because 10.1.1.2 and 10.2.2.2 are addresses of the same device, the device can use 10.1.1.2 in the reply.

In general, **trace-l2** first tries to use the IP address of the virtual routing interface that is associated with a VLAN. If the virtual routing interface is not available, it then uses the loopback address. If both addresses are not available, it displays MAC address only.

The *input* and *output* ports show the path of the hops. Hop 3 has no output port because it is the destination.

The *microsec* column is the round trip time (sum of the time) to and from the previous hop. For example, 316 microsec for hop 1 is the time from the source to hop 1 and from hop 1 to the source. One way time is not available because the trace-l2 protocol does not synchronize the clocks between hops.

The **comment** column shows the Layer 2 protocol used on the input port. It could be the following:

- STP - spanning tree protocol
- RSTP - Rapid STP, 802.1w draft 3
- 802.1w - Rapid STP
- ring - Metro ring ID of input port.
- Single STP - Includes Single STP, Single RSTP and Single 802.1w
- STP port disabled - The **spanning-tree ethernet disabled** command is configured.
- route-only - This device has route-only configuration
- port route-only - The input port has route-only configuration

## Displaying Layer 2 topology information

To display information about the Layer 2 topology, first issue a **trace-l2vlan** command, then enter the **trace-l2 show** command as in the following example.

```
device(config)#trace-l2 vlan 10
Vlan 10 L2 topology probed, use "trace-l2 show" to display
device(config)#trace-l2 show
Vlan 10 L2 topology was probed 6 sec ago, # of paths: 2
path 1 from e27, 1 hops:
hop input  output IP and/or MAC address      microsec comment
1   e13           10.1.1.1 0000.0057.0d00          383 802-1w
path 2 from e25, 2 hops:
hop input  output IP and/or MAC address      microsec comment
1   e27     e26   10.1.1.3 0000.0052.ea00          657 802-1w
2   e28           10.1.1.4 0000.003f.c400          296 route-only
```

The **trace-l2 show** command does not display a path if the path is a subset of another path; therefore, the number of paths displayed could be fewer than the number of devices.

If the topology contains Layer 2 loops, a message such as the following is displayed.

```
*** Warning! The following 3 hops form a loop in vlan 2
hop input  output IP and/or MAC address      microsec comment
1   e25           10.1.2.2 0000.0057.2500
2   e28           10.4.100.1 0000.003f.c400
3   e29           10.1.1.1 0000.0057.0d00
```

**Syntax:** **trace-l2 show**

## IPv6 Traceroute over an MPLS network

### NOTE

IPv6 MPLS traceroute not supported on the BR-MLX-10Gx24-DM 24-port 10GbE module.

IPv6 traceroute behavior is similar to IPv4 traceroute. However, unlike IPv4 traceroute, IPv6 traceroute has a new 6PE label added during each hop across the MPLS cloud. Based on the IP header value, the node devices differentiate if the Internet Control Message Protocol version 6 (ICMPv6) echo request is from an IPv6 or IPv4 source device.

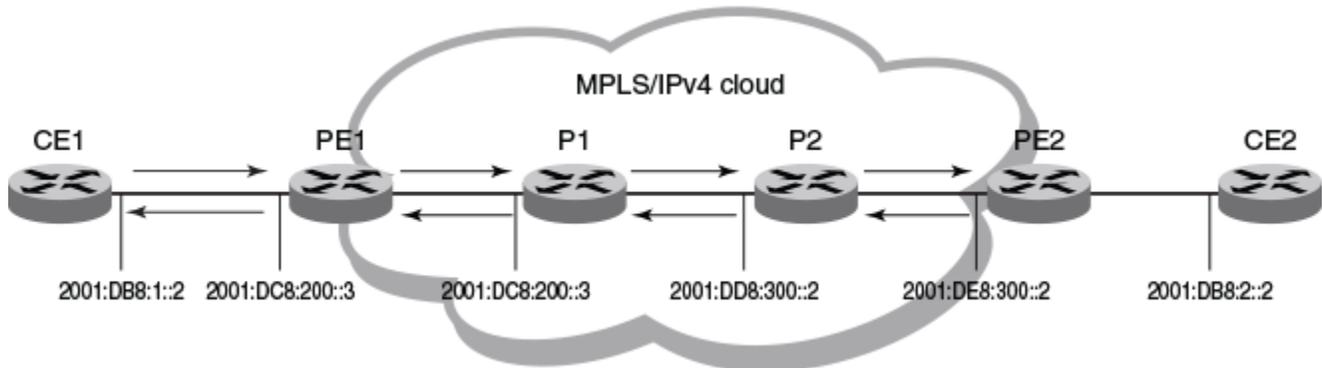
When the traceroute sends ICMPv6 echo request packets with a TTL value (hop limit) value of 1, the first router in the path replies with the *ttl-exceeded* error message to the source. The next packet has a TTL (hop limit) value of 2 and the second router replies with the *ttl-exceeded* error message. This process continues till the destination host receives the packets and returns an ICMPv6 Echo Reply message.

Based on the *ttl-exceeded* messages or the ICMPv6 Echo Reply messages received during the traceroute operation, the source device obtains details such as the hop sequence, total hops taken to complete the path, and the IPv4 or IPv6 addresses of devices that it passed during the path. For each hop, the traceroute gathers information about the hop number, best hop time, and the TTL value.

## Tracing an IPv6 route through an MPLS domain

The following figure shows an MPLS-enabled provider network consisting of four LSRs. PE1 is the ingress PE Label Edge Router (LER), P1 and P2 are transit LSRs, and PE2 is the egress provider edge LER. CE1 and CE2 are CE devices located in different geographical locations.

FIGURE 11 IPv6 Traceroute in an MPLS cloud



To understand the IPv6 traceroute behavior in an MPLS domain, assume the following:

- Customer traffic is tunneled through a MPLS VPN network, and traffic within the MPLS core is forwarded by label-switching only.
- The CE1 router sends UDP packets from CE1 router towards the CE2 router.
- Traceroute is configured to generate ICMPv6 messages per ICMP extensions and to use LSPs to forward these messages. Refer to [Configuring IPv6 Traceroute over MPLS](#) on page 153 for more information.
- The PE routers are aware of the source and destination IPv6 addresses while the transit LSRs have no such knowledge.
- The **traceroute** command is issued from CE1 to CE2 and reports the following information:

```
device# traceroute ipv6 2001:DB8:2::2
Type Control-c to abort
Tracing the route to IPv6 node 2001:DB8:2::2 from 1 to 30 hops
 1  <1 ms  <1 ms  <1 ms  2001:DB8:1::2
 2  <1 ms  <1 ms  <1 ms  2001:DC8:200::3
    MPLS Label=1026 Exp=0 TTL=1 S=0
    MPLS Label=794624 Exp=0 TTL=1 S=1
 3  <1 ms  <1 ms  <1 ms  2001:DD8:300::2
    MPLS Label=1029 Exp=0 TTL=1 S=0
    MPLS Label=794624 Exp=0 TTL=2 S=1
 4  <1 ms  <1 ms  <1 ms  2001:DE8:300::2
 5  <1 ms  <1 ms  <1 ms  2001:DB8:2::2
```

#### NOTE

The traceroute output reports information on a traceroute packet only when its TTL equals 1. Label stack information associated with subsequent routing of the ICMP message along the LSPs to the destination and back to the source is not displayed.

In the the previous scenario, the traceroute operation can be described as follows:

1. CE1 sends a traceroute probe with a TTL of 1 to its peer, CE2, with the destination IP address of 2001:DB8:2::2. PE1 decrements the packet's TTL by one and drops the expired packet. It generates a *tll-exceeded* ICMPv6 message, and sends it back to CE1 with the source IPv6 address embedded in the IPv6 header of the expired packet. Traceroute reports the PE1 IPv6 address at hop 1, but there is no label information.
 

```
1.    <1 ms  <1 ms  <1 ms  2001:DB8:1::2
```
2. CE1 sends a second traceroute probe to CE2, with an incremented TTL value of 2. PE1 decrements the TTL value to 1, and adds the 6PE label and the Label Distribution Protocol (LDP) label onto the packet to route it to CE2 by way of the transit router

P1. PE1 also copies the TTL value from the IP header into the TTL field of the labels (recall that TTL propagation must be enabled on the ingress PE).

The transit router P1 decrements the TTL, drops the expired packet since the TTL value is 0, and generates a *tll-exceeded* ICMPv6 message. Before dropping the packet, and using the ICMPv6 extension mechanism, P1 copies the packet's label stack plus its IP header and appends both to the ICMPv6 message. Though the message destination is CE1, P1 cannot return the ICMPv6 message directly to CE1. It uses label-switching to forward the encapsulated ICMP response in the direction of the original traceroute probe along the configured LSPs and back to CE1. P1 sets the maximum TTL value of 255 to ensure that the message can reach its destination before it times out.

Traceroute reports the IP address of P1, plus the label stack that was pushed onto the traceroute packet by PE1 and received by P1 when the packet's TTL was 1.

```
2    <1 ms    <1 ms    <1 ms  2001:DC8:200::3
      MPLS Label=1026 Exp=0 TTL=1 S=0
      MPLS Label=794624 Exp=0 TTL=1 S=1
```

- The third traceroute probe (TTL=3) is forwarded until it expires at the transit router P2. P2 (the Penultimate Hop Popping (PHP) LSR) generates the ICMPv6 message, appends the label stack from the expired traceroute packet, and passes it on to PE2 without imposing a label. PE2 forwards the ICMPv6 message back to CE1 along the return LSP.

Traceroute reports the IP address of P2, plus the label stack which P2 received with the traceroute packet from P1 when the packet's TTL was 1.

```
3    <1 ms    <1 ms    <1 ms  2001:DD8:300::2
      MPLS Label=1029 Exp=0 TTL=1 S=0
      MPLS Label=794624 Exp=0 TTL=2 S=1
```

- The fourth traceroute probe (TTL=4) is forwarded until it expires at the egress provider edge device PE2. PE2 drops the packet and generates a *tll-exceeded* ICMPv6 message without label stack extension since there is no label stack to report.

Traceroute reports only the IP address of PE2. The transit router P2 popped the outer label before passing the traceroute packet on to the egress PE2 and PE2 pops the VPN label before sending the ICMPv6 message back to the customer source device CE1.

```
4    <1 ms    <1 ms    <1 ms  2001:DE8:300::2
5    <1 ms    <1 ms    <1 ms  2001:DB8:2::2
```

- The fifth traceroute probe (TTL=5) has a TTL large enough for the packets to reach the customer destination device CE2. CE2 generates an ICMPv6 *port unreachable* message, which CE2 sends back to CE1.

Traceroute reports only the IP address of the destination device CE2. No label extension is added because the received packet is not labeled. The *port unreachable* message is label-switched back to the customer source device CE1, as a normal data packet.

```
5    <1 ms    <1 ms    <1 ms  2001:DB8:2::2
```

## Configuring IPv6 Traceroute over MPLS

The `ipv6icmp mpls-response` command configures the behavior of the traceroute operation by controlling both the ICMPv6 message format (use ICMPv6 label stack extensions or not) and the manner in which the ICMPv6 messages are **forwarded through an MPLS domain** (by way of IP routing table lookup or through label-switching using LSPs).

MPLS response is enabled by default. To enable the MPLS response after it was disabled, enter the following command:

```
device(config)# ipv6 icmp mpls-response
```

You can use this version of the command if the traceroute is over an IPv6-aware MPLS core. In such a case, IPv6 traceroute uses the default option of using the routing tables to forward packets. The IPv6 link local addresses should not be used to send the ICMPv6 packet. At the same time, you can still use the **ipv6 icmp mpls-response use-lsp** command to use the configured LSPs.

To specify using LSP to forward the ICMPv6 messages with MPLS label extensions, enter the following command:

```
device(config)# ipv6 icmp mpls-response use-lsp
```

Use this version of the command if the MPLS core is non IPv6-aware, because the IPv6 forwarding will not work.

To specify generating ICMPv6 messages without MPLS label extensions, enter the following command:

```
device(config)# ipv6 icmp mpls-response no-label-extensions
```

To disable the IPv6 Traceroute over MPLS feature, enter the following command:

```
device(config)# no ipv6 icmp mpls-response
```

**Syntax:** `[no] ipv6 icmp mpls-response [ use-lsp ] [ no-label-extension ]`

The **mpls-response** parameter enables the ICMPv6 traceroute response in default mode. The feature is enabled by default and configured to use IP routing to forward ICMP messages.

The **use-lsp** parameter enables forwarding of ICMPv6 error messages along the LSPs configured for the MPLS domain. By default, using configured LSPs use is disabled.

The **no-label-extension** parameter disables the use of label stack information in the ICMPv6 error messages.

The **no** option disables the ICMPv6 traceroute response configuration. When the ICMP traceroute feature is disabled, standard traceroute using IPv6 forwarding is used to trace a traffic path through an MPLS domain.

#### NOTE

The **ipv6 icmp mpls-response** command supports TTL expiry for IPv6 packets only.

The output of the **show ipv6 traffic** command displays counts for ICMPv6 *tll-exceeded* error reply packets.

## LSP ping and traceroute

### Overview

The LSP Ping and Traceroute feature provides Operation, Administration, and Maintenance (OAM) functionality for MPLS networks based up RFC 4379 (Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures).

The LSP ping and traceroute functions provide a mechanism to detect MPLS data plane failure. LSP ping is used to detect data plane failure and to check the consistency between the data plane and the control plane. LSP traceroute is used to isolate the data plane failure to a particular router and to provide LSP path tracing. They are implemented using MPLS echo request and reply messages which are sent as UDP packets to a well-known UDP port 3503. This section provides the details of LSP Ping and Traceroute operation

### LSP ping operation

An MPLS echo request (described in [MPLS echo request](#) on page 155) is sent from the ingress to the egress LSR. At the transit LSRs, the ping packet is label switched (the same as a regular MPLS data packet) without any control plane intervention. Upon arriving at the egress LSR, the echo request is sent to the control plane for processing based on the IP Router Alert option and the well-known

destination UDP port 3503. An echo reply (described in [MPLS echo reply](#) on page 155) is sent back as a UDP packet with an appropriate return code that depends on the result of the FEC stack validation.

## LSP traceroute operation

An MPLS echo request (described in [MPLS echo request](#) on page 155) is sent from the ingress LSR with the TTL of the outermost label set to an incremental value that starts with a TTL value of 1. This request causes the MPLS echo request to be forwarded to the control plane for processing at each transit LSR, based on the MPLS TTL expiration value. An echo reply (described in [MPLS echo reply](#) on page 155) is sent back with a return code indicating that it is the transit LSR for the FEC specified in the echo request. This process repeats until the echo request arrives at the egress LSP. The echo request is then forwarded to the control plane for processing, based on the IP Router Alert option. An echo reply is sent back as a UDP packet with an appropriate return code that depends on the result of the FEC stack validation.

## MPLS echo request

The MPLS echo request is sent from the ingress LSR as a labeled UDP packet (except for single-hop LSP). The echo request has the following characteristics.

### IP/UDP header information:

- Source address = user-input or LSR ID.
- Destination address = user-input or 127.0.0.1.
- UDP source port = 3503.
- UDP destination port = 3503.
- IP TTL = 1
- Router Alert option is set.

By default, the reply mode is set to 2 (reply by way of an IPv4 UDP packet), and you can set it to 1 (no reply) or 3 (reply by way of an IPv4 UDP packet with Router Alert option).

The sender handle is set to an internally-generated, 32-bit number that is assigned to each ping or traceroute session when the ping or traceroute operation begins. This sender handle is sent back in the echo reply, which is used to locate the appropriate ping or traceroute session.

The sequence number is a running number associated with each ping or traceroute session. It starts with a value of 1.

The TTL for the outermost label is set to 255 for a ping. For traceroute, it is 1, 2, 3, and so on.

You can configure a timeout when starting the ping or traceroute command. The default value is 5 seconds.

## MPLS echo reply

The MPLS echo reply is sent by the transit (for traceroute) or egress (for ping and traceroute) LSR as a regular IPv4 UDP packet or an IPv4 UDP packet with Router Alert option depending on the reply-mode field of the echo request. If reply with Router Alert option is chosen, the user should make sure that all intermediate routers are capable of handling MPLS echo reply. If a reply is sent with Router Alert option and the reply is sent over a tunnel interface, the MPLS Router Alert label (label value 1) will be the topmost label for the packet. A reply with a Router Alert option should be used if and only if the normal IP return path is deemed unreliable.

The echo reply has the following characteristics.

### IP/UDP header information:

- Source address = LSR ID

- Destination address = source IP address from the echo request
- UDP source port = 3503
- UDP destination port = UDP source port from the echo request
- IP TTL = 255
- Router Alert option set if and only if reply-mode field of the echo request set to 3.

The sender handle is copied from echo request message

The sequence number is copied from echo request message

## LSP ping TLVs

Table 26 lists the TLVs defined in RFC 3479 that are included in an echo request and reply.

**TABLE 26** Show Cfm output descriptions

TLV type	TLV name	TX in echo request	TX in echo reply
1	Target FEC stack	Yes	No
2	Downstream mapping	Yes if the <b>dsmap</b> option is set	Yes for transit LSRs only if downstream mapping TLV is included in the MPLS Echo request.
3	Pad	Depend on the size option	Yes (if value = 2)
7	Interface and Label Stack	N/A	Yes if the I flag in DS mapping is set
9	Errored TLV	N/A	Yes (if error is detected)
10	Reply TOS bytes	Yes if reply-tos option is set	TLV is not sent back. Just copy TOS byte into IP header.

The Brocade devices support sending and receiving downstream mapping TLVs without multipath information (where the multipath type is always set to 0). Note that the detailed multipath information can be used by the ingress LSR to ping or traceroute through all ECMP paths at the transit LSR. Currently, the Brocade devices do not support LDP LSPs with ECMP. Consequently, the multipath type of non-zero is not relevant in these operations.

## LSP FEC types

For LDP LSPs, the LDP IPv4 prefix sub-TLV (sub-type = 1) is encoded in the target FEC stack of the echo request. For RSVP LSPs, the RSVP IPv4 LSP sub-TLV (sub-type = 3) is encoded in the target FEC stack.

### NOTE

Static RSVP LSPs are no longer supported, so a ping or traceroute for a static LSP is not supported.

## Redundant RSVP LSPs

For RSVP LSPs with redundant paths, ping or traceroute on a LSP is performed on the currently active path. For example, if the secondary path is the active path for an LSP, the MPLS echo request packets are sent out on the secondary path's interface.

If the active path changes while a ping or traceroute is in progress, the echo request continues to be sent out on the old active path. This implies that the echo request that was sent after path switchover times out. The user subsequently needs to restart the ping or traceroute.

## One-to-one Fast ReRoute (FRR) LSPs

Similar to the redundant LSPs, a ping or traceroute on a one-to-one FRR LSP is performed on the active path. If a path switchover occurs while a ping or traceroute is in-progress, the echo request continues to be sent out on the old active path. This implies that the echo request sent after path switchover will time out.

A user can ping or trace the route of the ingress-originated detour of a one-to-one FRR LSP by specifying the detour parameter. The operation is started only if the detour is operationally up.

## FRR bypass LSPs

The LSP ping and traceroute facilities support FRR bypass LSPs. You can ping or trace the protected LSP and bypass tunnel separately.

You can ping or trace the ingress-originated or transit-originated bypass tunnel by specifying either the name of bypass LSP (as you would any regular LSP name) or the entire RSVP session ID (including the tunnel endpoint, the tunnel ID, and the extended tunnel ID).

### NOTE

In the current facility backup implementation, the bypass LSP name must be unique in the system (for example, the name cannot be the same as the regular LSP name).

The traceroute output of a backup tunnel depends on the setting of the **propagate-ttl** and **label-propagate-ttl** options. If both **propagate-ttl** and **label-propagate-ttl** options are turned on, the traceroute output shows the detail of the bypass path. If both options are turned off, the bypass path is shown as a single hop. The options should be either both ON or both OFF.

To trace the route of a backup path, the TTL of the bypass and protected labels (if they are not implicit NULL labels) are set as in the following example:

- Both **propagate-ttl** and **label-propagate-ttl** are ON: TTL = 1, 2, 3, and so on, are set for both labels.
- Otherwise: bypass label TTL is set to 255. Protected label TTL is set to 1, 2, 3, and so on.

IP TTL is set to topmost label TTL. Otherwise, it is set to 255.

## Transit-originated detour

The user can initiate a ping or traceroute operation on a transit-originated, detour LSP. Because the session name does not uniquely identify a session on a transit LSR, the user needs to specify the entire session ID (including the tunnel endpoint, tunnel ID, and extended tunnel ID) for the detour LSP to which the LSP ping or traceroute command is applied.

## LSP reoptimization

If LSP reoptimization happens while the ping or traceroute is operating, the echo request is still sent out on the current LSP instance until the new instance is created. This avoids displaying partial information from the old and new paths if they are different; particularly for a traceroute. Similarly, if the ping or traceroute operation is started while LSP reoptimization is occurring, the LSP label, out interface, and other parameters from the currently up instance will be used.

## PHP behavior

Ping is transparent to the penultimate LSR. MPLS and IP TTL operations performed on a ping packet are the same as for a regular data packet. In the default case where the MPLS TTL is copied into the IP TTL, the echo request packet can arrive at the egress LSR with an IP TTL value greater than 1. Consequently, in this situation, the IP Router Alert option is used to direct the echo request packet to the control plane for ping processing.

For a traceroute operation; if the echo request is received with a downstream mapping TLV, the Implicit Null label is encoded in the Downstream label in the echo reply just like any other label.

Since a Brocade device advertises an implicit Null label to its upstream LSR for both LDP and RSVP LSPs, packets that arrive at the egress LSR do not have the tunnel label. For a single-hop LSP, the echo request is sent out from ingress LSR as an unlabeled UDP packet.

## Using the LSP ping and Traceroute commands

The following sections described operation of the LSP Ping and Traceroute command:

- [Executing LDP LSP ping](#) on page 158
- [Executing RSVP LSP ping](#) on page 159
- [Executing LDP LSP traceroute](#) on page 160
- [Executing RSVP LSP traceroute](#) on page 161

### Executing LDP LSP ping

The LDP LSP ping command, sends an MPLS echo request from the ingress to the egress LSR.

To perform the LDP LSP ping operation, use the following command.

```
device# ping mpls ldp 10.22.22.22
Send 5 80-byte MPLS Echo Requests for LDP FEC 10.22.22.22/32, timeout 5000 msec
Type Control-c to abort
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max=0/1/1 ms.
device)#
```

**Syntax:** ping mpls ldp *ip-address* | *ip-address/mask-length* [ **count** *num* ] [ **destination** *ip-address* ] [ **detail** ] [ **reply-mode no-reply** | **reply-mode router-alert** ] [ **reply-tos** *num* ] [ **size** *bytes* ] [ **source** *ip-address* ] [ **timeout** *msec* ] [ **nexthop** *ipv4address* ]

The **ldp** *ip-address* and *ip-address/mask-length* variables specify the LDP IPv4 destination prefix and mask length. If the **mask-length** is not specified, the default value is 32.

The **count** option with the *num* variable specifies the number of echo requests to send. The default value is 5.

The **destination** option specifies an IP address within the 127/8 subnet. The default address is 127.0.0.1

The **detail** option displays the details of the echo request and reply messages. By default, the display is in the brief mode.

The **reply-mode** option species the reply mode field in the echo request if and only if the user does not want the reply to be sent as an IPv4 UDP packet.

The **no-reply** option can be used to test one-way connectivity.

The **router-alert** option is used when the normal IP return path is unreliable. This option indicates that the reply should be sent as an IPv4 UDP packet with the Router Alert option. This option requires extra overhead processing at each LSR along the return path.

The **reply-tos** option specifies a TOS value between 0 and 254 to be included in the Reply-TOS-byte TLV. This value will be copied to the IP header TOS byte of the echo reply. By default, the reply-tos TLV is not included in the echo request.

#### NOTE

The last bit of the TOS byte is always 0.

The **size** option specifies that the size of the echo request including the label stack to be sent will be the value of the variable *bytes*. The pad TLV is used to fill the echo request message to the specified size. The minimum size is 80 byte for an LDP echo request. The maximum size is the size of the LSP MTU.

The **source** option specifies the IP address of any interface. This address is used as the destination address for the echo reply address. The default address is the LSR ID.

The **timeout** option specifies an interval in milliseconds for the echo request message. The default timeout is 5 seconds. The maximum timeout value is 5 minutes.

The **nexthop** specifies the nexthop IPv4 address to send the OAM request to. If an address that does not match the outgoing path for the tunnel is given, following error message appears as response:

```
Ping fails: LDP next-hop does not exist.
```

## Executing RSVP LSP ping

The RSVP ping command in the (enable) mode, sends an MPLS echo request from the ingress to the egress LSR.

To perform the RSVP LSP ping operation, use the following command.

```
device# ping mpls rsvp lsp toxmr2frr-18
Send 5 92-byte MPLS Echo Requests over RSVP LSP toxmr2frr-18, timeout 5000 msec
Type Control-c to abort
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max=0/1/5 ms.
device)#
```

**Syntax:** ping mpls rsvp lsp *lsp-name* session *tunnel-source-address tunnel-destination-address* *tunnel-id* [ **count** *num* ] [ **destination** *ip-address* ] [ **detail** ] [ **detour** ] [ **reply-mode** *no-reply* | *router-alert* ] [ **reply-tos** *num* ] [ **size** *bytes* ] [ **source** *ip-address* ] [ **standby** ] [ **timeout** *msec* ]

The **rsvp lsp** option specifies the name of the RSVP IPv4 LSP in the **lsp-name** variable.

The **rsvp session** option specifies the session ID. The **tunnel-source-address**, **tunnel-destination-address** and **tunnel-id** variables must all be specified to form a valid session ID.

The **count** option with the *num* variable specifies the number of echo requests to send. The default value is 5.

The **destination** option specifies an IP address within the 127/8 subnet. The default address is 127.0.0.1

The **detail** option displays the details of the echo request and reply messages. By default, the display is in the brief mode.

The **detour** option specifies a ping detour path. For a detour originated on the ingress LSR, you can ping the detour path using either the LSP name or session ID with the **detour** option specified.

The **reply-mode** option species the reply mode field in the echo request if and only if the user does not want the reply to be sent as an IPv4 UDP packet.

The **no-reply** option can be used to test one-way connectivity.

The **router-alert** option is used when the normal IP return path is unreliable. This option indicates that the reply should be sent as an IPv4 UDP packet with the Router Alert option. This option requires extra overhead processing at each LSR along the return path.

The **reply-tos** option specifies a TOS value between 0 and 254 to be included in the Reply-TOS-byte TLV. This value will be copied to the IP header TOS byte of the echo reply. By default, the reply-tos TLV is not included in the echo request.

### NOTE

The last bit of the TOS byte is always 0.

The **size** option specifies that the size of the echo request including the label stack to be sent will be the value of the variable *bytes*. The pad TLV is used to fill the echo request message to the specified size. The minimum size is 92 bytes for an MPLS Echo request. The maximum size is the size of the LSP MTU.

The **source** option specifies the IP address of any interface. This address is used as the destination address for the echo reply address. The default address is the LSR ID.

The **standby** option directs the ping operation to the secondary path of a redundant LSP that is operationally up.

The **timeout** option specifies an interval in milliseconds for the echo request message. The default timeout is 5 seconds. The maximum timeout value is 5 minutes.

## Executing LDP LSP traceroute

The LDP LSP traceroute command in the (enable) mode, sends an MPLS echo request from the ingress to the egress LSR.

To perform the LDP LSP traceroute operation, use the following command.

```
device# traceroute mpls ldp 10.22.22.22
Trace LDP LSP to 10.22.22.22/32, timeout 5000 msec, TTL 1 to 30
Type Control-c to abort
 1 10ms 10.22.22.22 return code 3(Egress)
device#
```

**Syntax:** `traceroute mpls ldp ip-address/mask-length[ destination ip-address] [ dsmap ] [ min-ttl min-num] [ max-ttl max-num] [ reply-mode router-alert ] [ reply-tos num] [ size bytes] [ source ip-address] [ timeout msec] [ nexthop ipv4address]`

The **ldp ip-address/mask-length** variable specifies the LDP IPv4 destination prefix and mask length. If the **mask-length** is not specified, the default value is 32.

The **destination** option specifies an IP address within the 127/8 subnet. The default address is 127.0.0.1

The **dsmap** option enables the Downstream (DS) mapping TLV in the echo request for traceroute operation. The DS mapping TLV is used to instruct the transit LSR to include the next-hop interface and label information in the echo reply. By default, the DS TLV is not included in the echo request.

The **min-ttl** option specifies a minimum value in the *min-num* variable for the outermost label in traceroute operation. The default minimum TTL value is 1. Acceptable values that can be configured are: 1 - 255.

The **max-ttl** option specifies a maximum value in the *max-num* variable for the outermost label in traceroute operation. The default maximum TTL value is 30. Acceptable values that can be configured are: 1 - 255.

The **reply-modero-router-alert** option is used when the normal IP return path is unreliable. This option indicates that the reply should be sent as an IPv4 UDP packet with the Router Alert option. This option requires extra overhead processing at each LSR along the return path.

The **reply-tos** option specifies a TOS value between 0 and 254 to be included in the Reply-TOS-byte TLV. This value will be copied to the IP header TOS byte of the echo reply. By default, the reply-tos TLV is not included in the echo request.

### NOTE

The last bit of the TOS byte is always 0.

The **size** option specifies that the size of the echo request including the label stack to be sent will be the value of the variable *bytes*. The pad TLV is used to fill the echo request message to the specified size. The minimum size is 92 bytes for an MPLS Echo request. The maximum size is the size of the LSP MTU.

The **source** option specifies the IP address of any interface. This address is used as the destination address for the echo reply address. The default address is the LSR ID.

The **timeout** option specifies an interval in milliseconds for the echo request message. The default timeout is 5 seconds. The maximum timeout value is 5 minutes.

The **nexthop** specifies the nexthop IPv4 address to send the OAM request to. If an address that does not match the outgoing path for the tunnel is given, following error message appears as response:

```
Traceroute fails: LDP next-hop does not exist.
```

## Executing RSVP LSP traceroute

The RSVP LSP traceroute command in the (enable) mode, sends an MPLS echo request from the ingress to the egress LSR.

To perform the RSVP LSP traceroute operation, use the following command.

```
device# traceroute mpls rsvp lsp toxmr2frr-18
Trace RSVP LSP toxmr2frr-18, timeout 5000 msec, TTL 1 to 30
Type Control-c to abort
  1 lms 10.22.22.22 return code 3(Egress)
device#
```

**Syntax:** `traceroute mpls rsvp lsp lsp-name | session tunnel-source-addresstunnel-destination-addresstunnel-id [ destination ip-address ] [ dsmap ] [ detour ] [ min-ttl min-num ] [ max-ttl max-num ] [ reply-mode router-alert ] [ reply-tos num ] [ size bytes ] [ source ip-address ] [ standby ] [ timeout msec ]`

The **rsvp lsp** option specifies the name of the RSVP IPv4 LSP in the **lsp-name** variable.

The **rsvp session** option specifies the session ID. The *tunnel-source-address*, *tunnel-destination-address* and *tunnel-id* variables must all be specified to form a valid session ID.

The **destination** option specifies an IP address within the 127/8 subnet. The default address is 127.0.0.1

The **dsmap** option enables the Downstream (DS) mapping TLV in the echo request for traceroute operation. The DS mapping TLV is used to instruct the transit LSR to include the next-hop interface and label information in the echo reply. By default, the DS TLV is not included in the echo request.

The **detour** option specifies a traceroute detour path. For a detour originated on the ingress LSR, you can ping the detour path using either the LSP name or session ID with the **detour** option specified.

The **reply-mode router-alert** option is used when the normal IP return path is unreliable. This option indicates that the reply should be sent as an IPv4 UDP packet with the Router Alert option. This option requires extra overhead processing at each LSR along the return path.

The **reply-tos** option specifies a TOS value between 0 and 254 to be included in the Reply-TOS-byte TLV. This value will be copied to the IP header TOS byte of the echo reply. By default, the reply-tos TLV is not included in the echo request.

### NOTE

The last bit of the TOS byte is always 0.

The **size** option specifies that the size of the echo request including the label stack to be sent will be the value of the variable *bytes*. The pad TLV is used to fill the echo request message to the specified size. The minimum size is 92 bytes for an MPLS Echo request. The maximum size is the size of the LSP MTU.

The **source** option specifies the IP address of any interface. This address is used as the destination address for the echo reply address. The default address is the LSR ID.

The **standby** option directs the traceroute operation to the secondary path of a redundant LSP that is operationally up.

The **timeout** option specifies an interval in milliseconds for the echo request message. The default timeout is 5 seconds. The maximum timeout value is 5 minutes.

## Displaying LSP ping and traceroute statistics

You can use the **show mpls statistics oam** command to display the following LSP ping and traceroute counters:

- Ping and traceroute requests that are issued by the user
- Echo requests sent
- Echo requests received
- Echo request time-outs
- Echo replies sent
- Echo replies received
- Echo replies with error return codes

To display the LSP ping and traceroute counters use the **show mpls statistics oam** command, as shown in the following.

```
device # show mpls statistics oam
User ping request processed: 8
User traceroute request processed: 3
Echo requests: sent(102658), received(2865), timeout(0)
Echo replies: sent(2865), received(102628)
Echo reply return code distribution:
Egress(3) : 0 102628
Transit(8) : 0 0
No return code(0) : 0 0
Malformed request(1) : 0 0
Unsupported TLV(2) : 2865 0
No FEC mapping(4) : 0 0
DS map mismatch(5) : 0 0
Unknown upstream intf(6) : 0 0
Reserved return code(7) : 0 0
Unlabeled output intf(9) : 0 0
FEC mapping mismatch(10) : 0 0
No label entry(11) : 0 0
Rx intf protocol mismatch(12) : 0 0
```

Premature LSP termination(13) : 0 0

### Syntax: show mpls statistics oam

When the detail option is specified, the echo reply is shown with a error return code based on the error codes listed in RFC 4379.

## Clearing the LSP ping and traceroute counters

You can use the **clear mpls statistics oam** command to clear the LSP ping and traceroute counters as shown in the following.

```
device# clear mpls statistics oam
```

### Syntax: clear mpls statistics oam

## CFM monitoring for ISID

- ISID is configured in edge devices (BEB) of a PBB network.
- CFM is configured for ISID in a BEB and is monitored between BEBs.
- The CCM interval for the sub-second timer is supported for CER with PBIF version 0x56 and greater.
- Loopback, Link trace, and delay measurement messages are supported for ISID.
- MIP functionality is not applicable for ISID.

## Configuring CFM monitoring for ISID

The following PBB configuration is mandatory to configure CFM ISID.

1. Configure ESI for B-VLAN and VLAN under the ESI.
2. Add ports into the configured B-VLAN.
3. Configure ESI for ISID and ISID under the ESI.
4. Associate ISID ESI as client ESI with B-VLAN ESI.

Use the following commands for each step in the CFM configuration for ISID.

### Sample configuration

```
device(config)#interface eth 1/1
device(config-if-e1000-1/1)#enable
device(config-if-e1000-1/1)#port-type backbone-network
device(config)#esi isid_1 encapsulation isid
device(config-esi-isid_esi_1)#isid 2000
device(config)# esi bvlan_1 encapsulation bvlan
device(config-esi-bvlan_1)#vlan 200
device(config-esi-bvlan_1-vlan-200)#tagged eth1/1 device(config-esi-bvlan_1)#esi-client isid_1

device(config)#interface ethernet 1/2
device(config-if-e1000-1/2)#enable
device(config-if-e1000-1/2)#port-type backbone-network
device(config)#esi isid_1 encapsulation isid
device(config-esi-isid_esi_1)#isid 2000
device(config)# esi bvlan_1 encapsulation bvlan
device(config-esi-bvlan_1)#vlan 200
device(config-esi-bvlan_1-vlan-200)#tagged ethernet 1/2
device(config-esi-bvlan_1)#esi-client isid_esi_1

device(config)#tag-value tag1 88A8
device(config)#interface ethernet 1/1
device(config-if-e1000-1/1)#enable
device(config)#interface ethernet 1/2
device(config-if-e1000-1/2)#enable
device(config)#vlan 200
device(config-vlan-200)#tagged eth 1/1
device(config-vlan-200)#tagged eth 1/2
```

### Sample configuration for ISID CFM

The below configuration shows the sample configuration for ISID CFM

```
device(config)#cfm-enable
device(config-cfm)#domain-name ISID_domain level 7
device(config-cfm-md-ISID_domain)#ma-name ISID_2000 esi isid_1 isid 2000 priority 7
device(config-cfm-md-ISID_domain-ma-ISID_2000)#ccm-interval 1-second
device(config-cfm-md-ISID_domain-ma-ISID_2000)#mep 1 down port eth 1/1
device(config-cfm-md-ISID_domain-ma-ISID_2000)#

device(config-cfm)#domain-name ISID_domain level 7 device(config-cfm-md-ISID_domain)#ma-name ISID_2000 esi
isid_1 isid 2000 priority 7
device(config-cfm-md-ISID_domain-ma-ISID_2000)#ccm-interval 1-second
device(config-cfm-md-ISID_domain-ma-ISID_2000)#mep 2 down port eth 1/2 device(config-cfm-md-ISID_domain-ma-
ISID_2000)#
```

### Show commands for CFM monitoring for ISID

The following **show** commands provide output for each component of the sample configuration.

## Show cfm

Use the **show cfm** command to display the cfm configuration.

### Syntax: show cfm

```
device#show cfm
Domain: ISID_domain
Index: 1
Level: 3
Maintenance association: ISID_2000
Ma Index: 1
CCM interval: 1000 ms
ESI isid_1 ISID : 2000
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
MEP  Direction MAC                PORT          PORT-STATUS-TLV
====  =====  =====  =====  =====
1    DOWN          0000.0011.86d1 ethe 1/1      N

device#show cfm
Domain: ISID_domain
Index: 1
Level: 3
Maintenance association: ISID_2000
Ma Index: 1
CCM interval: 1000 ms
ESI isid_1 ISID : 2000
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
MEP  Direction MAC                PORT          PORT-STATUS-TLV
====  =====  =====  =====  =====
2    DOWN          0000.00ef.2a0b ethe 1/2      N
```

## Show cfm connectivity

Use the **show cfm connectivity** command to display the cfm connectivity configuration.

### Syntax: show cfm connectivity

```
device#show cfm connectivity
Domain: ISID_domain Index: 1
Level: 3
Maintenance association: ISID_2000
MA Index: 1
CCM interval: 1000 ms
ESI: isid_1 ISID: 2000
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
RMEP MAC                ISID  AGE  PORT  SLOTS  STATE  AIS_STATE
====  =====  =====  =====  =====  =====  =====
2    0000.00ef.2a0b 2000  231  1/1    1      OK      None

device#show cfm connectivity
Domain: ISID_domain Index: 1
Level: 3
Maintenance association: ISID_2000
MA Index: 1
CCM interval: 1000 ms
ESI: isid_1 ISID: 2000
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
RMEP MAC                ISID  AGE  PORT  SLOTS  STATE  AIS_STATE
```

```
=====
1      0000.0011.86d1 2000 317 1/2 1      OK      None
```

## Loopback Messages

### CFM loopback

Use the **cfm loopback** command to display loopback messages.

**Syntax:** **cfm loopback domain** *domain-name* **ma** *ma-name* **src-mep** *ID* **target-mep** *ID*

The following output shows the Loopback messages.

```
device#cfm loopback domain ISID_domain ma ISID_2000 src-mep 1 target-mep 2
DOT1AG: Sending 10 Loopback to 0000.00ef.2a0b, timeout 10000 msec
Type Control-c to abort
Reply from 0000.00ef.2a0b: time=1ms
Reply from 0000.00ef.2a0b: time<1ms
sent = 10 number = 10 A total of 10 loopback replies received.
Success rate is 100 percent (10/10), round-trip min/avg/max=0/0/1 ms.
```

### CFM linktrace

Use the **cfm linktrace** command to display linktrace messages.

**Syntax:** **cfm linktrace domain** *domain-name* **ma** *ma-name* **src-mep** *ID* **target-mep** *ID*

The following output shows the linktrace messages.

```
device#cfm linktrace domain ISID_domain ma ISID_2000 src-mep 1 target-mep 2
Linktrace to 0000.00ef.2a0b on Domain ISID_domain, level 3: timeout 10ms, 8 hops
-----
Hops MAC Ingress Ingress Action Relay Action
Forwarded Egress Egress Action Nexthop
-----
Type Control-c to abort
1 0000.00ef.2a0b 1/2 IgrOK RLY_HIT
Not Forwarded
Destination 0000.00ef.2a0b reached
```

## Delay-Measurement

### CFM delay\_measurement

Use the **cfm delay\_measurement** command to display the delay measurement and delay variation using ISID.

**Syntax:** **cfm delay\_measurement domain** *domain-name* **ma** *ma-name* **src-mep** *ID* **target-mep** *ID*

The following output shows the delay measurement and delay variation using ISID.

```
device#cfm delay_measurement domain ISID_domain ma ISID_2000 src-mep 1 target-mep 2
Y1731: Sending 10 delay_measurement to 0000.00ef.2a0b, timeout 1000 msec tras=0
Type Control-c to abort
Reply from 0000.00ef.2a0b: time= 35.295 us
Reply from 0000.00ef.2a0b: time= 35.400 us
Reply from 0000.00ef.2a0b: time= 35.115 us
```

```

Reply from 0000.00ef.2a0b: time= 35.265 us
Reply from 0000.00ef.2a0b: time= 35.040 us
Reply from 0000.00ef.2a0b: time= 35.265 us
Reply from 0000.00ef.2a0b: time= 35.190 us
Reply from 0000.00ef.2a0b: time= 35.325 us
Reply from 0000.00ef.2a0b: time= 35.280 us
Reply from 0000.00ef.2a0b: time= 35.205 us
sent = 10 number = 10 A total of 10 delay measurement replies received.
Success rate is 100 percent (10/10)
=====
Round Trip Frame Delay Time : min = 35.040 us avg = 35.238 us max = 35.400 us
Round Trip Frame Delay Variation : min = 45 ns avg = 146 ns max = 285 ns
=====

```

## Link MA

Link MA can be used to monitor connectivity between any two Links in the network. It can be configured between any links since it is independent of the VLAN.

- The CCM interval for a sub-second timer is supported for CER with PBIF Support.
- Loopback and delay measurement messages are supported for Link MA.

## Configuring Link MA

The below step captures the CFM configuration for Link MA

1. Domain configuration.

```
device(config-cfm)#domain-name d7 level 7
```

**Syntax:** domain-name *name* level *value*

2. MA configuration.

```
device(config-cfm-md-d7)#ma-name link link-ma priority 7
```

**Syntax:** ma-name *name* link-ma priority *value*

3. MEP configuration.

```
device(config-cfm-md-d7-ma-link)#mep 1 down port eth 1/1
```

**Syntax:** mep *ID dir* port *portID*

4. Individual -link monitor configuration.

```
device(config-cfm-md-erp-ma-ma-erp)#individual-link-monitoring
```

**Syntax:** [no] individual-link-monitor

## Sample Link MA configuration

The following sample configuration shows the Link Monitoring between DUT1 and DUT2. It also shows the Link Monitoring between DUT2 and DUT3.

### DUT1

```

device(config)#cfm-enable
device(config-cfm)#domain-name d7 level 7
device(config-cfm-md-d7)#ma-name link link-ma priority 7

```

```
device(config-cfm-md-d7-ma-link)#ccm-interval 1-second
device(config-cfm-md-d7-ma-link)#mep 1 down port eth 1/1
```

## DUT2

```
device(config)#cfm-enable DUT_2(config-cfm)#domain-name d7 level 7
device(config-cfm-md-d7)#ma-name link link-ma priority 7
device(config-cfm-md-d7-ma-link)#ccm-interval 1-second
device(config-cfm-md-d7-ma-link)#mep 3 down port eth 1/1
deviceconfig-cfm-md-d7-ma-link)#mep 4 down port eth 1/2
```

## DUT3

```
device(config)#cfm-enable
device(config-cfm)#domain-name d7 level 7
device(config-cfm-md-d7)#ma-name link link-ma priority 7
device(config-cfm-md-d7-ma-link)#ccm-interval 1-second
device(config-cfm-md-d7-ma-link)#mep 2 down port eth 1/2
```

## Show commands

The following **show** commands provide output for each component of the sample configuration.

### Show cfm

Use the **show cfm** command to display the cfm configuration.

#### Syntax: show cfm

```
device#show cfm
Domain: d7
Index: 1
Level: 7
Maintenance association: link
Ma Index: 1
CCM interval: 1000 ms
LINK MA ID: N/A
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
MEP Direction MAC PORT PORT-STATUS-TLV
=====
2 DOWN 0000.0011.86d1 ethe 1/1 N
```

```
device#show cfm
Domain: d7
Index: 1
Level: 7
Maintenance association: link
Ma Index: 1
CCM interval: 1000 ms
LINK MA ID: N/A
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
MEP Direction MAC PORT PORT-STATUS-TLV
=====
3 DOWN 0000.0011.6351 ethe 1/1 N
4 DOWN 0000.0011.634b ethe 1/2 N
```

```
device#show cfm
Domain: d7
Index: 1
Level: 7
Maintenance association: link
Ma Index: 1
```

```

CCM interval: 1000 ms
LINK MA ID: N/A
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
MEP Direction MAC PORT PORT-STATUS-TLV
=====
1 DOWN 0000.00ef.2a0b ethe 1/2 N DUT_3#

```

### Show cfm connectivity

Use the **show cfm connectivity** command to display the cfm connectivity configuration.

#### Syntax: show cfm connectivity

```

device#show cfm connectivity
Domain: d7 Index: 1
Level: 7
Maintenance association: link
MA Index: 1
CCM interval: 1000 ms
LINK MA ID: N/A
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
RMEP MAC VLAN/PEER AGE PORT SLOTS STATE AIS_STATE
=====
3 0000.0011.6351 N/A 696 1/1 1 OK None

```

```

device#show cfm connectivity
Domain: d7 Index: 1
Level: 7
Maintenance association: link
MA Index: 1
CCM interval: 1000 ms
LINK MA ID: N/A
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
RMEP MAC VLAN/PEER AGE PORT SLOTS STATE AIS_STATE
=====
1 0000.00ef.2a0b N/A 799 1/1 1 OK None
2 0000.0011.86d1 N/A 799 1/2 1 OK None

```

```

device#show cfm connectivity
Domain: d7 Index: 1
Level: 7
Maintenance association: link
MA Index: 1
CCM interval: 1000 ms
LINK MA ID: N/A
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
RMEP MAC VLAN/PEER AGE PORT SLOTS STATE AIS_STATE
=====
4 0000.0011.634b N/A 869 1/2 1 OK None

```

### Loop back messages

## CFM loopback

Use the **cfm loopback** command to display loopback messages.

**Syntax:** **cfm loopback domain** *domain-name* **ma** *ma-name* **src-mep** *ID* **target-mep** *ID*

The following output shows the Loopback messages.

```
device#cfm loopback domain d7 ma link src-mep 2 target-mep 3
DOT1AG: Sending 10 Loopback to 0000.0011.6351, timeout 10000 msec
Type Control-c to abort
Reply from 0000.0011.6351: time=1ms
Reply from 0000.0011.6351: time<1ms
sent = 10 number = 10 A total of 10 loopback replies received.
Success rate is 100 percent (10/10), round-trip min/avg/max=0/0/1 ms.
```

## CFM linktrace

Use the **cfm linktrace** command to display linktrace messages.

**Syntax:** **cfm linktrace domain** *domain-name* **ma** *ma-name* **src-mep** *ID* **target-mep** *ID*

The following output shows the linktrace messages.

```
device#cfm linktrace domain d7 ma link src-mep 2 target-mep 3
Link trace functionality is not supported on Link-MA.
```

## Port status TLV

- Port status TLV is carried in every CCM message and it carries the state of transmitting port
- The state can be either 1 or 2
  - 2 - Port state is Forwarding
  - 1 - Port state other than Forwarding
- Port status TLV is supported for sub-second timers from PBIF version 0x56 onwards
- Port status TLV is supported for all type of VLANs
  - CVLAN, SVAN, ISID and BVLAN
- Port status TLV is not applicable for Link MA

## Configuring Port Status TLV

Port status TLV is optional and will be carried in a CCM message only if it is enabled in the MEP configuration. Use the following command to enable port-status-tlv at the MEP level.

**Syntax:** **[no] mep** *id dir* **tlv-type** **port-status-tlv** **port** *portId*

## Sample configuration of Port Status TLV

The following configuration shows the process of enabling port status TLV at the MEP level.

```
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
device(config-cfm-md-customer)#ma-name admin vlan-id 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 1-second
```

```

device(config-cfm-md-customer-ma-admin)#mep 1 down tlv-type port-status-tlv port eth 1/1
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
device(config-cfm-md-customer)#ma-name admin vlan-id 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 1-second
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
device(config-cfm-md-customer)#ma-name admin vlan-id 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 1-second
device(config-cfm-md-customer-ma-admin)#mep 2 down tlv-type port-status-tlv port ethe 1/2

```

## Show commands

The following commands are used to display the port status tlv at MEP.

### Show cfm

Use the **show cfm** command to display the cfm configuration.

#### Syntax: show cfm

```

device#show cfm
Domain: customer
Index: 1
Level: 7
Maintenance association: admin
Ma Index: 1
CCM interval: 1000 ms
VLAN ID: 100
Priority: 7
MEP Direction MAC PORT PORT-STATUS-TLV
==== =====
1 DOWN 0000.0011.86d1 ethe 1/1 Y

device#show cfm
Domain: customer
Index: 1
Level: 7
Maintenance association: admin
Ma Index: 1
CCM interval: 1000 ms
VLAN ID: 100
Priority: 7
MEP Direction MAC PORT PORT-STATUS-TLV
==== =====
2 DOWN 0000.00ef.2a0b ethe 1/2 Y

```

### Show cfm connectivity

Use the **show cfm connectivity** command to display the cfm connectivity configuration.

```
show cfm connectivity
```

The following commands display the received port status tlv state at RMEP.

```

device#show cfm connectivity domain customer ma admin rmep-id 2
Domain: customer Level: 7
Maintenance association: admin VLAN VLAN/VPLS/VLL ID: 100 Priority: 7
CCM interval: 1000 ms
RMEP MAC PORT Oper Age CCM RDI Port Intf Intvl Seq core
=====
2 0000.00ef.2a0b 1/1 OK 547 552 N 2 0 N N N
State Val Cnt Status Status Error Error Fault level

device#
device#show cfm connectivity domain customer ma admin rmep-id 1
Domain: customer Level: 7
Maintenance association: admin VLAN VLAN/VPLS/VLL ID: 100 Priority: 7

```

```
CCM interval: 1000 ms
RMEP MAC          PORT  Oper Age CCM RDI  Port  Intf  Intvl  Seq  core
                State Val Cnt  Status Status Error Error Fault level
=====
1      0000.0011.86d1  1/2  OK   590 590  N    2     0     N     N     N
```

## Remote Defect Indication

Remote Defect Indication (RDI) is a single bit, is carried by CCM to convey the MEPs in MA about reception of CCM messages by receiving MEPs (RMEP)

- The absence of RDI in a CCM indicates that the transmitting MEP is receiving CCMs from all remote MEPs
- The presence of RDI indicates that transmitting MEP is not receiving CCM from one or more RMEPs (one or more RMEP failed is in state) attached to the MEP.
- RDI is supported for all type of VLANs
- CVLAN, SVAN, ISID and BVLAN
- RDI is supported for regular and sub-second CCM intervals

## Limitations

- UPMEP and MIP on C-VLAN ESI is not supported if it is a client of S-VLAN ESI (in Provider Edge).
- UPMEP and MIP on S-VLAN ESI is not supported if it is a client of ISID ESI (in Backbone Edge).
- Sub-second CCM interval is not supported for CES.
- RDI is not applicable for Link MA.

## Sample configuration of Remote Defect Indication

The following sample configuration shows the RDI configuration.

DUT1

```
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
device(config-cfm-md-customer)#ma-name admin vlan-id 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 1-second
device(config-cfm-md-customer-ma-admin)#mep 1 down port eth 1/1
```

DUT2

```
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
device(config-cfm-md-customer)#ma-name admin vlan-id 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 1-second
```

DUT3

```
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
device(config-cfm-md-customer)#ma-name admin vlan-id 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 1-second
device(config-cfm-md-customer-ma-admin)#mep 2 down port ethe 1/2
```

DUT4

```
device(config)#cfm-enable
device(config-cfm)#domain-name customer level 7
device(config-cfm-md-customer)#ma-name admin vlan-id 100 priority 7
device(config-cfm-md-customer-ma-admin)#ccm-interval 1-second
device(config-cfm-md-customer-ma-admin)#mep 3 down port eth 1/3
```

## Show commands

The following **show** commands provide output for each component of the sample configuration.

## Show cfm connectivity

Assume link between DUT 2 and 4 goes down. RMEP(DUT4's MEP) will get failed in DUT1 and DUT3. At this time DUT1 and 2 will start transmitting CCM with RDI bit set since RMEP has failed.

```
device#show cfm connectivity
Domain: customer Index: 1
Level: 7
Maintenance association: admin
MA Index: 1
CCM interval: 1000 ms
VLAN ID: 100
Priority: 7
ETH-AIS TX: DISABLED
ETH-AIS RX: DISABLED
ETH-AIS Interval: 10 sec
RMEP MAC          VLAN/PEER  AGE  PORT  SLOTS  STATE  AIS_STATE
=====
2  0000.00ef.2a0b  100   799  1/1    1    OK      None
3  0000.0011.86d1  100   400  1/1    1    FAILED  None
device#
```

## show cfm connectivity

The **show cfm connectivity** command shows the RDI received by RMEP.

The following command shows the RDI received by RMEP.

```
device#show cfm connectivity domain customer ma admin rmep-id 1
Domain: customer Level: 7
Maintenance association: admin VLAN VLAN/VPLS/VLL ID: 100 Priority: 7
CCM interval: 1000 ms
RMEP MAC          PORT  Oper Age CCM RDI  Port  Intf  Intvl  Seq  core
=====
2  0000.0011.3301  1/2  OK   590 590  Y    0     0     N     N     N

device#
device#show cfm connectivity domain customer ma admin rmep-id 2
Domain: customer Level: 7
Maintenance association: admin VLAN VLAN/VPLS/VLL ID: 100 Priority: 7
CCM interval: 1000 ms
RMEP MAC          PORT  Oper Age CCM RDI  Port  Intf  Intvl  Seq  core
=====
2  0000.00ef.2a0b  1/1  OK   690 590  Y    0     0     N     N     N

device#
```

**Syntax:** `show cfm connectivity domain customer ma admin rmep-id id`

## Frame Loss Measurement

The Frame Loss Measurement feature (ETH-LM) maintains counters of received and transmitted data frames between a pair of MEPs. These counters are used to calculate the frame loss ratio.

Only single-ended ETH-LM, which is used for on-demand OAM, is supported. An MEP sends frames with an ETH-LM request information to its peer MEP and receives frames with ETH-LM reply information from its peer MEP to perform loss measurement. Frames which carry the Loss Measurement Message (LMM) PDU are called LMM frames. Frames which carry the Loss Measurement Reply (LMR) PDU are called LMR frames.

When the Loss Measurement Message (LMM) is configured the Frame Loss Measurement is enabled.

## Device Considerations

Frame loss measurement, One-way delay measurement, and Synthetic loss measurement are not supported on the following Brocade NetIron CES and Brocade NetIron CER Series device models:

- - BR-CER-2024C-4X-RT-AC
- BR-CER-2024C-4X-RT-DC
- BR-CER-2024F-4X-RT-AC
- BR-CER-2024F-4X-RT-DC
- BR-CES-2024C-4X-AC
- BR-CES-2024C-4X-DC
- BR-CES-2024F-4X-AC
- BR-CES-2024F-4X-DC

## LMM over VLAN

Frame Loss Measurement can be done over VLAN where Connectivity Fault Management (CFM) is configured. In this use case, CFM should be enabled and down MEP should be configured on the VLAN end-points which should be monitored. LMM can be configured on the end-points for periodic measurements irrespective of the CFM connectivity. Ensure CFM connectivity is UP and running before the LMM session actually get started. Otherwise, an error will be thrown.

## LMM over VPLS

Frame Loss Measurement can be done over VPLS and VLL where Connectivity Fault Management (CFM) is configured. In this use case, CFM should be enabled and UP MEP should be configured on the VPLS end-points which should be monitored. LMM can be configured on the end-points for periodic measurements irrespective of the CFM connectivity. Ensure CFM connectivity is UP and running before the LMM session actually get started. Otherwise, an error will be thrown.

## Configuration considerations and limitations

As the Frame Loss Measurement feature uses ACL for getting data packet counters, it will be affected as follows:

- When there is an active LMM session and an L2 ACL is getting bounded, there will be some drop or frame loss expected as the LMM ACL is getting re-programmed.
- The responder should be started first before starting the initiator. Otherwise, the LMM packets will be dropped at the responder and no ACLs will be programmed, which may lead to inaccurate results.
- During termination, stop the initiator before the responder. Stopping the responder first may lead to inaccurate results as mentioned in the previous point.
- Only one LMM session will be active per source MEP per priority. This means eight active sessions per source MEP, one active for each priority.
- Maximum of 32 LMM sessions can be created per source MEP (irrespective of the priority).
- Maximum of 100 LMM sessions can be activated per system at any given point of time irrespective of the MD, MA, and MEP.
- LMM functionality not guaranteed if there exists multiple VPLS end points sharing the single peer for that VPLS instance. There should be a single VPLS end point.
- As the measurement is performed in the LP, LMM functionality is not supported over LAG, if member ports are from multiple slots. Loss will be measured only the ports on the same slot.
- If any ACLs are dropped on the same port or vport, the packets matching those ACLs will not be counted or taken into account as the LMM ACLs will be listed below the layer 2 ACLs.

- Protocol packets or packets trapped to CPU are not counted.
- To measure frame loss on untagged endpoints in VPLS, cos 8 should be used which covers all the priorities, as there is no priority carried in the untagged packet. This feature not supported via SNMP as the priority range supported is 0 to 7.
- LMM initiator and responder should monitor on the same priority, otherwise the packet will be discarded on the responder or initiator side which leads to inaccurate results.
- If cos 8 is configured on the source MEP, no other session with different priority is supported as cos 8 already counts all the priorities. Cos 8 not supported via SNMP as it is additional and not as per the standard MIB.
- If the start time is configured without the daily option, it will be shown in the running-config until it is explicitly removed by the "stop now" command.
- LMM over VLL is not supported.
- For Layer 3 traffic, with VPLS the incoming priority in the data packet gets modified by DSCP bits and gets changed in the egress side. As the ingress and egress priorities are different in VPLS data traffic, only cos 8 should be used which monitors on all the priorities.
- For individual packet priority monitoring with VPLS L3 traffic, VLAN PCP and DSCP bits should be the same in the ingress traffic.

## Supported configurations

The following functionalities are common for both VPLS and VLAN endpoints.

### Monitor LMM on demand

The LMM can be started immediately whenever required and can be stopped after some period of time. The frame loss ratio will be calculated after every measurement interval configured and can be viewed whenever required. This use case will be useful whenever the administrator wants to measure immediately (on demand).

### Monitor LMM for a fixed interval of time

The LMM can be configured to start at any fixed time (more than the current time) and can be stopped after some period of time (more than the start time). The frame loss ratio will be calculated after every measurement interval configured and can be viewed whenever required. This use case will be useful whenever the administrator wants to measure at particular time interval.

### Monitor LMM after some relative time

The LMM can be configured to start after any relative time and can be stopped after some period of time (more than the start time). The frame loss ratio will be calculated after every measurement interval configured and can be viewed whenever required. This use case will be useful whenever the administrator wants to trigger the measurement after some duration.

### Monitor LMM daily for fixed interval of time

The LMM can be configured to start daily at any fixed time and stop after some period of time (more than the start time). The frame loss ratio will be calculated after every measurement interval configured and can be viewed whenever required. This use case will be useful whenever the administrator wants to measure daily at particular time interval.

## LMM configurations common for VLAN and VPLS

Before configuring Loss Measurement Message (LMM), Connectivity Fault Management (CFM) must be configured for the VLAN or VPLS. Refer to OAM chapter for the procedures to configure CFM for VLAN or VPLS.

The configuration of Loss Measurement Message (LMM) is the same process for both VLANs and VPLS.

## LMM initiator session configuration

Use the following procedure to configure the LMM initiator session.

1. LMM initiator session creation.

Create the Loss Measurement Message (LMM) session.

```
device(config-cfm)#loss-measurement lmm initiator 1
device(config-cfm-loss-measurement-lmm-initiator-1)#
```

**Syntax:** `lmm initiator session_id`

2. LMM Initiator session configuration.

Configure the LMM session.

```
device(config-cfm-loss-measurement-lmm-initiator-1)#domain md1 ma ma1 src-mep 1 target-mep 2
```

**Syntax:** `domain name ma name src-mep id target-mep id`

3. LMM session CoS configuration.

```
device(config-cfm-loss-measurement-lmm-initiator-1)#Cos 1
device(config-cfm-loss-measurement-lmm-initiator-1)#
```

**Syntax:** `Cos value`

4. LMM session Tx-interval configuration.

```
device(config-cfm-loss-measurement-lmm-initiator-1)#Tx-interval 10
device(config-cfm-loss-measurement-lmm-initiator-1)#
```

**Syntax:** `Tx-interval timer_value`

5. LMM session measurement-interval configuration.

```
device(config-cfm-loss-measurement-lmm-initiator-1)#Measurement-interval 10
device(config-cfm-loss-measurement-lmm-initiator-1)#
```

**Syntax:** `Measurement-interval timer_value`

6. LMM session threshold configuration

```
device(config-cfm-loss-measurement-lmm-initiator-1)#threshold forward average 5000 maximum 10000
device(config-cfm-loss-measurement-lmm-initiator-1)#threshold backward average 5000 maximum 10000
```

**Syntax:** `threshold forward | backward average value maximum value`

## LMM responder session configuration

Use the following procedure to configure the LMM responder session.

1. LMM responder session creation.

```
device(config-cfm)#loss-measurement lmm responder 1
device(config-cfm-loss-measurement-lmm-responder-1)#
```

**Syntax:** `loss-measurement lmm responder session_id`

2. LMM responder session configuration.

```
device(config-cfm-loss-measurement-lmm-responder-1)#domain md1 ma ma1 src-mep 2 target-mep 1
device(config-cfm-loss-measurement-lmm-responder-1)#
```

**Syntax:** `domain name ma name src-mep id target-mep id`

3. LMM session CoS configuration.

```
device(config-cfm-loss-measurement-lmm-responder-1)#Cos 1
device(config-cfm-loss-measurement-lmm-responder-1)#
```

**Syntax:** `Cos value`

## Starting LMM session responder

Use the **start** command to start the session responder.

```
device(config-cfm-loss-measurement-lmm-responder-1)#start now
```

**Syntax:** `start { now | after HH:MM:SS | HH:MM:SS [ daily ] }`

*now* starts the session immediately.

*after HH:MM:SS* starts the session after the indicated time interval.

*HH:MM:SS* starts the session at the indicated time.

*HH:MM:SS daily* starts the session at the indicated time every day.

## Starting LMM Session Initiator

Use the **start** command to start the session initiator.

```
device(config-cfm-loss-measurement-lmm-initiator-1)#start after 01:10:00
```

**Syntax:** `start[now|afterHH:MM:SS|HH:MM:SS[daily]]`

*now* starts the session immediately.

*after HH:MM:SS* starts the session after the indicated time interval.

*HH:MM:SS* starts the session at the indicated time.

*HH:MM:SS daily* starts the session at the indicated time every day.

No configuration changes are supported once the session is started or triggered. Only the "Stop now" configuration is allowed which stops the session.

Session will not start if the target MEP not available. Session will be started, only if the target MEP is in FAILED state or OK state.

## Stopping LMM Session Responder

Use the **stop** command to stop the session responder.

```
device(config-cfm-loss-measurement-lmm-responder-1)#stop now
```

**Syntax:** `stop { now | after HH:MM:SS | HH:MM:SS [ daily ] }`

*now* stops the session immediately.

*after HH:MM:SS* stops the session after the indicated time interval.

*HH:MM:SS* stops the session at the indicated time.

*HH:MM:SS daily* stops the session at the indicated time every day.

## Stopping LMM Session Initiator

Use the **stop** command to stop the session initiator.

```
device(config-cfm-loss-measurement-lmm-initiator-1)#stop now
```

**Syntax:** **stop** { **now** | **after** *HH:MM:SS* | *HH:MM:SS* [ **daily** ] }

*now* stops the session immediately.

*after HH:MM:SS* stops the session after the indicated time interval.

*HH:MM:SS* stops the session at the indicated time.

*HH:MM:SS daily* stops the session at the indicated time every day.

## Configuration examples

### Configuration example for LMM over VLAN

#### CE-1 Configuration

```
device(config)# cfm
device(config-cfm)#loss-measurement lmm initiator 1
device(config-cfm-loss-measurement-lmm-initiator-1)#domain md1 ma ma1 src-mep 3 target-mep 4
device(config-cfm-loss-measurement-lmm-initiator-1)#Cos 2
device(config-cfm-loss-measurement-lmm-initiator-1)#tx-interval 10
device(config-cfm-loss-measurement-lmm-initiator-1)#measurement-interval 10
```

#### CE-2 Configuration

```
device(config)# cfm
device(config-cfm)# loss-measurement lmm responder 1
device(config-cfm-loss-measurement-lmm-responder-1)#domain md1 ma ma1 src-mep 4 target-mep 3
device(config-cfm-loss-measurement-lmm-responder-1)#Cos 2
```

### Configuration example for VPLS tagged endpoints

#### PE-1 Configuration (Initiator)

```
device(config-cfm)# loss-measurement lmm initiator 1
device(config-cfm-loss-measurement-lmm-initiator-1)#domain md1 ma ma1 src-mep 3 target-mep 4
device(config-cfm-loss-measurement-lmm-initiator-1)#Cos 2
device(config-cfm-loss-measurement-lmm-initiator-1)#tx-interval 10
device(config-cfm-loss-measurement-lmm-initiator-1)#measurement-interval 10
```

#### PE-2 Configuration (Responder)

```
device(config-cfm)# loss-measurement lmm responder 1
device(config-cfm-loss-measurement-lmm-responder-1)#domain md1 ma ma1 src-mep 4 target-mep 3
device(config-cfm-loss-measurement-lmm-responder-1)#Cos 2
```

### Configuration example for VPLS untagged endpoints

#### PE-1 Configuration (Initiator)

```
device(config-cfm)# loss-measurement lmm initiator 1
device(config-cfm-loss-measurement-lmm-initiator-1)#domain md1 ma ma1 src-mep 3 target-mep 4
device(config-cfm-loss-measurement-lmm-initiator-1)#Cos 8
```

```
device(config-cfm-loss-measurement-lmm-initiator-1)#tx-interval 10
device(config-cfm-loss-measurement-lmm-initiator-1)#measurement-interval 10
```

### PE-2 Configuration (Responder)

```
device(config-cfm)# loss-measurement lmm responder 1
device(config-cfm-loss-measurement-lmm-responder-1)#domain md1 ma ma1 src-mep 4 target-mep 3
device(config-cfm-loss-measurement-lmm-responder-1)#Cos 8
```

## Configuration example for VPLS tagged and untagged endpoints

### PE-1 Configuration (Initiator)

```
device(config-cfm)# loss-measurement lmm initiator 1
device(config-cfm-loss-measurement-lmm-initiator-1)#domain md1 ma ma1 src-mep 3 target-mep 4
device(config-cfm-loss-measurement-lmm-initiator-1)#Cos 8
device(config-cfm-loss-measurement-lmm-initiator-1)#tx-interval 10
device(config-cfm-loss-measurement-lmm-initiator-1)#measurement-interval 10
```

### PE-2 Configuration (Responder)

```
device(config-cfm)# loss-measurement lmm responder 1
device(config-cfm-loss-measurement-lmm-responder-1)#domain md1 ma ma1 src-mep 4 target-mep 3
device(config-cfm-loss-measurement-lmm-responder-1)#Cos 8
```

## Starting LMM Sessions

Start the responder before starting the initiator.

### CE-2 Configuration

```
device(config)# cfm
device(config-cfm)# loss-measurement lmm responder 1
device(config-cfm-loss-measurement-lmm-responder-1)#start now
```

### CE-1 Configuration

```
device(config)# cfm
device(config-cfm)# loss-measurement lmm initiator 1
device(config-cfm-loss-measurement-lmm-initiator-1)#start now
```

## Stopping LMM Sessions

Stop the initiator before stopping the responder.

### CE-1 Configuration

```
device(config)# cfm
device(config-cfm)# loss-measurement lmm initiator 1
device(config-cfm-loss-measurement-lmm-initiator-1)#stop now
```

### CE-2 Configuration

```
device(config-cfm)# loss-measurement lmm responder 1
device(config-cfm-loss-measurement-lmm-responder-1)#stop now
```

## Clearing history statistics per session

```
device(config-cfm)# loss-measurement lmm initiator 1
device(config-cfm-loss-measurement-lmm-initiator-1)#clear-stat
```

## Clearing history statistics globally

```
device(config-cfm)# loss-measurement clear-stat
```

## Syslog messages

Syslogs will be raised for the following cases:

- When the LMM session is started.
- When the LMM session is stopped.
- When the Average Frame Loss Ratio is greater than the Threshold Average Frame Loss Ratio.
- When the Maximum Frame Loss Ratio is greater than the Threshold Maximum Frame Loss Ratio.

## Syslog message display output

The following are the Syslog message outputs displayed for various cases:

When the LMM session started

```
<Syslog>: Y.1731: The LMM session started for MA index 1, MD index 1, MEP id 2 Session index 1
```

When the LMM session stopped

```
<Syslog>: Y.1731: The LMM session started for MA index 1, MD index 1, MEP id 2 Session index 1
```

When the Average Frame Loss Ratio greater than Threshold Average Frame Loss Ratio

```
<Syslog>: Y.1731: The LMM session for MA index 1, MD index 1, MEP id 2 Session index 1 has crossed the forward average threshold value, with value 35000.
```

When the Maximum Frame Loss Ratio greater than Threshold Maximum Frame Loss Ratio

```
<Syslog>: Y.1731: The LMM session for MA index 1, MD index 1, MEP id 2 Session index 1 has crossed the forward maximum threshold value, with value 60000.
```

## One-way Delay Measurement

One-way delay measurement can be used for on-demand or proactive OAM to measure frame delay and frame delay variation. Frame delay and frame delay variation measurements are performed by sending periodic frames with Ethernet Delay Measurement information to the peer MEP and receiving frames with Ethernet Delay Measurement information from the peer MEP during proactive measurement session and/or the diagnostic interval. Each MEP may perform frame delay and frame delay variation measurement.

When a MEP is enabled to generate frames with one-way delay measurement information, it periodically sends frames with one-way delay measurement information to its peer MEP in the same ME. When a MEP is enabled to generate frames with one-way delay measurement information, it also expects to receive frames with one-way delay measurement information from its peer MEP in the same ME.

A MIP is transparent to the frames with one-way delay measurement information and therefore does not require any information to support one-way delay measurement functionality.

A MEP transmits frames with one-way delay measurement information with the following information element:

- TxTimeStampf: Timestamp at the transmission time of one-way delay measurement frame

The receiving MEP can compare this value with the RxTimeef, the time at the reception of a one-way delay measurement frame and calculate the one-way frame delay as:

- Frame Delay = RxTimeef - TxTimeStampf

## Configuration considerations

- Only one one-way delay measurement session will be active per source MEP per priority.
- Maximum of 32 one-way delay measurement sessions can be created per source MEP.
- Maximum of 100 one-way delay measurement sessions can be activated per system at any given point of time.
- There can be maximum 16 one-way delay measurement sessions (8 Initiator sessions and 8 Receiver sessions) which can be active per MEP.
- The one-way delay measurement receiver session should be started before starting the initiator session. Otherwise, the one-way delay measurement packets will be dropped at the receiver, which may lead to inaccurate results.
- The NTP should be disabled and the system clock should be set explicitly through CLI when the one-way delay has to be measured between a Brocade device and another vendor device.

## One-way Delay Measurement

In this case, each MEP sends frame with one-way Ethernet Delay Measurement information to its peer MEP to facilitate one-way frame delay and/or one-way frame delay variation measurements at the peer MEP.

## One-way Delay Measurement transmission

When configured for one-way delay measurement, a MEP periodically transmits one-way delay measurement frames with the TxTimeStampf value.

## One-way Delay Measurement reception

When configured for one-way delay measurement, a MEP, upon receiving a valid one-way delay measurement frame, uses the following values to make one-way frame delay measurement. A one-way delay measurement frame with a valid MEG level and a destination MAC address equal to the receiving MEP's MAC address is considered to be a valid one-way delay measurement frame. These values serve as input to the one-way frame delay variation measurement:

- One-way delay measurement frame's TxTimeStampf value
- RxTimef, which is the time at reception of the one-way delay measurement frame
- $\text{Frame Delayone-way} = \text{RxTimef} - \text{TxTimeStampf}$

## Use Cases

The following use cases are supported for one-way delay measurement.

### One-way Delay Measurement over VLAN

One-way delay measurement can be done over VLAN where CFM is configured. In this use case, CFM should be enabled and the down MEP should be configured on the VLAN end-points (tagged ports) for periodic measurements irrespective of the CFM connectivity. Verify CFM connectivity is up and running before the one-way delay measurement session is actually started. Otherwise, this may cause an error.

#### NOTE

The one-way delay measurement should be configured over CFM, where CFM should be configured over the VLAN and the down MEPs should be configured only on the tagged ports.

## One-way Delay Measurement over VPLS

One-way delay measurement can be done over VPLS where CFM is configured. In this use case, CFM should be enabled and the up MEP should be configured on the VPLS end-points which should be monitored. One-way delay measurement can be configured on the end-points for periodic measurements irrespective of the CFM connectivity. Ensure CFM connectivity is up and running before the one-way delay measurement session is actually started. Otherwise, this may cause an error.

### NOTE

If the VPLS end is configured as an untagged port, then the one-way delay measurement packet will be considered as no priority and one-way delay measurement will be measured with priority 8. If priority 8 is configured for the one-way delay measurement session, then all the other priority one-way delay measurement sessions under the same MEP will not be allowed.

## One-way Delay Measurement over VLL

One-way delay measurement can be done over VLL where CFM configured. In this use case, CFM should be enabled and the up MEP should be configured on the VLL end-points which should be monitored. One-way delay measurement can be configured on the end-points for periodic measurements irrespective of the CFM connectivity. Ensure CFM connectivity is up and running before the one-way delay measurement session is actually started. Otherwise, this may cause an error.

## Supported configurations

The following are the additional supported configurations for monitoring one-way delay measurement based on different time intervals. The functionality discussed below are common for both VPLS and VLAN.

### Monitor one-way delay measurement on demand

In this case, one-way delay measurement can be started immediately whenever required and can be stopped after a period of time. The one-way delay will be calculated after receiving each one-way delay measurement packet and delay statistics will be calculated for every measurement interval configured. It can be viewed whenever required. This use case is useful whenever the you want to measure immediately (on demand).

### Monitor one-way delay fixed interval of time

In this case, the one-way delay measurement can be configured to start at any fixed time and can be stopped after a period of time. The one-way delay will be calculated after receiving each one-way delay measurement packet and delay statistics will be calculated for every measurement interval configured. It can be viewed whenever required. This use case is useful whenever the administrator wants to measure at particular time interval.

### Monitor one-way delay after relative time

In this case, the one-way delay measurement can be configured to start after a relative time and can be stopped after a period of time. The one-way delay will be calculated after receiving each one-way delay measurement packet and delay statistics will be calculated every measurement interval configured. It can be viewed whenever required. This use case is useful whenever the administrator wants to trigger the measurement after some duration.

### Monitor one-way delay daily for fixed interval of time

In this case, the one-way delay measurement can be configured to start daily at any fixed time and stop after some period of time. The one-way delay will be calculated after receiving each one-way delay measurement packet and delay statistics will be calculated for every

measurement interval configured. It can be viewed whenever required. This use case is useful whenever the administrator wants to measure daily at particular time interval.

## Configuration procedure

### CFM Configuration for VLAN

#### VLAN Configuration

VLAN Creation.

```
device(config)#vlan 20
device(config-vlan-20)#tagged ethernet 1/1
```

**Syntax:** `vlan id`

#### CFM Configuration

1. Enabling CFM.

```
device(config)#cfm-enable
device(config-cfm)#
```

**Syntax:** `cfm-enable`

2. Domain Configuration

```
device(config)#cfm-enable
device(config-cfm)#domain-name md1 level 7
device(config-cfm-md-md1)#
```

**Syntax:** `domain-name md_name [ id id] level level`

3. MA Configuration

```
device(config-cfm-md-md1)#ma-name ma1 vlan 20 priority 4
device(config-cfm-md-md1-ma-ma1)
```

**Syntax:** `ma-name ma_name [ id id] vlan-id vlan | vpls-id vpls priority priority`

4. MEP Configuration

```
device(config-cfm-md-md1-ma-ma1)#mep 1 down port ethernet 1/1
```

**Syntax:** `mep id { down | up } port ethernet slot/port`

### CFM Configuration for VPLS and VLL

#### Creation of VPLS

```
device(config)#router mpls
device(config-mpls)#vpls vpls100 100
device(config-mpls-vpls-vpls100)#vlan 100
device(config-mpls-vpls-vpls100-vlan-10)#tagged Ethernet 1/1
```

**Syntax:** `vpls vpls-nameid`

**Syntax:** `vlan vlan-id`

**Syntax:** `tagged ethernet slot/port`

## Creation of VLL

```
device(config)#router mpls
device(config-mpls)#vll vll100 100
device(config-mpls-vll-vll100)#vlan 100
device(config-mpls-vll-vll100-vlan-10)#tagged Ethernet 1/1
```

**Syntax:** `vll` *vll-nameid*

**Syntax:** `vlan` *vlan-id*

**Syntax:** `tagged ethernet` *slot/port*

## CFM Configuration

1. Enable CFM.

```
device(config)#cfm-enable
device(config-cfm)#
```

**Syntax:** `cfm-enable`

2. Configure the domain.

```
device(config)#cfm-enable
device(config-cfm)#domain-name md1 level 7
device(config-cfm-md-md1)#
```

**Syntax:** `domain-name` *md\_name id id level level*

3. Configure MA.

```
device(config-cfm-md-md1)#ma-name ma1 vpls-id 100 priority 4
device(config-cfm-md-md1-ma-ma1)#
```

**Syntax:** `ma-name` *ma\_name [ id id ] vlan-id vlan | vpls-id vpls priority priority*

**Ma\_name** - Maintenance Association Name

4. Configure MEP.

```
device(config-cfm-md-md1-ma-ma1)#mep 1 up vlan 100 port ethernet 1/1
```

**Syntax:** `mep` *id down | up vlan vlan port ethernet slot/port*

## One-way delay measurement configuration

### NOTE

The following configuration is common for common for VLAN, VPLS, and VLL.

## One-way delay measurement initiator session configuration

1. One-way delay measurement initiator session creation

```
device(config)#cfm
device(config-cfm)# oneway-dm initiator 1
device(config-cfm-oneway-dm-initiator-1)# domain md1 ma ma1 src-mep 1 target-mep 101
```

**Syntax:** `oneway-dm initiator` *session-index*

*session\_index* - Is used to configure the one-way delay measurement initiator session index (1-1000)

**Syntax:** `domain` *md\_name ma ma\_name src-mep id target-mep id*

*Md\_name* - Domain Name

*Ma\_name* - Maintenance Association Name

*Src-Mep ID* - Source MEP

*Target-MEP ID* - Destination MEP

2. One-way delay measurement initiator session configuration

```
device(config-cfm-oneway-dm-initiator-1)# cos 4
device(config-cfm-oneway-dm-initiator-1)# tx-interval 10
```

**Syntax:** `cos` *value*

**Syntax:** `tx-interval` *sec*

*Cos (value)* - Priority Value (1-7) (optional - Default value 7)

**Tx-interval** options include {start | stop} {now | after <HH:MM:SS> | <HH:MM:SS> | daily}

### One-way delay measurement receiver session configuration

1. One-way delay measurement receiver session creation

```
device(config)# cfm
device(config-cfm)# oneway-dm receiver 1
device(config-cfm-oneway-dm-receiver-1)# domain md1 ma ma1 src-mep 101 target-mep 1
```

**Syntax:** `oneway-dm receiver` *session-index*

**Syntax:** `domain` *md\_name* `ma` *ma\_name* `src-mep` *id* `target-mep` *id*

2. One-way delay measurement receiver session configuration

```
device(config-cfm-oneway-dm-receiver-1)# cos 4
device(config-cfm-oneway-dm-receiver-1)# measurement-interval 10
```

**Syntax:** `cos` *value*

**Syntax:** `measurement-interval` *sec*

3. One-way delay measurement receiver session threshold configuration

```
device(config-cfm-oneway-dm-receiver-1)# threshold max 50
device(config-cfm-oneway-dm-receiver-1)# threshold average 25
```

**Syntax:** `threshold max` *value*

**Syntax:** `threshold average` *value*

### Starting one-way delay measurement receiver session

A receiver session can be started immediately, after a specified amount of time, once at a specific time, or a specific time daily.

```
device(config-cfm-oneway-dm-receiver-1)# start now
```

**Syntax:** `start now` | `after` *HH:MM:SS* | *HH:MM:SS* `daily`

1. Start the one-way delay measurement receiver session after a period of time.

```
device(config-cfm-oneway-dm-receiver-1)# start after 01:30:00
```

The example above will start after 1 hour and 30 minutes.

2. Start IDM Receiver Session exactly at given time.

```
device(config-cfm-oneway-dm-receiver-1)# start 09:30:00
```

The example above will be started exactly at 09:30 AM.

3. Start 1DM Receiver Session daily at given time.

```
device(config-cfm-oneway-dm-receiver-1)# start 09:30:00 daily
```

The example above will be started daily exactly at 09:30 AM.

### Starting the one-way delay measurement session initiator

A session can be started immediately, after a specified amount of time, once at a specific time, or a specific time daily.

```
device(config-cfm-oneway-dm-initiator-1)# start now
```

**Syntax:** start now | after *HH:MM:SS* | *HH:MM:SS* daily

### Stopping the one-way delay measurement initiator session

A session can be stopped immediately, after a specified amount of time, once at a specific time, or a specific time daily.

```
device(config-cfm-oneway-dm-initiator-1)# stop now
```

**Syntax:** stop now | after *HH:MM:SS* | *HH:MM:SS* daily

### Stopping one-way delay measurement receiver session

A receiver session can be stopped immediately, after a specified amount of time, or at a specific time.

```
device(config-cfm-oneway-dm-receiver-1)# stop now
```

**Syntax:** stop now | after *HH:MM:SS* | *HH:MM:SS*

#### NOTE

The one-way delay measurement Receiver session should be started before starting the one-way delay measurement Initiator session. Also, the one-way delay measurement Initiator session should be stopped before stopping the one-way delay measurement Receiver session.

#### NOTE

Relative time is converted to absolute time otherwise it would not point to the expected time after a config-save and reboot. This case is applicable to both start and stop times.

## Configuration examples

### Sample configuration one-way delay measurement over VLAN

#### VLAN configurations:

##### CE-1 Configuration

```
device(config)# interface ethernet 1/1
device(config-if-e10000-1/1)# enable
device(config-if-e10000-1/1)# exit
device(config)# vlan 10
device(config-vlan-10)# tagged ethernet 1/1
```

**CE-2 configuration**

```
device(config)# interface ethernet 1/1
device(config-if-e10000-1/1)# enable
device(config-if-e10000-1/1)# exit
device(config)# vlan 10
device(config-vlan-10)# tagged ethernet 1/1
```

**CFM configurations:****CE-1 configuration**

```
device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vlan 10 priority 4
device(config-cfm-md-md1-ma-mal)# mep 1 down port ethernet 1/1
```

**CE-2 configuration**

```
device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vlan 10 priority 4
device(config-cfm-md-md1-ma-mal)# mep 101 down port ethernet 1/1
```

**One-way delay measurement configurations:****CE-1 Configuration**

```
device(config)# cfm
device(config-cfm)# oneway-dm initiator 1
device(config-cfm-oneway-dm-initiator-1)#domain md1 ma mal src-mep 1 target-mep 2
device(config-cfm-oneway-dm-initiator-1)#tx-interval 10
```

**CE-2 Configuration**

```
device(config)# cfm
device(config-cfm)# oneway-dm receiver 2
device(config-cfm-oneway-dm-receiver-2)# domain md1 ma mal src-mep 2 target-mep 1
device(config-cfm-oneway-dm-receiver-2)# measurement-interval 10
```

**Starting IDM Sessions:****CE-1 Configuration**

```
device(config-cfm-oneway-dm-initiator-1)# start now
```

**CE-2 Configuration**

```
device(config-cfm-oneway-dm-receiver-2)# start now
```

**Stopping IDM Sessions:****CE-1 Configuration**

```
device(config-cfm-oneway-dm-initiator-1)# stop now
```

**CE-2 Configuration**

```
device(config-cfm-oneway-dm-receiver-2)# stop now
```

**Sample Configuration one-way delay measurement over VPLS or VLL**

**VPLS Configurations:****PE-1 Configuration**

```

device(config)# interface ethernet 1/1
device(config-if-e10000-1/1)# enable
device(config-if-e10000-1/1)# exit
device(config)# router mpls
device(config-mpls)# vpls vpls100 100
device(config-mpls-vpls-vpls100)# vlan 10
device(config-mpls-vpls-vpls100-vlan-10)# tagged ethernet 1/1
device(config-mpls-vpls-vpls100-vlan-10)# end

```

**PE-2 Configuration**

```

device(config)# interface ethernet 1/1
device(config-if-e10000-1/1)# enable
device(config-if-e10000-1/1)# exit
device(config)# router mpls
device(config-mpls)# vpls vpls100 100
device(config-mpls-vpls-vpls100)# vlan 10
device(config-mpls-vpls-vpls100-vlan-10)# tagged ethernet 1/1
device(config-mpls-vpls-vpls100-vlan-10)# end

```

**VLL Configurations:****PE-1 Configuration**

```

device(config)# interface ethernet 1/1
device(config-if-e10000-1/1)# enable
device(config-if-e10000-1/1)# exit
device(config)# router mpls
device(config-mpls)# vll vll100 100
device(config-mpls-vll-vll100)# vlan 10
device(config-mpls-vll-vll100-vlan-10)# tagged ethernet 1/1
device(config-mpls-vll-vll100-vlan-10)# end

```

**PE-2 Configuration**

```

device(config)# interface ethernet 1/1
device(config-if-e10000-1/1)# enable
device(config-if-e10000-1/1)# exit
device(config)# router mpls
device(config-mpls)# vll vpls100 100
device(config-mpls-vll-vll100)# vlan 10
device(config-mpls-vll-vll100-vlan-10)# tagged ethernet 1/1
device(config-mpls-vll-vll100-vlan-10)# end

```

**CFM Configurations:****PE-1 Configuration**

```

device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vpls 100 priority 4
device(config-cfm-md-md1-ma-mal)# mep 1 up vlan 10 port ethernet 1/1

```

**PE-2 Configuration**

```

device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vpls 100 priority 4
device(config-cfm-md-md1-ma-mal)# mep 101 up vlan 10 port ethernet 1/1

```

## One-way delay measurement configurations (common for VPLS/VLL)

### NOTE

The one-way delay measurement receiver session should be started first before starting the initiator session. Otherwise, the one-way delay measurement packets will be dropped at the receiver, which may lead to inaccurate results.

### CE-1 Configuration

```
device(config)# cfm
device(config-cfm)# oneway-dm initiator 1
device(config-cfm-oneway-dm-initiator-1)#domain md1 ma mal src-mep 1 target-mep 2
device(config-cfm-oneway-dm-initiator-1)#tx-interval 10
```

### CE-2 Configuration

```
device(config)# cfm
device(config-cfm)# oneway-dm receiver 2
device(config-cfm-oneway-dm-receiver-2)# domain md1 ma mal src-mep 2 target-mep 1
device(config-cfm-oneway-dm-receiver-2)# measurement-interval 10
```

## Starting one-way delay measurement sessions:

### CE-1 Configuration

```
device(config-cfm-oneway-dm-initiator-1)# start now
```

### CE-2 Configuration

```
device(config-cfm-oneway-dm-receiver-2)# start now
```

## Stopping one-way delay measurement sessions:

### CE-1 Configuration

```
device(config-cfm-oneway-dm-initiator-1)# stop now
```

### CE-2 Configuration

```
device(config-cfm-oneway-dm-receiver-2)# stop now
```

## Show commands

The show cfm oneway-dm **session\_index** command is used to display the session for a specified index. If a session index is not specified all available session indices will be displayed.

### Syntax: show cfm oneway-dm session\_index

```
device# show cfm oneway-dm 101
One Way DM Session Index : 101
-----
1DM Session Index      : 101
Status                 : Running
Session Type           : Receiver
Domain                 : MD4
MA                     : MA4.1
Source MEP             : 2
Target MEP             : 1
Cos                    : 2
Measurement-Interval(in M : 30
Start time             : 22:56:41
Start time type        : Immediate
Stop time              : 22:56:22
Stop time type         : Immediate
Threshold Configuration
```

```
-----
Threshold Average      : 0
Threshold Max         : 0
```

The show cfm oneway-dm statistics **session\_index** command is used to display the latest 32 measurement statistics for a specified session index. If a session index is not specified the statistics for all available session indices will be displayed.

```
device# show cfm oneway-dm statistics
```

**Syntax:** show cfm oneway-dm statistics *session\_index*

#### NOTE

The statistics command is valid only for receiver session indices. An error will occur for initiator session indices.

The following information will be displayed in the show command output:

```
device# show cfm oneway-dm statistics
HISTORY TABLE :
Flag - S: Suspect, All measurements are in us unit.
-----
Index Flag Start      Elapsed   Avg Delay   Max Delay   Min Delay   FDV Avg   FDV Max   FDV Min
-----
89  -   16:26:41 00:30:00  708306.712  710750.194  705415.159    99.324   3983.960   59.430
88  -   15:55:41 00:30:00  706484.225  709951.529  703322.004   121.515   6629.525   59.549
87  S   15:26:41 00:30:00  3121638.643 4002430.793  704518.559  18410.613 3297707.009  58.890
86  S   14:55:41 00:30:00  4003266.051 4010147.033 3997113.188   160.754   9650.315   59.085
85  S   14:26:41 00:30:00  4007927.518 4011404.633 4004814.353   125.277   6287.675   59.505
-----
```

#### NOTE

If a one-way delay measurement is skipped for any one-way delay measurement packet within the measurement interval, then it will be marked as suspect.

The show cfm oneway-dm statistics **session\_index row-index row-index** command is used to display details for a specific session index.

**Syntax:** show cfm oneway-dm statistics *session-index row-index row-index*

```
device# show cfm oneway-dm statistics 1 row-index 2
One Way DM Session Index : 1
-----
HISTORY ENTRY :
-----
Row Index      : 2
Flag           : -
Start Time     : 18:27:39
Elapsed Time   : 00:00:11
Valid RX Count : 10
Total RX Count : 10
Avg Delay      :      13.115
Max Delay      :      13.287
Min Delay      :      12.956
Avg Frame Delay Variation :      0.110
Max Frame Delay Variation :      0.218
Min Frame Delay Variation :      0.016
```

## Syslog messages

The following are the Syslog message outputs displayed for various cases:

When the one-way delay measurement session is started.

```
SYSLOG: <time> Y.1731: The DM session started for MA index <ma index>, MD index <md index>, MEP id <med id> Session index <id>
```

When the one-way delay measurement session is stopped.

```
SYSLOG: <time> Y.1731: The DM session stopped for MA index <ma index>, MD index <md index>, MEP id <med id> Session index <id>
```

When the Average delay is greater than the Threshold Average delay.

```
SYSLOG: <timestamp> Y.1731: The DM session for MA index <ma index>, MD index <md index>, MEP id <med id> Session index <id> has crossed the forward average threshold, with value <value>
```

When the Maximum delay is greater than the Threshold Maximum delay.

```
SYSLOG: <timestamp> Y.1731: The DM session for MA index <ma index>, MD index <md index>, MEP id <med id> Session index <id> has crossed the forward maximum threshold, with value <value>
```

When the Destination MEP moves to, or is already in a FAILED state, when the session is Active.

```
<Syslog>: 1DM Session <Id> not started as the RMEP <Id> is in FAILED state.
```

## Synthetic loss measurement

Synthetic loss measurement (SLM) is part of the ITU-T Y.1731 standard. It can be used to periodically measure Frame Loss, Forward Loss Ratio (FLR), and Frame delay between a pair of point to point MEPs. Measurements are made between two MEPs belonging to the same domain and MA.

The procedure involves a Sender MEP sending an SLM Protocol Data Unit (PDU) once per transmit interval (e.g. 1 second, 10 seconds, 1 minute). The Remote MEP responds with a Synthetic Loss Reply (SLR). The messages are used to collect the number of SLMs and SLRs transmitted and received by the two MEPs.

## Configuration considerations

- An MEP instance must be configured before configuring Synthetic loss measurement (SLM).
- A Synthetic loss measurement instance cannot be started if the target MEP is not known. However, the session can start if the remote MEP is known but in a failed state.
- A maximum of 32 SLM sessions can be created per source MEP.
- History data generated after every measurement cycle for a particular SLM session overwrites the oldest entry after 32 history entries.
- Only one Synthetic loss measurement session will be active per source MEP per COS.
- At any point of time a maximum of 100 SLM sessions can be activated on a node. This number is shared across all Y1731 modules.
- A maximum of 1000 SLM sessions can be configured over a system. This number is shared across all Y1731 modules.
- Synthetic loss measurement functionality will not be accurate if VPLS is point to multipoint.
- Synthetic loss measurement support is currently not available for MLX and XMR devices.
- Configuration of tx-interval, measurement interval, threshold, and clear statistics is possible only under the initiator mode.
- The same set of attributes are available under both the initiator and the responder mode, but attribute configuration will be rejected if it does not apply for the selected mode.
- Synthetic loss measurement should not be configured over VLAN untagged ports in the case of a regular VLAN.
- When COS 8 is used on an initiator and responder, a cos value is randomly chosen between 0-7 before transmission of an Synthetic loss measurement (SLM) packet. On the responder side, all SLM packets for the target MEP are accounted for session 8 by ignoring the COS. Similar handling is present for Synthetic Loss Reply (SLR) processing. SLR packet uses the same cos which was present in the incoming SLM packet.

- When synthetic loss measurement is configured over VPLS untagged end-point, only cos 8 can be used.
- The initiator and responder for a particular SLM session should have the same cos configured on both ends.
- Other than an immediate case, the start and stop configuration will always be a part of the running configuration. It is persistent after a reload.
- The stop now command stops any running session. It cancels the start of any scheduled session. In addition, it also resets the start/stop time to "00:00:00" and type to "Immediate" for non-periodic sessions.
- Session configuration cannot be changed when it is running.
- Before configuring any SLM session, ensure the device is configured with the correct date and time. Use the show clock command to verify. Otherwise bring the clock to present time with the set clock hh:mm:ss mm-dd-yy command.
- Synthetic loss measurement (SLM) and Synthetic Loss Reply (SLR) packets are not transmitted or received over blocked ports.

## Commands

The following commands are described for the initiator and the responder.

```
device(config-cfm)#loss-measurement slm initiator
```

**Syntax:** `loss-measurement slm initiator | responder | clear-stat`

Initiator - is used configure synthetic loss measurement parameters on Tx side.

Responder - is used to configure synthetic loss measurement parameters on Responder side.

Clear-stat - is used to clear the history logs globally.

```
device(config-cfm)#loss-measurement slm initiator 1
```

**Syntax:** `loss-measurement slm initiator session_index`

Session\_index - is used to configure the session index in range. The acceptable range is 1 - 1000.

```
device(config-cfm-loss-measurement-slm-initiator-1)# domain
```

**Syntax:** `domain`

Domain - is used to configure the domain name

```
device(config-cfm-loss-measurement-slm-initiator-1)# cos 1
```

**Syntax:** `cos cos`

Cos- is used to configure the priority value. The acceptable range is 1 - 8. The default is 7.

```
device(config-cfm-loss-measurement-slm-initiator-1)# tx-interval 1
```

**Syntax:** `tx-interval interval`

Interval - is used to configure the Tx interval between SLM packets (default - 1sec).

```
device(config-cfm-loss-measurement-slm-initiator-1)# tx-interval 1
```

**Syntax:** `measurement-interval interval`

Interval - is used to configure SLM Measurement interval (default- 15min).

```
device(config-cfm-loss-measurement-slm-initiator-1)# threshold forward
```

**Syntax:** `threshold [ forward | backward ] [ average | maximum ] value`

Default values:

Threshold Forward Average 0xFFFFFFFF milli-percent  
 Threshold Backward Average 0xFFFFFFFF milli-percent  
 Threshold Forward maximum 0xFFFFFFFF milli-percent  
 Threshold Backward maximum 0xFFFFFFFF milli-percent

## Configuration examples

### Sample configuration of synthetic loss measurement over VLAN

#### VLAN Configurations:

##### DUT1 Configuration

```
device(config)# vlan 2
device(config-vlan-2)# tagged ethernet 1/1
```

##### DUT2 Configuration

```
device(config)# vlan 2
device(config-vlan-2)# tagged ethernet 1/1
```

#### CFM Configurations:

##### DUT1 Configuration

```
device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vlan 10 priority 4
device(config-cfm-md-md1-ma-mal)# mep 3 down port ethernet 1/1
```

##### DUT2 Configuration

```
device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vlan 2 priority 4
device(config-cfm-md-md1-ma-mal)# mep 4 down port ethernet 1/1
```

#### SLM Configurations:

##### DUT1 Configuration

```
device(config)# cfm
device(config-cfm)# loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#domain md1 ma mal src-mep 3 target-mep 4
device(config-cfm-loss-measurement-slm-initiator-1)#cos 2
device(config-cfm-loss-measurement-slm-initiator-1)#tx-interval 1
device(config-cfm-loss-measurement-slm-initiator-1)#measurement-interval 1
```

##### DUT2 Configuration

```
device(config)# cfm
device(config-cfm)# loss-measurement slm responder 1
device(config-cfm-loss-measurement-slm-responder-1)#domain md1 ma mal src-mep 4 target-mep 3
device(config-cfm-loss-measurement-slm-responder-1)#cos 2
```

### Starting synthetic loss measurement sessions:

#### NOTE

Start the synthetic loss measurement (SLM) session on the responder side before the initiator.

#### DUT2 Configuration (Responder)

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm responder 1
device(config-cfm-loss-measurement-slm-responder-1)#start now
```

#### DUT1 Configuration (Initiator)

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#start now
```

### Stopping synthetic loss measurement sessions:

#### NOTE

Stop the initiator before stopping the responder.

#### DUT1 Configuration

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#stop now
```

#### DUT2 Configuration

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm responder 1
device(config-cfm-loss-measurement-slm-responder-1)#stop now
```

### Clearing loss statistics:

You can clear history statistics on the initiator side at any point of time using the following command.

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#clear-stat
```

You can clear the history statistics globally using the following command.

#### NOTE

When this command is executed, history logs will be cleared for all sessions in the system.

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm clear-stat
```

## Sample configuration - synthetic loss measurement over VPLS

### VPLS Configurations:

#### LER1 Configuration

```
device(config)# router mpls
device(config-mpls)# vpls vpls100 100
device(config-mpls-vpls-vpls100)# vlan 10
device(config-mpls-vpls-vpls100-vlan-10)# tagged ethernet 1/1
device(config-mpls-vpls-vpls100-vlan-10)# end
```

**LER2 Configuration**

```

device(config)# router mpls
device(config-mpls)# vpls vpls100 100
device(config-mpls-vpls-vpls100)# vlan 10
device(config-mpls-vpls-vpls100-vlan-10)# tagged ethernet 1/1
device(config-mpls-vpls-vpls100-vlan-10)# end

```

**CFM Configurations:**

```

device Configuration
device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vpls 100 priority 4
device(config-cfm-md-md1-ma-mal)# mep 3 up vlan 10 port ethernet 1/1

```

**LER2 Configuration**

```

device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vpls 100 priority 4
device(config-cfm-md-md1-ma-mal)# mep 4 up vlan 10 port ethernet 1/1

```

**Synthetic loss measurement configurations:****LER1 Configuration**

```

device(config)# cfm
device(config-cfm)# loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#domain md1 ma mal src-mep 3 target-mep 4
device(config-cfm-loss-measurement-slm-initiator-1)#cos 2
device(config-cfm-loss-measurement-slm-initiator-1)#tx-interval 1
device(config-cfm-loss-measurement-slm-initiator-1)#measurement-interval 1

```

**LER2 Configuration**

```

device(config)# cfm
device(config-cfm)# loss-measurement slm responder 1
device(config-cfm-loss-measurement-slm-responder-1)#domain md1 ma mal src-mep 4 target-mep 3
device(config-cfm-loss-measurement-slm-responder-1)#cos 2

```

**NOTE**

Start the synthetic loss measurement session on the responder side before the initiator.

**Starting synthetic loss measurement sessions:****LER2 Configuration (Responder)**

```

device(config)# cfm
device(config-cfm)# cfm loss-measurement slm responder 1
device(config-cfm-loss-measurement-slm-responder-1)#start now

```

**LER1 Configuration (Initiator)**

```

device(config)# cfm
device(config-cfm)# cfm loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#start now

```

**Stopping synthetic loss measurement sessions:****NOTE**

Stop the initiator before stopping the responder.

## LER1 Configuration

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#stop now
```

## LER2 Configuration

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm responder 1
device(config-cfm-loss-measurement-slm-responder-1)#stop now
```

## Clearing loss statistics:

You can clear history statistics on the initiator side at any time using the following command.

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#clear-stat
```

You can clear the history statistics globally using the following command.

### NOTE

When this command is executed, history logs will be cleared for all sessions in the system.

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm clear-stat
```

## Sample configuration - Synthetic loss measurement over VLL

### VLL Configurations:

#### LER1 Configuration

```
device(config)# router mpls
device(config-mpls)# vll vll100 100
device(config-mpls-vll-vll100)# vlan 10
device(config-mpls-vll-vll100-vlan-10)# tagged ethernet 1/1
device(config-mpls-vll-vll100-vlan-10)# end
```

#### LER2 Configuration

```
device(config)# router mpls
device(config-mpls)# vll vll100 100
device(config-mpls-vll-vll100)# vlan 10
device(config-mpls-vll-vll100-vlan-10)# tagged ethernet 1/1
device(config-mpls-vll-vll100-vlan-10)# end
```

### CFM Configurations:

#### LER1 Configuration

```
device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vll 100 priority 4
device(config-cfm-md-md1-ma-mal)# mep 3 up vlan 10 port ethernet 1/1
```

#### LER2 Configuration

```
device(config)# cfm-enable
device(config-cfm)# domain md1 level 7
device(config-cfm-md-md1)# ma mal vll 100 priority 4
device(config-cfm-md-md1-ma-mal)# mep 4 up vlan 10 port ethernet 1/1
```

**Synthetic loss measurement configurations:****LER1 Configuration**

```

device(config)# cfm
device(config-cfm)# loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#domain mdl ma mal src-mep 3 target-mep 4
device(config-cfm-loss-measurement-slm-initiator-1)#cos 2
device(config-cfm-loss-measurement-slm-initiator-1)#tx-interval 1
device(config-cfm-loss-measurement-slm-initiator-1)#measurement-interval 1

```

**LER2 Configuration**

```

device(config)# cfm
device(config-cfm)# loss-measurement slm responder 1
device(config-cfm-loss-measurement-slm-responder-1)#domain mdl ma mal src-mep 4 target-mep 3
device(config-cfm-loss-measurement-slm-responder-1)#cos 2

```

**Starting synthetic loss measurement sessions:****NOTE**

Start the synthetic loss measurement (SLM) session on the responder side before the initiator.

**LER2 Configuration (Responder)**

```

device(config)# cfm
device(config-cfm)# cfm loss-measurement slm responder 1
device(config-cfm-loss-measurement-slm-responder-1)#start now

```

**LER1 Configuration (Initiator)**

```

device(config)# cfm
device(config-cfm)# cfm loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#start now

```

**Stopping synthetic loss measurement sessions:****NOTE**

Stop the initiator before stopping the responder.

**LER1 Configuration**

```

device(config)# cfm
device(config-cfm)# cfm loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#stop now

```

**LER2 Configuration**

```

device(config)# cfm
device(config-cfm)# cfm loss-measurement slm responder 1
device(config-cfm-loss-measurement-slm-responder-1)#stop now

```

**Clearing loss statistics:**

You can clear history statistics on the initiator side at any time using the following command.

```

device(config)# cfm
device(config-cfm)# cfm loss-measurement slm initiator 1
device(config-cfm-loss-measurement-slm-initiator-1)#clear-stat

```

You can clear the history statistics globally using the following command.

**NOTE**

When this command is executed, history logs will be cleared for all sessions in the system.

```
device(config)# cfm
device(config-cfm)# cfm loss-measurement slm clear-stat
```

## Show commands

The show cfm loss-measurement slm **session\_index** command is used to display the configuration data for a specified indices.

**Syntax:** show cfm loss-measurement slm *sessionindex*

```
device# show cfm loss-measurement slm 1
-----
SLM Session Index      : 1
Status                 : Stopped
Session Type          : Initiator
Domain                : d1
MA                    : m1
Source MEP            : 20
Target MEP            : 30
Cos                   : 0
Start time            : 16:29:57
Start time type       : Immediate
Stop time             : 16:30:02
Stop time type       : Immediate
Tx-interval (in Sec)  : 1
Measurement-Interval : 1
Forward Average       : 0
Forward Max           : 0
Backward Average      : 0
Backward Max         : 0
-----
```

**TABLE 27** show cfm loss-measurement slm output

Row	Definition
SLM Session Index	Session index value
Status	stopped or running
Session Type	initiator or responder
Domain	domain name
MA	ma name
Source MEP	source mep id
Target MEP	target mep id or RMEP
COS	data priority loss in which needs to be monitored
Start time	Configured start time
Start time type	Immediate, relative, fixed, periodic
Stop time	configured stop time
Stop time type	Immediate, relative, fixed, periodic
Tx interval (sec)	transmission interval in sec, only for initiator
Measurement interval	measurement-interval in minutes, only for initiator
Forward Average	configured forward average threshold, for initiator
Forward Max	configured forward maximum threshold, for initiator
Backward Average	configured backward average threshold, for initiator
Backward Max	configured backward maximum threshold, for initiator

**Syntax: Show cfm loss-measurement slm statistics *sessionindex***

```
device# show cfm loss-measurement slm statistics 1
HISTORY TABLE :
Flag - S:Suspect
-----
```

Index	Flag	Start	Elapsed	TxFwd	RxFwd	TxBck	RxBck	FLR (ratio)	BLR (ratio)
5	-	16:29:56	00:00:05	5	5	5	5	0.00000	0.00000
4	-	16:29:39	00:00:14	14	4	4	4	0.71428	0.00000
3	-	16:29:25	00:00:04	4	0	0	0	1.00000	0.00000
2	-	16:29:17	00:00:03	3	0	0	0	1.00000	0.00000
1	-	16:27:14	00:00:03	3	0	0	0	1.00000	0.00000

```
=====
```

**Syntax: show cfm loss-measurement slm statistics detailed *session\_index rowindex***

```
device# show cfm loss-measurement slm statistics detailed 1 2
HISTORY TABLE :
Flag - S:Suspect
-----
```

Index	: 2
Flag	: -
Start	: 16:29:56
Elapsed	: 00:00:05
TxFwd	: 5
RxFwd	: 5
TxBck	: 5
RxBck	: 5
FLR (ratio) Max	: 0.00000
FLR (ratio) Min	: 0.00000
FLR (ratio) Avg	: 0.00000
BLR (ratio) Max	: 0.00000
BLR (ratio) Min	: 0.00000
BLR (ratio) Avg	: 0.00000

```
-----
```

**Syntax: show cfm loss-measurement slm statistics detailed *session\_index***

```
device# show cfm loss-measurement slm statistics detailed 1
HISTORY TABLE :
Flag - S:Suspect
-----
```

Index	: 1
Flag	: -
Start	: 16:29:22
Elapsed	: 00:00:05
TxFwd	: 5
RxFwd	: 5
TxBck	: 5
RxBck	: 5
FLR (ratio) Max	: 0.00000
FLR (ratio) Min	: 0.00000
FLR (ratio) Avg	: 0.00000
BLR (ratio) Max	: 0.00000
BLR (ratio) Min	: 0.00000
BLR (ratio) Avg	: 0.00000

```
-----
```

Index	: 2
Flag	: -
Start	: 16:29:56
Elapsed	: 00:00:05
TxFwd	: 5
RxFwd	: 5
TxBck	: 5
RxBck	: 5
FLR (ratio) Max	: 0.00000
FLR (ratio) Min	: 0.00000
FLR (ratio) Avg	: 0.00000
BLR (ratio) Max	: 0.00000
BLR (ratio) Min	: 0.00000

```
BLR(ratio) Avg          : 0.00000  
-----
```

## Syslog messages

Syslogs will be raised for the following cases:

When the SLM session started

```
<Syslog>: SLM Session started for Session Index <id>
```

When the SLM session stopped

```
<Syslog>: SLM Session stopped for Session Index <id>
```

When the Average Frame Loss Ratio greater than Threshold Average Frame Loss Ratio for both forward and backward case.

```
<Syslog>: SLM Average FLR <value> greater than Threshold Average FLR <value>.
```

When the Maximum Frame Loss Ratio greater than Threshold Maximum Frame Loss Ratio for both forward and backward case.

```
<Syslog>: SLM Average FLR <value> greater than Threshold Average FLR <value>.
```



# Network Time Protocol

---

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## Network Time Protocol (NTP) overview

Network Time Protocol (NTP) maintains uniform time across all devices in a network. The NTP commands support the configuration of an external time server to maintain synchronization between all local clocks in a network.

NTP has a hierarchical structure. At the highest level, or stratum, are precise hardware clocks, which can synchronize to highly accurate external time reference. These hardware clock devices are known as stratum 0 devices. A stratum 1 time server obtains time directly from a hardware clock and is the most accurate reference in the NTP hierarchy. All lower stratum devices obtain time from the stratum above over a network. As the network introduces timing discrepancies, lower stratum devices are a factor less accurate.

A hierarchical structure allows the overhead of providing time to many clients to be shared among many time servers. Not all clients need to obtain time directly from a stratum 1 reference, but can utilize stratum 2 or 3 references.

NTP operates on a client-server basis. A network time client periodically requests time from a time server. The time server responds with a packet of information containing a time stamp. The time stamp is then used by the client to synchronize its system time.

The NTP client maintains the server and peer state information as an association. The server and peer association is mobilized at startup when a new NTP peer connection is established, or when a user configures an NTP server or peer. The symmetric passive association is mobilized upon arrival of the NTP packet from the peer, which is not statically configured. A syslog message is generated when a new association is mobilized. The statically configured server or peer associations are not demobilized unless the user removes the configuration. If the NTP packet from the symmetric passive peer results in an error or timeout, then the symmetric passive peer is demobilized. A syslog message is generated when an association is demobilized. For more information about the generated syslog messages, refer to [Syslog messages NTP](#) on page 315.

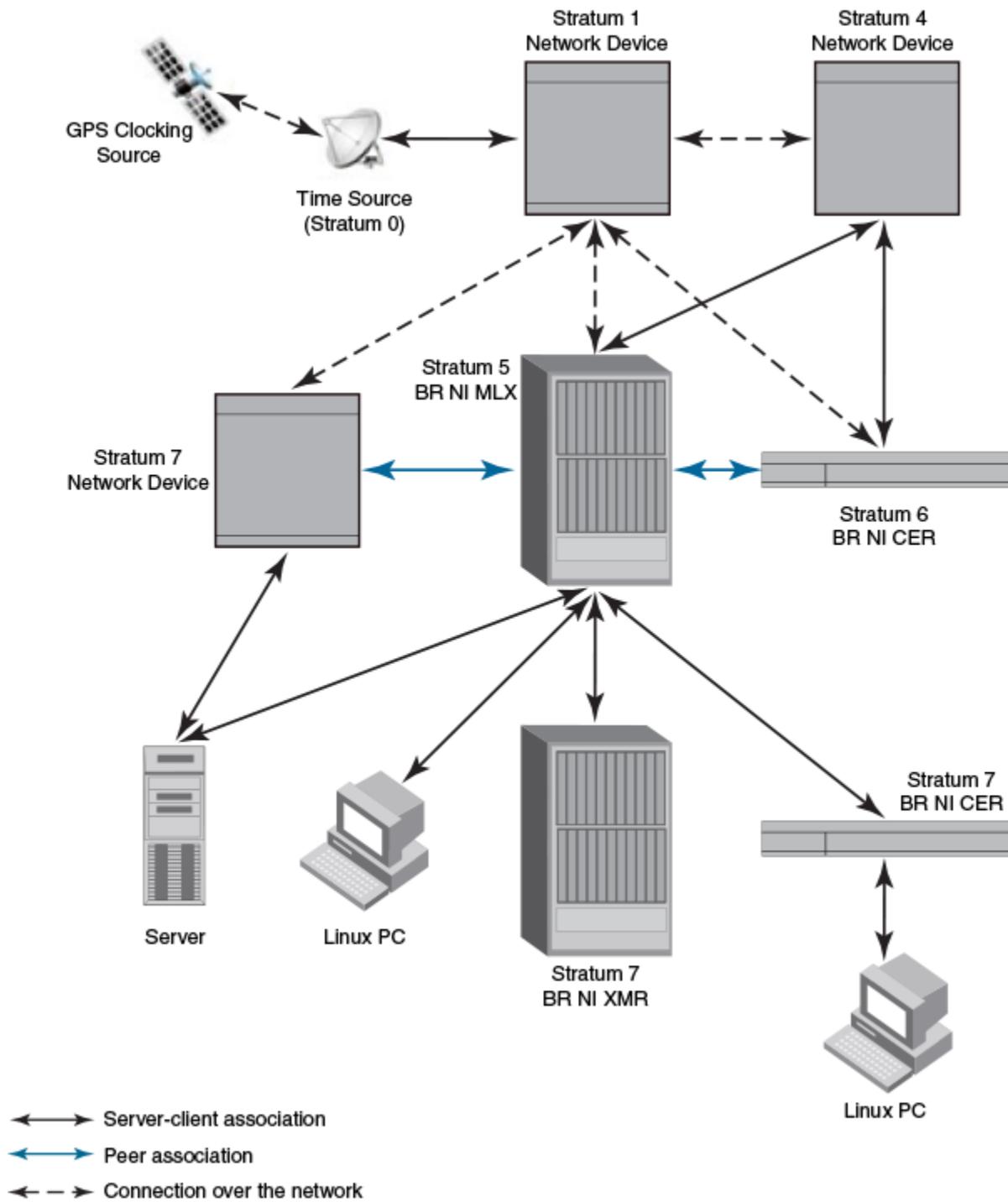
NTP uses UTC (Universal Time Coordinated) time, which is similar to GMT time. It knows nothing of local time zones or daylight-saving time. It is a function of the time client to apply an offset to the supplied time to adjust for local time. In this manner, a time server located anywhere in the world can provide synchronisation to a client located anywhere else in the world. It allows clients to utilize different time zone and daylight-saving properties.

To keep the time in your network current, it is recommended that each device have its time synchronized with at least four external NTP servers. External NTP servers should be synchronized among themselves in order to maintain time synchronization.

### NOTE

Network Time Protocol (NTP) commands must be configured on each individual device.

FIGURE 12 NTP sample network configuration



## Network Time Protocol (NTP) leap second

A leap second is a second added to Coordinated Universal Time (UTC) in order to keep it synchronized with astronomical time (UT1).

There are two main reasons that cause leap seconds to occur. The first is that the atomic second defined by comparing cesium clocks to the Ephemeris Time (ET) scale was incorrect, as the duration of the ephemeris second was slightly shorter than the mean solar second and this characteristic was passed along to the atomic second. The second reason for leap seconds is that the speed of the Earth's rotation is not constant. It sometimes speeds up, and sometimes slows down, but when averaged over long intervals the trend indicates that it is gradually slowing. This gradual decrease in the rotational rate is causing the duration of the mean solar second to gradually increase with respect to the atomic second.

Leap seconds are added in order to keep the difference between UTC and astronomical time (UT1) to less than 0.9 seconds. The International Earth Rotation and Reference Systems Service (IERS), measures Earth's rotation and publishes the difference between UT1 and UTC. Usually leap seconds are added when UTC is ahead of UT1 by 0.4 seconds or more.

## How Brocade MLX supports leap second handling for NTP

The obvious question raised is what happens during the NTP leap second itself.

Specifically, a positive leap second is inserted between second 23:59:59 of a chosen UTC calendar date (the last day of a month, usually June 30 or December 31) and second 00:00:00 of the following date. This extra second is displayed on UTC clocks as 23:59:60. On clocks that display local time tied to UTC, the leap second may be inserted at the end of some other hour (or half-hour or quarter-hour), depending on the local time zone. When ever there is a leap second the NTP server notifies by setting the NTP leap second bits.

On Brocade devices when ever there is a negative leap second, the clock is set once second backward of the following date as described here. On positive leap second the clock suppress second 23:59:59 of the last day of a chosen month, so that second 23:59:58 of that date would be followed immediately by second 00:00:00 of the following date.

Because the Earth's rotation speed varies in response to climatic and geological events, UTC leap seconds are irregularly spaced and unpredictable. Insertion of each UTC leap second is usually decided about six months in advance by the International Earth Rotation and Reference Systems Service (IERS), when needed to ensure that the difference between the UTC and UT1 readings will never exceed 0.9 second.

## How NTP works

### NTP server

A **NTP server** will provide the correct network time on your device using the Network time protocol (NTP). Network Time Protocol can be used to synchronize the time on devices across a network. A NTP time server is used to obtain the correct time from a time source and adjust the local time in each connecting device.

The NTP server can operate in master mode to serve time using the local clock, when it has lost synchronization.

### NTP client

An NTP client gets time responses from an NTP server or servers, and uses the information to calibrate its clock. This consists of the client determining how far its clock is off and adjusting its time to match that of the server. The maximum error is determined based on the round-trip time for the packet to be received.

## NTP peer

NTP peer mode is intended for configurations where a group of devices operate as mutual backups for each other. If one of the devices lose a reference source, the time values can flow from the surviving peers to all the others.

The NTP peer can operate in:

*Symmetric Active* - When the peer is configured using the peer command.

*Symmetric Passive* - Dynamically learnt upon arrival of a NTP packet from the peer which is not configured. The symmetric passive association is removed on timeout or error.

## NTP broadcast server

An NTP server can also operate in a broadcast or multicast mode. Both work similarly; broadcast servers send periodic time updates to a broadcast address, while multicast servers send periodic updates to a multicast address. Using broadcast packets can greatly reduce the NTP traffic on a network, especially for a network with many NTP clients.

The interfaces should be enabled with NTP broadcasting. The NTP broadcast server broadcasts the NTP packets periodically (every 64 sec) to subnet broadcast IP address of the configured interface.

## NTP broadcast client

An NTP broadcast or multicast client listens for NTP packets on a broadcast or multicast address. When the first packet is received, it attempts to quantify the delay to the server in order to better quantify the correct time from later broadcasts. This is accomplished by a series of brief interchanges where the client and server act as a regular (non-broadcast) NTP client and server. Once these interchanges occur, the client has an idea of the network delay and thereafter can estimate the time based only on broadcast packets.

## Synchronizing time

After the system peer is chosen, the system time is synchronized using one of the following ways based on the time difference with system peer:

< 128 msec - The system clock is adjusted slowly towards the system peer time reference time.

> 128 msec and < 1000 sec - The system clock is stepped to the system peer reference time and the NTP state information is cleared.

> 1000 sec - NTP is operationally disabled. The admin should set the time to the current UTC time.

## Configuration considerations of NTP

- NTP multicast server, client, and manycast client functionalities are not supported.
- In a scaled network, Brocade recommends configuring the NetIron device to one external NTP server (at minimum), or a dedicated internal NTP server.
- While upgrading from R05.2.00 or lower versions to R05.3.00, the SNTP configuration will be ignored.
- On reboot or MP switchover, all the NTP state information will be lost and time synchronization will start from fresh. The time synchronized to real time clock is retained across reboot and MP switchover.
- The following SNTP MIB objects are not supported.
  - snNTPPollInterval
  - snNTPSync
  - All the objects in snNTPServerTable
- The web management support for SNTP is removed

## The following optional features are not supported

- NTP version 4 Extension fields
- The NTP packets having control (6) or private (7) packet modes
- Autokey public key authentication
- NTP version 1 and 2
- Hostnames

## Configuring NTP

Before you begin to configure NTP, you must use the **clock set** command to set the time on your device to within 1000 seconds of the coordinated Universal Time (UTC).

## Changing to the NTP mode

Use the **ntp** command to enable the NTP client and server mode.

```
device(config)# ntp
```

**Syntax:** **ntp**

## Enabling NTP authentication

To enable Network Time Protocol (NTP) strict authentication, use the **authenticate** command. To disable the function, use the **no** form of this command.

```
device(config-ntp)# authenticate
```

**Syntax:** **[no] authenticate**

## Defining an authentication key

To define an authentication key for Network Time Protocol (NTP), use the **authentication-key** command. To remove the authentication key for NTP, use the **no** form of this command.

```
device(config-ntp)# authentication-key key-id 1 md5 moof
```

**Syntax:** **[no] authentication-key** *key-id* [**md5**|**sha1**] *keystring*

The valid *key-id* parameter is 1 to 65535.

The **md5** keyword specifies the message authentication support that is provided using the Message Digest 5 Algorithm.

The **sha1** keyword specifies that the SHA1 keyed hash algorithm is used for NTP authentication.

### NOTE

In JITC mode, MD5 authentication scheme is disabled for NTP. For more information on JITC, refer to [JITC overview](#) on page 371

The *keystring* parameter is the value of the MD5 key or SHA1 key. The maximum length of the key string may be defined up to 16 characters. Up to 32 keys may be defined.

## Specifying a source interface

To use a particular source interface in Network Time Protocol (NTP) packets, use the **source-interface** command. To remove the specified source address, use the **no** form of this command.

### NOTE

If the **source-interface** is not configured, then the lowest IP address in the outgoing interface will be used in the NTP packets.

```
device(config-ntp) # source-interface ethernet 3/1
```

**Syntax:** **[no] source-interface ethernet** *slot/port* | **loopback** *num* | **ve** *num*

The **ethernet** *slot/port* parameter specifies the ethernet port number.

The **loopback** *num* parameter specifies the loopback interface number.

The **ve** *number* parameter specifies the virtual port number.

## Enable or disable the VLAN containment for NTP

To enable or disable the VLAN containment for NTP, use the **access-control vlan** command. To remove the specified NTP VLAN configuration, use the **no** form of this command.

### NOTE

The management interface is not part of any VLAN. When configuring the VLAN containment for NTP, it will not use the management interface to send or receive the NTP packets.

```
device(config-ntp) # access-control vlan 100
```

**Syntax:** **[no] access-control vlan** *vlan-id*

The *vlan-id* parameter specifies the VLAN ID number.

## Configuring the NTP client

To configure the device in client mode and specify the NTP servers to synchronize the system clock, use the **server** command. A maximum 8 NTP servers can be configured. To configured NTP server, use the **no** form of this command.

```
device(config-ntp) #server 10.2.3.4 key 1234
```

**Syntax:** **# [no] server** *ipv4address* | *ipv6address* [ **version** 3 | 4 ] [ **key** *keyid* ] [ **minpoll** *interval* ] [ **maxpoll** *interval* ]

The *ipv4 address* / *ipv6 address* parameter is the IP address of the server providing the clock synchronization.

The **version** 3/4 option defines the Network Time Protocol (NTP) version number. If this option is not specified, then it defaults to 4.

The **key** *key id* option defines the authentication key. By default, no authentication key is configured.

The **minpoll** *interval* option is the shortest polling interval. The range is from 4 through 17. Default is 6. The interval argument is power of 2 (4=16s, 5=32s, 6=64s, 7=128s, 8=256s, 9=512s etc.).

The **maxpoll** *interval* option is the longest polling interval. The range is 4 through 17. Default is 10. The interval argument is calculated by the power of 2 (4=16s, 5=32s, 6=64s, 7=128s, 8=256s, 9=512s etc.).

## Configuring the NTP peer

To configure the software clock to synchronize a peer or to be synchronized by a peer, use the **peer** command. A maximum of 8 NTP peers can be configured. To disable this capability, use the **no** form of this command.

```
device(config-ntp) # peer 10.2.3.4 key 1234
```

**Syntax:** `[no] peer ipv4address | ipv6address [ version 3 | 4 ] [ key keyid ] [ minpoll interval ] [ maxpoll interval ]`

The `ipv4 address / ipv6 address` parameter is the IP address of the peer providing the clock synchronization.

The `version 3/4` option defines the Network Time Protocol (NTP) version number. If this option is not specified, then it defaults to 4.

The `key key id` option defines the authentication key. By default, no authentication key is configured.

The `minpoll interval` option is the shortest polling interval. The range is from 4 through 17. Default is 6. The interval argument is power of 2 (4=16s, 5=32s, 6=64s, 7=128s, 8=256s, 9=512s etc.).

The `maxpoll interval` option is the longest polling interval. The range is 4 through 17. Default is 10. The interval argument is calculated by the power of 2 (4=16s, 5=32s, 6=64s, 7=128s, 8=256s, 9=512s etc.).

## Configuring NTP on an interface

To configure the NTP interface context, use the `ntp-interface` command. The broadcast server or client is configured on selected interfaces. To remove the NTP broadcast configurations on the specified interface, use the `no` form of this command.

### NOTE

The `ntp-interface` command is a mode change command, and will not be included in to the `show run output` unless there is configuration below that interface.

```
device(config-ntp)# ntp-interface ethernet 2/13
device(config-ntp-if-e1000-2/13)#

device(config-ntp)# ntp-interface management 1
(config-ntp-mgmt-1)#

device(config-ntp)# ntp-interface ve 100
device(config-ntp-ve-100)#
```

**Syntax:** `[no] ntp-interface [ management 1 | ethernet slot/port | ve id ]`

The `management 1` parameter is the management port 1.

The `ethernet slot/port` parameter specifies the ethernet port number.

The `ve id` parameter specifies the virtual port number.

## Configuring the broadcast client

To configure a device to receive Network Time Protocol (NTP) broadcast messages on a specified interface, use the `broadcast client` command. NTP broadcast client can be enabled on maximum of 16 ethernet interfaces. If the interface is operationally down or NTP is disabled, then NTP broadcast server packets are not received. To disable this capability, use the `no` form of this command.

```
device(config-ntp mgmt-1)# broadcast client
```

**Syntax:** `[no] broadcast client`

## Configuring the broadcast destination

To configure the options for broadcasting Network Time Protocol (NTP) traffic, use the `ntp broadcast destination` command. NTP broadcast server can be enabled on maximum 16 ethernet interfaces and four subnet addresses per interface. If the interface is operationally down or there is no ip address configured for the subnet address, then NTP broadcast server packets are not sent. To disable this capability, use the `no` form of this command.

**NOTE**

This command is not effective, if the NTP server is disabled.

```
device(config)#int m1
device(config-if-mgmt-1)#ip address 10.20.99.173/24
device(config-if-mgmt-1)#ntp
device(config-ntp)#ntp-interface m1
device(config-ntp -mgmt-1)# broadcast destination 10.20.99.0 key 2
```

**Syntax:** `[no] broadcast destination ip-address [ key key-id] [ version 3|4 ]`

The *IP-address* parameter is the IPv4 subnet address of the device to send NTP broadcast messages to.

The **key** *key id* option defines the authentication key. By default, no authentication key is configured.

The **version** *3/4* option defines the Network Time Protocol (NTP) version number. If this option is not specified, then it defaults to 4.

## Disabling NTP

To disable the NTP server and client, use the **disable** command. Disabling the NTP server or client mode will not remove the configurations. To enable receipt of NTP packets, use the **no** form of this command.

```
device(config-ntp)# disable
```

**Syntax:** `[no] disable [ server ]`

If the **server** keyword is specified, then NTP will not serve the time to downstream devices. This keyword disables the NTP server mode functionalities.

If this keyword is not specified, then both NTP client mode and NTP server mode functionalities will be disabled.

## Configuring the master

To configure the Multi-Service IronWare as a Network Time Protocol (NTP) master clock to which peers synchronize themselves when an external NTP source is not available, use the **master** command. The master clock is disabled by default. To disable the master clock function, use the **no** form of this command.

**NOTE**

This command is not effective, if the NTP is enabled in client-only mode.

```
device(config-ntp)# master stratum 5
```

**Syntax:** `[no] master [ stratum number ]`

Stratum *number* is the number from 2 to 15. It indicates the NTP stratum number that the system will claim.

## Enable or disable NTP logging

To enable or disable Network Time Protocol (NTP) message logging, use the **logging enable ntp** command. By default, the logging is enabled for NTP. To disable NTP logging, use the **no** form of this command.

```
device(config)# logging enable ntp
```

**Syntax:** `[no] logging enable ntp`

## Show commands

## Displaying NTP status

Use the **show ntp status** command to display the NTP status

```
device#show ntp status
Clock is synchronized, stratum 4, reference clock is 10.20.99.174
precision is 2**-16
reference time is D281713A.80000000 (03:21:29.3653007907 GMT+00 Thu Dec 01 2011)
clock offset is -2.3307 msec, root delay is 24.6646 msec
root dispersion is 130.3376 msec, peer dispersion is 84.3335 msec
system poll interval is 64, last clock update was 26 sec ago
NTP server mode is enabled, NTP client mode is enabled
NTP master mode is disabled, NTP master stratum is 8
NTP is not in panic mode
```

**TABLE 28** show ntp status command output descriptions

Field....	Description....
synchronized	Indicates the system clock is synchronized to NTP server or peer.
stratum	Indicates the stratum number that this system is operating. Range 2..15.
reference	IPv4 address or first 32 bits of the MD5 hash of the IPv6 address of the peer to which clock is synchronized.
precision	Precision of the clock of this system in Hz.
reference time	Reference time stamp.
clock offset	Offset of clock (in milliseconds) to synchronized peer.
root delay	Total delay (in milliseconds) along path to root clock.
root dispersion	Dispersion of root path.
peer dispersion	Dispersion of root path.
system poll interval	Poll interval of the local system.
last update	Time the router last updated its NTP information
server mode	Status of the NTP server mode for this device.
client mode	Status of the NTP client mode for this device.
master	Status of the master mode
master stratum	Stratum number that will be used by this device when master is enabled and no upstream time servers are accessible.
panic mode	Status of the panic mode. If the clock offset is more than 1000 seconds with the current time, then panic mode will be on.

## Displaying NTP associations

Use the **show ntp associations** command to display detailed association information of the NTP server or peers.

```
device# show ntp associations
address      ref clock      st  when poll reach delay  offset  disp
*~172.19.69.1 172.24.114.33 3   25   64   3      2.89  0.234  39377
~2001:db8::234
      INIT      16  -    64   0      0.00  0.000  15937
* synced, # selected, + candidate, - outlayer, x falseticker, ~ configured
```

**TABLE 29** show ntp associations command output descriptions

Field....	Description....
*	The peer has been declared the system peer and lends its variables to the system variables.
#	This peer is a survivor in the selection algorithm.
+	This peer is a candidate in the combine algorithm.

TABLE 29 show ntp associations command output descriptions (continued)

Field....	Description....
-	This peer is discarded as outlier in the clustering algorithm.
x	This peer is discarded as falteticker in the selection algorithm.
~	The server or peer is statically configured.
address	IPv4 or IPv6 address of the peer.
ref clock	IPv4 address or first 32 bits of the MD5 hash of the IPv6 address of the peer to which clock is synchronized.
St	Stratum setting for the peer.
when	Time, in seconds, since last NTP packet was received from peer.
poll	Polling interval (seconds).
reach	Peer reachability (bit string, in octal).
delay	Round-trip delay to peer, in milliseconds.
offset	Relative time difference between a peer clock and a local clock, in milliseconds.
disp	Dispersion.

## Displaying NTP associations details

Use the **show ntp associations detail** command to display all the NTP servers and peers association information.

```
device# show ntp association detail
2001:db8:99:30::1 configured server, sys peer, stratum 3
ref ID 10.235.61.9, time d288dc3b.f2a17891 (10:23:55.4070668433 Pacific Tue Dec 06 2011)
our mode client, peer mode server, our poll intvl 10, peer poll intvl 10,
root delay 0.08551025 msec, root disp 0.09309387, reach 17, root dist 0.17668502
delay 0.69961487 msec, offset -13.49459670 msec, dispersion 17.31550718,
precision 2**-16, version 4
org time d288df70.a91de561 (10:37:36.2837308769 Pacific Tue Dec 06 2011)
rcv time d288df70.a0c8d19e (10:37:36.2697515422 Pacific Tue Dec 06 2011)
xmt time d288df70.a086e4de (10:37:36.2693194974 Pacific Tue Dec 06 2011)
filter delay      1.7736    0.9933    0.8873    0.6699    0.7709    0.7712    0.7734    6.7741
filter offset    -17.9936   33.0014  -13.6604  -13.4494  -14.4481  -16.4453  -18.4423  -22.0025
filter disp      15.6660    0.0030   17.7730   17.7700   17.6670   17.6640   17.6610   16.6635
filter epoch     55824     56866    55686    55688    55690    55692    55694    55759
```

Use the **show ntp associations detail *IPv4 address* / *IPv6 address*** command to display the NTP servers and peers association information for a specific ip address.

```
device# show ntp association detail 10.99.40.1
10.99.40.1 configured server, candidate, stratum 3
ref ID 10.45.57.38, time d288de7d.690ca5c7 (10:33:33.1762436551 Pacific Tue Dec 06 2011)
our mode client, peer mode server, our poll intvl 10, peer poll intvl 10,
root delay 0.02618408 msec, root disp 0.10108947, reach 3, root dist 0.23610585
delay 0.92163588 msec, offset 60.77749188 msec, dispersion 70.33842156,
precision 2**-16, version 4
org time d288defa.b260a71f (10:35:38.2992678687 Pacific Tue Dec 06 2011)
rcv time d288defa.a2efbd41 (10:35:38.2733620545 Pacific Tue Dec 06 2011)
xmt time d288defa.a2ae54f8 (10:35:38.2729334008 Pacific Tue Dec 06 2011)
filter delay      0.000     6.7770    6.7773    6.7711    6.7720    6.7736    6.7700    0.9921
filter offset      0.000    19.0047   19.1145   19.2245   19.3313   17.4410   15.4463   60.7777
filter disp    16000.000  16.0005   15.9975   15.9945   15.9915   15.8885   15.8855    0.0030
filter epoch     55683     55683    55685    55687    55689    55691    55693    56748
```

**Syntax:** **show ntp association detail *IPv4 address* | *IPv6 address***

The IPv4 or IPv6 address of the NTP peer

TABLE 30 show ntp associations detail command output descriptions

Field....	Description....
server	Indicates server is statically configured.
symmetric active peer	Indicates peer is statically configured.
symmetric passive peer	Indicates peer is dynamically configured.
sys_peer	This peer is the system peer
candidate	This peer is chosen as candidate in the combine algorithm.
reject	This peer is rejected by the selection algorithm
falsetick	This peer is dropped as falseticker by the selection algorithm
outlier	This peer is dropped as outlier by the clustering algorithm
Stratum	Stratum number
ref ID	IPv4 address or hash of IPv6 address of the upstream time server to which the peer is synchronized.
Time	Last time stamp that the peer received from its master.
our mode	This system's mode relative to peer (active /passive /client /server /bdcast /bdcast client).
peer mode	Mode of peer relative to this system
our poll intvl	This system's poll interval to this peer.
peer poll intvl	Poll interval of peer to this system
root delay	The delay along path to root (the final stratum 1 time source).
root disp	Dispersion of path to root.
root distance	The distance from the server or peer to the client
reach peer	The peer reachability (bit string in octal).
Delay	Round-trip delay to peer.
offset	Offset of peer clock relative to this clock
Dispersion	Dispersion of peer clock
precision	Precision of peer clock
version	Peer NTP version number
org time	Originate time stamp of the last packet.
rcv time	Receive time stamp of the last packet.
xmt time	Transmit time stamp of the last packet.
filter delay	Round-trip delay in milliseconds of last 8 samples.
filter offset	Clock offset in milliseconds of last 8 samples.
filter error	Approximate error of last 8 samples

## Configuration Examples

The following sections lists configuration examples to configure the Brocade device.

### NTP server and client mode configuration

Sample CLI commands to configure the NI device in NTP server and client modes.

```
device(config-ntp) # server 10.1.2.3 minpoll 5 maxpoll 10
device(config-ntp) # server 2001:db8::1/64
device(config-ntp) # peer 10.100.12.18
device(config-ntp) # peer 10.100.12.20
```

```
device(config-ntp)# peer 10.100.12.67
device(config-ntp)# peer 10.100.12.83
```

## NTP client mode configuration

Sample CLI commands to configure the Brocade device in NTP client mode.

```
device(config-ntp)# server 10.1.2.3 minpoll 5 maxpoll 10
device(config-ntp)# server 2001:db8::1/24
device(config-ntp)# peer 10.100.12.83
device(config-ntp)# disable serve
```

## NTP strict authentication configuration

Sample CLI commands to configure the Brocade device in strict authentication mode.

```
device(config-ntp)# authenticate
device(config-ntp)# authentication-key key-id1 md5 key123
device(config-ntp)# server 10.1.2.4 key 1
```

## NTP loose authentication configuration

Sample CLI commands to configure the NI device in loose authentication mode. This allows some of the servers or clients to use the authentication keys.

```
device(config-ntp)# authentication-key-id key-id1 md5 key123
device(config-ntp)# server 10.1.2.4 key 1
device(config-ntp)# server 10.1.2.7
```

## NTP interface context for broadcast server or client mode

Sample CLI command enter the NTP interface context.

```
device(config)#int management 1
device(config-if-mgmt-1)#ip address 10.20.99.173/24
device(config-if-mgmt-1)#ntp
device(config-ntp)# ntp-interface management 1
device(config-ntp-mgmt-1)# broadcast destination 10.23.45.128
device(config-ntp)# ntp-interface ethernet 1/3
device(config-ntp-if-e1000-1/3)# broadcast destination 10.1.1.0 key 1
device(config-ntp)# ntp-interface ve 100
device(config-ntp-ve-100)# broadcast destination 10.2.2.0 key 23
```

## NTP broadcast client configuration

Sample CLI commands to configure the NTP broadcast client

```
device(config-ntp)# ntp-interface management 1
device(config-ntp-mgmt-1)# broadcast client
device(config-ntp)# ntp-interface ethernet 1/5
device(config-ntp-if-e1000-1/5)# broadcast client
device(config-ntp)# ntp-interface ve 100
device(config-ntp-ve-100)# broadcast client
```

# Network Configuration Protocol

---

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## NETCONF protocol introduction

The Network Configuration protocol (NETCONF) uses Extensible Markup Language (XML) for automated configuration management. The NETCONF protocol runs on top of a secure transport, such as Secure Shell version 2 (SSHv2). Only one NETCONF session is supported at a time and any new NETCONF connection requests are rejected after the first session has been established.

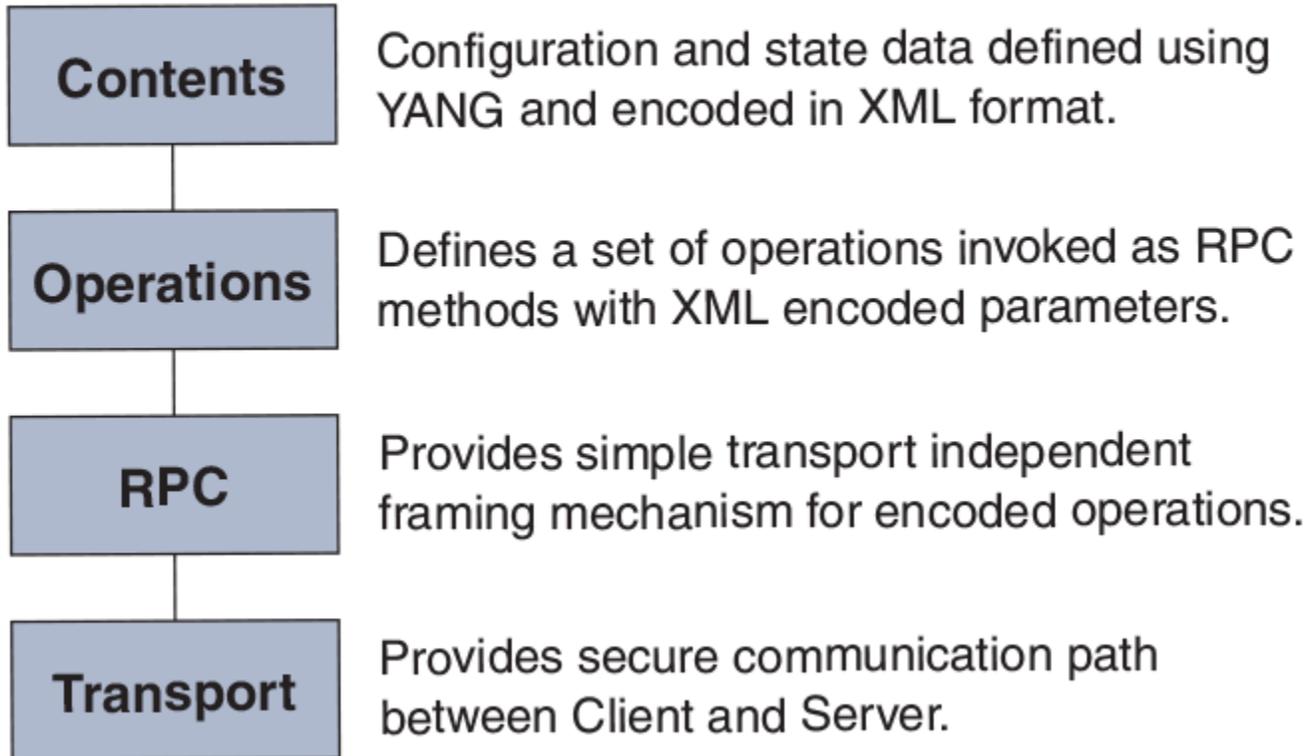
NETCONF provides mechanisms through which you can do the following:

- Manage multiple network devices
- Retrieve full or partial configuration and state data
- Upload and manipulate new configurations

Figure 13 illustrates NETCONF conceptually partitioned into four layers.

FIGURE 13 Four layers of NETCONF

## Four layers of NETCONF



### Platforms

NETCONF is supported on the Brocade NetIron MLX Series, Brocade NetIron XMR Series, Brocade NetIron CER Series, and Brocade NetIron CES Series devices.

### Related documentation

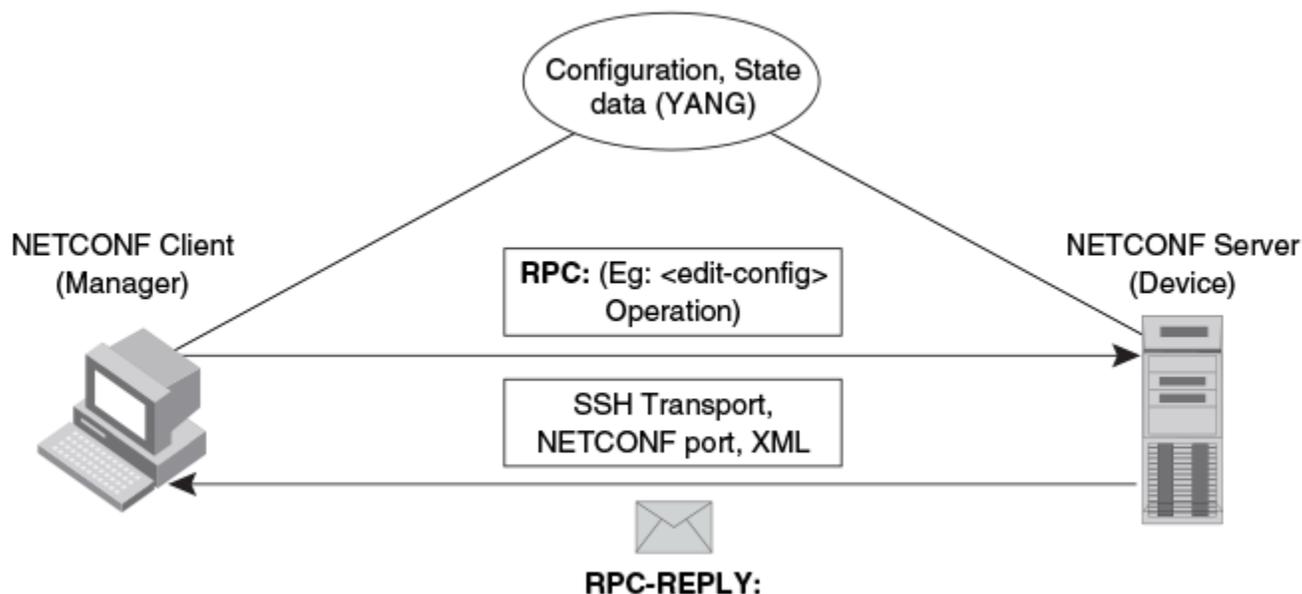
For detailed information about NETCONF, refer to RFC 4741.

For detailed information about using the NETCONF protocol over the Secure Shell (SSH), refer to RFC 4742.

### NETCONF in client/server architecture

The NETCONF protocol uses a Remote Procedure Call (RPC) paradigm to facilitate communication between the client (NETCONF Manager or application) and the server (NETCONF Agent or device). A client encodes an RPC in XML and sends it to a server using a secure, connection-oriented session. The server responds with a reply encoded in XML. [Figure 14](#) illustrates the NETCONF communication between a client and a server.

FIGURE 14 NETCONF communication



The communication between the client and server consists of a series of alternating request and reply messages. The NETCONF peers use `<rpc>` and `<rpc-reply>` elements to provide transport protocol-independent framing of NETCONF requests and responses. The NETCONF server processes the RPC requests sequentially in the order in which they are received.

## RPC request

The `<rpc>` element is used for enclosing a NETCONF request sent from the client to the server. Every `<rpc>` element contains a mandatory attribute, the `message-id`. This attribute has a unique value for every RPC request, and is used to associate every RPC request with the corresponding response. The `message-id` value is a monotonically increasing integer string. The maximum length of the string is 4095 characters. If the `message-id` is not present in the RPC request, the server rejects the request by returning an `<rpc-error>` with the `error-tag` element set to the `missing-attribute`.

If there are any additional attributes present in the RPC request, the NETCONF server returns them unmodified in the corresponding RPC reply.

## RPC reply

An `<rpc-reply>` element is sent in response to every RPC request. The `<rpc-reply>` element contains the mandatory attribute `message-id` copied from the corresponding RPC request, along with any additional attributes that are present in the RPC request.

For successfully processed `get` or `get-config` requests, the response data is encoded as the content of the `<rpc-reply>` element.

For successfully processed `edit-config` or `close-session` requests, the `<ok>` element is encoded as the content of the `<rpc-reply>` element.

For unsuccessful RPC requests, one or more `<rpc-error>` elements are encoded inside the `<rpc-reply>` element.

## RPC and error handling

If the RPC request fails, an `<rpc-error>` element, the first detected error, is encoded inside the `<rpc-reply>` element and sent to the client. The server is not required to detect or report multiple errors. If the server detects multiple errors then the order of the error detection and reporting is at the discretion of the server.

## CLI and SSH subsystem

The NETCONF client must use Secure Shell Version 2 (SSHv2) as the network transport to connect to the NETCONF server. Only the SSHv2 protocol is supported as the NETCONF transport protocol.

To run NETCONF over SSHv2, the client establishes an SSH transport connection using the SSH transport protocol to the NETCONF port. The default NETCONF port is 830. The underlying SSH client and server exchange keys for message integrity and encryption.

The SSHv2 client invokes the `ssh-userauth` service to authenticate the user. All currently supported SSH user authentication methods such as the public-key, password, and keyboard-interactive authentications are supported for a NETCONF session also. If the SSH user authentication is disabled, the user is allowed full access.

On successful user authentication, the client invokes the `ssh-connection` service, also known as the SSH connection protocol. After the SSH session is established, the NETCONF client invokes NETCONF as an SSH subsystem called `netconf`.

## NETCONF user privileges

Every NETCONF session has a corresponding authentication, authorization, and accounting (AAA) session. The AAA attributes apply to the NETCONF session. Only authentication and EXEC authorization are supported. Other forms of accounting and command authorization are not supported.

The privilege level of the user (read-only(5), read-write(0)) is obtained from the AAA server, if it is provided. If the privilege level is not provided by the AAA server, the default privilege level applies for the NETCONF session.

[Table 31](#) provides the mapping between the NETCONF privilege levels and the AAA privilege levels.

**TABLE 31** Privilege levels

AAA privilege level	NETCONF privilege level
0	NETCONF_PRIVILEGE_LEVEL_0
1-5	NETCONF_PRIVILEGE_LEVEL_5

[Table 32](#) provides the mapping between the NETCONF privilege levels and the supported NETCONF operations.

**TABLE 32** NETCONF operations and privilege levels

Operations	NETCONF_PRIVILEGE_LEVEL_0	NETCONF_PRIVILEGE_LEVEL_5
<code>&lt;get&gt;</code>	Yes	Yes
<code>&lt;get-config&gt;</code>	Yes	Yes
<code>&lt;edit-config&gt;</code>	Yes	No
<code>&lt;close-session&gt;</code>	Yes	Yes

## Recommendations for NETCONF

- Use an authentication method to secure the underlying SSH session and to prevent any unauthorized access.
- Use a NETCONF client to generate the RPCs. If you have manually written the XML requests, recycling the XML from a successful request is recommended.

- Refer to the *Brocade NetIron MLX Series and Brocade NetIron Family YANG guide* for XML and data verification.
- Plan the configuration or state information that must be sent or retrieved to avoid sending and receiving large RPC messages.
- Use of a scripting language or other custom interface is recommended.

## Basic NETCONF operations

The NETCONF protocol provides a small set of low-level operations to manage device configurations and retrieve device state information. The base protocol provides operations to retrieve, configure, copy, and delete configuration data stores. Additional operations are provided based on the capabilities advertised by the device.

The following base protocol operations are supported:

- `get`
- `get-config`
- `edit-config`
- `close-session`

### NOTE

Other operations, including `copy-config`, `delete-config`, `lock`, `unlock`, and `kill-session` are not supported.

## Initial connection

Each NETCONF session begins with a handshake in which the NETCONF server and the client specify the NETCONF capabilities they support. The following sections describe how to start a NETCONF session.

### Hello messages

After establishing a secure transport connection, both the NETCONF server and client send a `<hello>` element simultaneously to announce their capabilities and session identifier.

After sending the hello message, the server starts the hello timer (default is 600 seconds) and waits for the hello message from the client. If no hello message is received by the server before the hello timer expires, the server aborts the NETCONF session by closing the underlying SSH session.

The NETCONF server must include the `<session-id>` element, which contains the unique session value for the NETCONF session, in the `<hello>` element. If the client receives the `<hello>` element without the `<session-id>`, the client aborts the NETCONF session by closing the underlying SSH session.

The NETCONF client must not include the `<session-id>` element in the `<hello>` element. If the server receives the `<hello>` element with the `<session-id>`, the server aborts the NETCONF session by closing the underlying SSH session.

The NETCONF client must include a valid `xmlns` attribute in the `<hello>` element. If the server receives the `<hello>` element without a valid `xmlns` attribute, the server aborts the NETCONF session by closing the underlying SSH session.

The NETCONF client must include a base capability. The server receiving the `<hello>` element without a NETCONF base capability aborts the NETCONF session by closing the underlying SSH session.

The server receiving the `<rpc>` element without receiving the `<hello>` element aborts the NETCONF session by closing the underlying SSH session.

The NETCONF client may send arbitrary data before sending a valid hello message. The server discards the data until a valid `<hello>` element is received from the client.

The following is an example for a `<hello>` element from the NETCONF server.

```
<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <capabilities>
    <capability>
      urn:ietf:params:netconf:base:1.0
    </capability>
    <capability>
      urn:ietf:params:netconf:capability:writable-running:1.0
    </capability>
  </capabilities>
  <session-id>4</session-id>
</hello>
```

## Capabilities

A NETCONF capability is a set of protocol extensions that supplements the base NETCONF specification. A NETCONF capability is identified with a Uniform Resource Identifier (URI). Capabilities augment the base operations of the NETCONF server, describing both the additional operations and the contents allowed inside the operations. To support a capability, the NETCONF server must support all the dependent capabilities.

The following capabilities are supported on the NetIron platforms:

- **Base capability:** The base capability is the set of operations and contents that any NETCONF implementation must support. The URI for the base capability is `urn:ietf:params:xml:ns:netconf:base:1.0`. Both the NETCONF client and server must support the base capability.
- **Writable-running capability:** The writable-running capability indicates that the device supports `edit-config` and `copy-config` operations where the `<running>` configuration is the target. The URI is `urn:ietf:params:netconf:capability:writable-running:1.0`.

### NOTE

Other capabilities, including `Candidate Configuration Capability`, `Confirmed Commit Capability`, and `Validate Capability`, are not supported.

## get operation

The NETCONF `<get>` operation retrieves the devices and the state data, or a filtered subset of the data.

If the device can satisfy the request, the server sends an `<rpc-reply>` element containing a `<data>` element with the results of the query. If the request cannot be completed, an `<rpc-error>` element is included in the `<rpc-reply>` element.

## Parameter

The `<get>` operation uses the `filter` parameter. The `filter` parameter specifies the portion of the system data to retrieve. If this parameter is not present, show version information is returned.

## Examples

The following is an example of a `<get>` operation:

```
<nc:rpc message-id="1" xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
  <nc:get>
  </nc:get>
</nc:rpc>
]]>]]>
```

The following is an example of a <get> operation for MPLS state data.

```
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/" message-id="25">
<nc:get>
<nc:filter >
<brcd:netiron-statedata>
<brcd:mpls-statedata/>
</brcd:netiron-statedata>
</nc:filter>
</nc:get>
</nc:rpc>
]]>]]>
```

The following is an example of a <get> operation for a specific LSP.

```
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/" message-id="25">
<nc:get>
<nc:filter nc:type="subtree" >
<brcd:netiron-statedata>
<brcd:mpls-statedata>
<brcd:mpls-lsp-statedata>
<brcd:name>scriptlsp1001</brcd:name>
</brcd:mpls-lsp-statedata>
</brcd:mpls-statedata>
</brcd:netiron-statedata>
</nc:filter>
</nc:get>
</nc:rpc>
]]>]]>
```

```
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/" message-id="25">
<nc:data>
<netiron-statedata xmlns="http://brocade.com/ns/netconf/config/netiron-config/">
<brcd:mpls-statedata>
<brcd:mpls-lsp-statedata>
  <brcd:name>scriptlsp1001</brcd:name>
  <brcd:to>10.0.0.1</brcd:to>
  <brcd:admin-state>
    <brcd:up></brcd:up>
  </brcd:admin-state>
  <brcd:oper-state>
    <brcd:down></brcd:down>
  </brcd:oper-state>
  <brcd:tunnel-intf>tnl0</brcd:tunnel-intf>
  <brcd:up-dn-times>0</brcd:up-dn-times>
  <brcd:retry-no>273</brcd:retry-no>
</brcd:mpls-lsp-statedata>
</brcd:mpls-statedata>
</netiron-statedata>
</nc:data>
</nc:rpc-reply>
]]>]]>
```

The following is an example of a <get> operation for VLAN state data.

```
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/" message-id="25">
<nc:get>
<nc:filter >
<brcd:netiron-statedata>
<brcd:vlan-statedata/>
</brcd:netiron-statedata>
</nc:filter>
</nc:get>
</nc:rpc>
]]>]]>
```

The following is an example of a <get> operation for VLAN 1001.

```
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/" message-id="25">
```

```

<nc:get>
<nc:filter nc:type="subtree" >
<brcd:netiron-statedata>
<brcd:vlan-statedata>
<brcd:vlan>
<brcd:vlan-id>1001</brcd:vlan-id>
</brcd:vlan>
</brcd:vlan-statedata>
</brcd:netiron-statedata>
</nc:filter>
</nc:get>
</nc:rpc>
]]>]]>
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/
config/netiron-config/" message-id="25">
<nc:data>
<netiron-statedata xmlns="http://brocade.com/ns/netconf/config/netiron-config/">
<brcd:vlan-statedata>
<brcd:vlan>
  <brcd:vlan-id>1001</brcd:vlan-id>
  <brcd:vlan-name>scriptVlan1001</brcd:vlan-name>
  <brcd:topo-hw-idx>65535</brcd:topo-hw-idx>
  <brcd:topo-sw-idx>257</brcd:topo-sw-idx>
  <brcd:topo-next-vlan>0</brcd:topo-next-vlan>
  <brcd:port>
    <brcd:port-id>ethernet 1/20 </brcd:port-id>
    <brcd:tag-mode>TAGGED</brcd:tag-mode>
    <brcd:state>DISABLED</brcd:state>
  </brcd:port>
  <brcd:bytes-received>0</brcd:bytes-received>
</brcd:vlan>
<brcd:dual-mode>ethernet 1/1 to 1/20 </brcd:dual-mode>
<brcd:dual-mode>ethernet 2/1 to 2/8 </brcd:dual-mode>
<brcd:dual-mode>ethernet 5/1 to 5/8 </brcd:dual-mode>
<brcd:dual-mode>ethernet 7/1 to 7/8 </brcd:dual-mode>
<brcd:dual-mode>ethernet 8/1 to 8/48 </brcd:dual-mode>
<brcd:dual-mode>ethernet 9/1 to 9/8 </brcd:dual-mode>
<brcd:dual-mode>ethernet 10/1 to 10/8 </brcd:dual-mode>
<brcd:dual-mode>ethernet 11/1 to 11/8 </brcd:dual-mode>
<brcd:dual-mode>ethernet 12/1 to 12/8 </brcd:dual-mode>
<brcd:dual-mode>ethernet 13/1 to 13/8 </brcd:dual-mode>
<brcd:dual-mode>ethernet 14/1 to 14/8 </brcd:dual-mode>
<brcd:dual-mode>ethernet 15/1 to 15/2 </brcd:dual-mode>
<brcd:default-vlan-id>1</brcd:default-vlan-id>
<brcd:control-vlan-id>4095</brcd:control-vlan-id>
<brcd:maximum-port-vlan-entries>4095</brcd:maximum-port-vlan-entries>
</brcd:vlan-statedata>
</netiron-statedata>
</nc:data>
</nc:rpc-reply>
]]>]]>

```

The following is an example of a <get> operation for Interface state data.

```

<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/
netiron-config/" message-id="25">
<nc:get>
<nc:filter >
<brcd:netiron-statedata>
<brcd:interface-statedata/>
</brcd:netiron-statedata>
</nc:filter>
</nc:get>
</nc:rpc>
]]>]]>

```

The following is an example of a <get> operation for a specific Interface state data.

```

<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/
netiron-config/" message-id="25">
<nc:get>

```

```

<nc:filter nc:type="subtree" >
<brcd:netiron-statedata>
<brcd:interface-statedata>
<brcd:interface>
<brcd:interface-id>ethernet 1/20</brcd:interface-id>
</brcd:interface>
</brcd:interface-statedata>
</brcd:netiron-statedata>
</nc:filter>
</nc:get>
</nc:rpc>
]]>]]>
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/
config/netiron-config/" message-id="25">
<nc:data>
<netiron-statedata xmlns="http://brocade.com/ns/netconf/config/netiron-config/">
<brcd:interface-statedata>
<brcd:interface>
  <brcd:interface-id>ethernet 1/20</brcd:interface-id>
  <brcd:link-state>
    <brcd:down></brcd:down>
  </brcd:link-state>
  <brcd:l2-state>
    <brcd:disabled></brcd:disabled>
  </brcd:l2-state>
  <brcd:duplex>
    <brcd:none></brcd:none>
  </brcd:duplex>
  <brcd:speed></brcd:speed>
  <brcd:tag-mode>
    <brcd:yes></brcd:yes>
  </brcd:tag-mode>
  <brcd:priority-level>
    <brcd:level0></brcd:level0>
  </brcd:priority-level>
  <brcd:mac-address>0000.0085.2d00</brcd:mac-address>
</brcd:interface>
</brcd:interface-statedata>
</netiron-statedata>
</nc:data>
</nc:rpc-reply>
]]>]]>

```

## get-config operation

The NETCONF `<get-config>` operation retrieves all or part of a configuration from the source data store. The `<get-config>` operation is similar to the **show running-config** command.

If the device can satisfy the request, the server sends an `<rpc-reply>` element containing a `<data>` element with the results of the query. If the request cannot be completed, an `<rpc-error>` element is included in the `<rpc-reply>` element.

## Parameters

The parameters used for `<get-config>` are as follows:

- `source`: Name of the configuration data store being queried, such as `<running/>`. Only running configuration data store is supported.
- `filter`: Specifies the portions of the device configuration to retrieve. If this parameter is not present, no configuration is returned. The `filter` parameter must contain a `type` attribute. This attribute indicates the type of filtering syntax used within the `filter` parameter. The subtree filtering is the default filtering mechanism used in NETCONF.

### NOTE

xpath filtering is not supported.

## Examples

The following is an example of a <get-config> operation for MPLS configuration.

```
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/"
message-id="1">
<nc:get-config>
<nc:source>
<nc:running/>
</nc:source>
<nc:filter nc:type="subtree">
<brcd:netiron-config>
<brcd:mpls-config/>
</brcd:netiron-config>
</nc:filter>
</nc:get-config>
</nc:rpc>
]]>]]>
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/"
message-id="1">
<nc:data>
<brcd:netiron-config>
<brcd:mpls-config>
<brcd:path>
  <brcd:name>example</brcd:name>
  <brcd:strict>10.99.161.1</brcd:strict>
</brcd:path>
<brcd:path>
  <brcd:name>example2</brcd:name>
  <brcd:strict>10.99.145.1</brcd:strict>
</brcd:path>
<brcd:lsp>
  <brcd:name>examplelsp1</brcd:name>
  <brcd:adaptive></brcd:adaptive>
  <brcd:from>10.99.10.1</brcd:from>
  <brcd:to>10.99.161.1</brcd:to>
  <brcd:enable></brcd:enable>
  <brcd:hop-limit>10</brcd:hop-limit>
  <brcd:ipmtu>1526</brcd:ipmtu>
  <brcd:ldp-tunneling></brcd:ldp-tunneling>
  <brcd:metric>600</brcd:metric>
  <brcd:primary-path>example</brcd:primary-path>
  <brcd:record></brcd:record>
  <brcd:reoptimize-timer>3600</brcd:reoptimize-timer>
  <brcd:revert-timer>43200</brcd:revert-timer>
  <brcd:mpls-traffic-eng>
    <brcd:max-burst>44736</brcd:max-burst>
    <brcd:max-rate>6312</brcd:max-rate>
    <brcd:mean-rate>1544</brcd:mean-rate>
  </brcd:mpls-traffic-eng>
  <brcd:secondary-path>
    <brcd:name>example2</brcd:name>
  </brcd:secondary-path>
</brcd:lsp>
<brcd:lsp>
  <brcd:name>examplelsp2</brcd:name>
  <brcd:adaptive></brcd:adaptive>
  <brcd:from>10.99.10.1</brcd:from>
  <brcd:to>10.99.145.1</brcd:to>
  <brcd:enable></brcd:enable>
  <brcd:hop-limit>10</brcd:hop-limit>
  <brcd:ipmtu>1526</brcd:ipmtu>
  <brcd:ldp-tunneling></brcd:ldp-tunneling>
  <brcd:metric>600</brcd:metric>
  <brcd:primary-path>example2</brcd:primary-path>
  <brcd:record></brcd:record>
  <brcd:reoptimize-timer>3600</brcd:reoptimize-timer>
  <brcd:revert-timer>43200</brcd:revert-timer>
  <brcd:mpls-traffic-eng>
```

```

    <brcd:max-burst>44736</brcd:max-burst>
    <brcd:max-rate>6312</brcd:max-rate>
    <brcd:mean-rate>1544</brcd:mean-rate>
  </brcd:mpls-traffic-eng>
  <brcd:secondary-path>
    <brcd:name>example</brcd:name>
  </brcd:secondary-path>
</brcd:lsp>
<brcd:lsp>
  <brcd:name>exmaplelsp</brcd:name>
  <brcd:from>10.99.10.1</brcd:from>
  <brcd:to>10.99.161.1</brcd:to>
  <brcd:disable></brcd:disable>
  <brcd:record></brcd:record>
</brcd:lsp>
</brcd:mpls-config>
</brcd:netiron-config>
</nc:data>
</nc:rpc-reply>
]]>]]>

```

The following is an example of a <get-config> operation for VLAN configuration.

```

<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/
netiron-config/"
message-id="1">
  <nc:get-config>
  <nc:source>
  <nc:running/>
  </nc:source>
  <nc:filter nc:type="subtree">
  <brcd:netiron-config>
  <brcd:vlan-config/>
  </brcd:netiron-config>
  </nc:filter>
  </nc:get-config>
  </nc:rpc>
]]>]]>
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/
config/netiron-config/"
message-id="1">
  <nc:data>
  <brcd:netiron-config>
  <brcd:vlan-config>
  <brcd:vlan>
    <brcd:vlan-id>1</brcd:vlan-id>
    <brcd:vlan-name>DEFAULT-VLAN</brcd:vlan-name>
    <brcd:untagged>ethernet 1/1 </brcd:untagged>
    <brcd:untagged>ethernet 1/3 to 1/24 </brcd:untagged>
  </brcd:vlan>
  <brcd:vlan>
    <brcd:vlan-id>100</brcd:vlan-id>
    <brcd:vlan-name></brcd:vlan-name>
    <brcd:untagged>ethernet 2/1 to 2/2 </brcd:untagged>
    <brcd:router-interface>ve 100</brcd:router-interface>
  </brcd:vlan>
  <brcd:vlan>
    <brcd:vlan-id>200</brcd:vlan-id>
    <brcd:vlan-name></brcd:vlan-name>
    <brcd:tagged>ethernet 1/1 </brcd:tagged>
    <brcd:tagged>ethernet 1/3 </brcd:tagged>
    <brcd:tagged>ethernet 1/5 </brcd:tagged>
  </brcd:vlan>
  <brcd:vlan>
    <brcd:vlan-id>300</brcd:vlan-id>
    <brcd:vlan-name></brcd:vlan-name>
    <brcd:untagged>ethernet 1/2 </brcd:untagged>
  </brcd:vlan>
  <brcd:vlan>
    <brcd:vlan-id>4095</brcd:vlan-id>
    <brcd:vlan-name>CONTROL-VLAN</brcd:vlan-name>

```

```

    <brcd:tagged>ethernet 1/1 to 1/24 </brcd:tagged>
    <brcd:tagged>ethernet 2/1 to 2/2 </brcd:tagged>
</brcd:vlan>
<brcd:default-vlan-id>1</brcd:default-vlan-id>
</brcd:vlan-config>
</brcd:netiron-config>
</nc:data>
</nc:rpc-reply>
]]>]]>

```

The following is an example of a <get-config> operation for Interface configuration.

```

<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/config/
netiron-config/"
message-id="1">
<nc:get-config>
<nc:source>
<nc:running/>
</nc:source>
<nc:filter nc:type="subtree">
<brcd:netiron-config>
<brcd:interface-config/>
</brcd:netiron-config>
</nc:filter>
</nc:get-config>
</nc:rpc>
]]>]]>
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/
config/netiron-config/"
message-id="1">
<nc:data>
<brcd:netiron-config>
<brcd:interface-config>
<brcd:interface>
  <brcd:interface-id>management 1</brcd:interface-id>
  <brcd:enable></brcd:enable>
  <brcd:ip>
    <brcd:address>10.20.99.187/20</brcd:address>
  </brcd:ip>
  <brcd:ipv6>
    <brcd:address>2001:db8::10:20:99:187/64</brcd:address>
  </brcd:ipv6>
  <brcd:priority>
  </brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/1</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
  </brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
  </brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/2</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
  </brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
  </brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/3</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
  </brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>

```

```

    <brcd:speed-duplex>auto</brcd:speed-duplex>
    <brcd:priority>
  </brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/4</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/5</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/6</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/7</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/8</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/9</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/10</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>

```

```

    </brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/11</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/12</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/13</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/14</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/15</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/16</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/17</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>

```

```

<brcd:interface>
  <brcd:interface-id>ethernet 1/18</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/19</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/20</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/21</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/22</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/23</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 1/24</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
</brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:speed-duplex>auto</brcd:speed-duplex>
  <brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 2/1</brcd:interface-id>

```

```

<brcd:disable></brcd:disable>
<brcd:loop-detection>
</brcd:loop-detection>
<brcd:flow-control></brcd:flow-control>
<brcd:priority>
</brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ethernet 2/2</brcd:interface-id>
  <brcd:disable></brcd:disable>
  <brcd:loop-detection>
  </brcd:loop-detection>
  <brcd:flow-control></brcd:flow-control>
  <brcd:priority>
  </brcd:priority>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>ve 100</brcd:interface-id>
  <brcd:enable></brcd:enable>
  <brcd:ip>
  <brcd:address>10.2.2.2/24</brcd:address>
  </brcd:ip>
</brcd:interface>
<brcd:interface>
  <brcd:interface-id>loopback 1</brcd:interface-id>
  <brcd:enable></brcd:enable>
  <brcd:ip>
  <brcd:address>10.13.32.1/32</brcd:address>
  </brcd:ip>
</brcd:interface>
</brcd:interface-config>
</brcd:netiron-config>
</nc:data>
</nc:rpc-reply>
]]>]]>

```

## Error handling for get or get-config operations

A 32K response size limit is supported in releases prior to NetIron 6.0.00. In NetIron 6.0.00 and later, 512K response size limit is supported. An error is returned, if the response size limit is exceeded.

The following error response is generated when a client makes a NETCONF RPC request, resulting in a response size limit that exceeds 512 kilobytes.

```

<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <rpc-error>
    <error-type>rpc</error-type>
    <error-tag>too-big</error-tag>
    <error-severity>error</error-severity>
    <error-message>Response buffer exceeded</error-message>
  </rpc-error>
</rpc-reply>

```

### NOTE

Refer to the examples in get or get-config operations for a specific interface state data information.

## edit-config operation

The NETCONF <edit-config> operation loads all the configurations into the specified target configuration.

Elements in the <config> subtree may contain an <operation> attribute. The attribute identifies the point in the configuration to perform the operation and might appear on multiple elements throughout the <config> subtree.

The operation attribute contains any one of the following values: merge , replace , create , delete .

The values `merge`, `replace`, or `create` is enforced by the behavior of the individual CLI, so these options are ignored. The `delete` operation alone is supported.

## Parameters

The parameters used for `<edit-config>` are as follows:

- `target`: Name of the configuration data store being edited, such as `<nc:running/>`.
- `test-option`: This option is not supported.
- `default-operation`: Only the `none` value is supported. The other values such as `merge`, `replace`, `create`, and `delete` are ignored because the behaviors are enforced by the individual CLI.
- `error-option`: Only the `stop-on-error` option is supported. The other values such as `continue-on-error` and `rollback-on-error` are ignored.
- `config`: A hierarchy of configuration data as defined by the data models of the device. The new configuration must be inline configuration and other configuration options such as local file, remote file, and URL are not supported.

## Examples

The following is an example for an `<edit-config>` operation for MPLS configuration.

```
<nc:rpc message-id="1" xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://
brocade.com/ns/netconf/config/netiron-config/">
<nc:edit-config>
<nc:target>
<nc:running/>
</nc:target>
<nc:default-operation>merge</nc:default-operation>
<nc:config>
<brcd:netiron-config>
<brcd:mpls-config>
<brcd:lsp nc:operation="delete">
<brcd:name>examplelsp2</brcd:name>
</brcd:lsp>
</brcd:mpls-config>
</brcd:netiron-config>
</nc:config>
</nc:edit-config>
</nc:rpc>
]]>]]>
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/
config/netiron-config/"
message-id="1">
<nc:ok></nc:ok>
</nc:rpc-reply>
]]>]]>
```

The following is an example for an `<edit-config>` operation for VLAN configuration.

```
<nc:rpc message-id="1" xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://
brocade.com/ns/netconf/config/netiron-config/">
<nc:edit-config>
<nc:target>
<nc:running/>
</nc:target>
<nc:default-operation>merge</nc:default-operation>
<nc:config>
<brcd:netiron-config>
<brcd:vlan-config>
<brcd:vlan nc:operation="delete">
<brcd:vlan-id>200</brcd:vlan-id>
</brcd:vlan>
</brcd:vlan-config>
</brcd:netiron-config>
```

```

</nc:config>
</nc:edit-config>
</nc:rpc>
]]>]]>
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/
config/netiron-config/"
message-id="1">
<nc:ok></nc:ok>
</nc:rpc-reply>
]]>]]>

```

The following is an example for an `<edit-config>` operation to configure interface ethernet 1/1 with the IP address of 10.1.1.1/24 and enable the interface.

```

<nc:rpc message-id="1" xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/
netconf/config/netiron-config/">
<nc:edit-config>
<nc:target>
<nc:running/>
</nc:target>
<nc:config>
<brcd:netiron-config>
<brcd:interface-config>
<brcd:interface>
<brcd:interface-id>ethernet 1/1</brcd:interface-id>
<brcd:enable></brcd:enable>
<brcd:ip>
<brcd:address>10.1.1.1/24</brcd:address>
</brcd:ip>
</brcd:interface>
</brcd:interface-config>
</brcd:netiron-config>
</nc:config>
</nc:edit-config>
</nc:rpc>
]]>]]>
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0" xmlns:brcd="http://brocade.com/ns/netconf/
config/netiron-config/"
message-id="1">
<nc:ok></nc:ok>
</nc:rpc-reply>
]]>]]>

```

## Error handling

The `<error-option>` element contains the `stop-on-error` value. The `stop-on-error` value aborts the `edit-config` operation on the first error. All the configuration items before the error are already applied on the system. This is the default error option.

After receiving the complete `edit-config` RPC, the configuration items specified in the XML are applied sequentially as per the order specified in the YANG. If all the configuration items are successfully applied, an `<ok>` element is sent in the `<rpc-reply>` element.

Otherwise, an `<rpc-error>` element with the details of the error is sent in the `<rpc-reply>` element.

## Closing sessions

The NETCONF `<close-session>` operation is used for gracefully closing the current NETCONF session. The `<close-session>` operation uses no additional parameters.

When a NETCONF server receives a `<close-session>` request, the server releases resources associated with the session and closes the underlying SSH connection. Any NETCONF requests received after a `<close-session>` request are ignored. If the device is able to close the connection, an `<rpc-reply>` element is sent that includes an `<ok>` element. Otherwise, an `<rpc-error>` element with the details of the error is sent in the `<rpc-reply>` element.

## NETCONF commands and specifications

The following sections describe the configuration of NETCONF using the CLI and the associated show commands, the syslog messages, and the system limitations of NETCONF.

### Configuring NETCONF server

To enable the NETCONF server on a device, enter the following command.

```
device(config)# netconf server
device# netconf server?
server    Enable NETCONF server functionality
```

When no port number is specified, the command applies to the default port (830).

To enable the NETCONF server for a specific port, enter the following command.

```
device(config)# netconf server port 2001
```

**Syntax:** `[no] netconf server [ port port-number ]`

The **port** option allows you to enable NETCONF on a non-default port.

The *port-number* variable specifies the port number of the device. The range is from 1 through 65535.

Both the SSH server and the NETCONF server must be enabled to establish a NETCONF session. The **netconf server** command displays the following warning message if the SSH server configuration is disabled.

```
Warning: SSH server is disabled. Please enable the SSH server.
```

### Configuring session hello-timeout

A NETCONF session hello-timeout indicates the number of seconds a session waits before the hello message is received from the NETCONF client. A session is dropped if no hello message is received before the specified number of seconds elapses. If this parameter is set to zero, the server never drops a session.

#### NOTE

Setting the NETCONF session hello-timeout value to zero permits denial of service attacks.

To configure a NETCONF session hello-timeout, enter the following command.

```
device(config)# netconf hello-timeout 300
```

**Syntax:** `[no] netconf hello-timeout [ seconds ]`

The *seconds* variable specifies the number of seconds the server waits to receive a hello message. The range is from 1 through 3600 seconds. The default value is 600 seconds.

### Configuring session idle-timeout

A NETCONF session idle-timeout indicates the number of seconds that a session may remain idle without issuing any RPC requests. A session is dropped if it is idle for an interval longer than the specified number of seconds. If this parameter is set to zero, the server never drops a session because it is idle.

To configure a NETCONF session idle-timeout, enter the following command.

```
device(config)# netconf idle-timeout 86400
```

**Syntax:** `[no] netconf idle-timeout [ seconds ]`

The *seconds* variable specifies the number of seconds a session remains idle. The range is from 1 through 360000 seconds. The default value is 3600 seconds.

## Displaying NETCONF statistics

To display the NETCONF server level information and statistics, enter the following command.

```
device# show netconf server
NETCONF server status: Enabled, Port: 830, Transport: SSH
Start Time: Feb  4 19:20:31
Max allowed sessions: 1, Active sessions: 1
Hello timeout: 600 seconds, Idle timeout: 3600 seconds
Server statistics:
  In sessions      : 1           In bad hellos    : 0
  Dropped sessions: 0           In too big rpcs  : 0
  In rpcs          : 1           In bad rpcs      : 0
  Out rpcs         : 1           Out rpc errors   : 0
  Out too big rpcs: 0
```

**Syntax:** `show netconf server`

Table 33 describes the output of the `show netconf server` command.

**TABLE 33** NETCONF server parameters

Field	Description
server status	The admin status (enabled or disabled) of the NETCONF server. Also displays the SSH status, when SSH is not enabled.
Port	The NETCONF server port number.
Transport	The NETCONF transport (currently only SSH is supported).
Start Time	The time at which the NETCONF subsystem is started.
Max allowed sessions	The maximum number of simultaneous NETCONF sessions supported by the server.
Active sessions	The number of active NETCONF sessions.
Hello timeout	The NETCONF session hello message timeout in seconds.
Idle timeout	The NETCONF session idle message timeout in seconds.
In sessions	The number of sessions started.
In bad hellos	The number of sessions silently dropped because an invalid hello message was received.
Dropped sessions	The number of sessions that were abnormally terminated (for example, due to transport close).
In too big rpcs	The total number of RPC requests received by the server that are larger than the supported maximum RPC request size.
In rpcs	The total number of correct RPC requests received by the server.
In bad rpcs	The total number of incorrect RPC messages received by the server. This includes XML parse errors and errors on the RPC layer.
Out rpcs	The total number of RPC reply messages sent by the server containing an <code>&lt;rpc-ok&gt;</code> element or <code>&lt;data&gt;</code> element.
Out rpc errors	The total number of RPC reply messages sent by the server containing an <code>&lt;rpc-error&gt;</code> element.
Out too big rpcs	The total number of RPC reply messages sent by the server containing an <code>&lt;rpc-error&gt;</code> element with <code>too-big</code> as the error tag.

To display the NETCONF session level statistics, enter the following command.

```
device# show netconf session
Session Id: 1 SSH session Id: 1
Username: lab Login time: Feb  7 21:28:47
Client Ip Address: 10.120.73.112
```

```

Privilege Level: <edit-config> <get-config> <get> <close-session>
Session Statistics:
  In rpcs      : 1          In bad rpcs    : 0
  Out rpcs     : 1          Out rpc errors : 0
  Edit-Config  : 0          Get-Config    : 0

```

Get : 1 Un-supported : 0

**Syntax:** show netconf sessions

Table 34 describes the output of the **show netconf sessions** command.

**TABLE 34** NETCONF session parameters

Field	Description
Session Id	The unique identification value for the NETCONF session.
SSH session Id	The unique identification value for the SSH session.
Username	The authenticated SSH user name. The value is <none> for public key authentication.
Login time	The time at which the session is established.
Client Ip Address	The IP address of the NETCONF client.
Privilege Level	The supported NETCONF privilege level operations for a session, where privilege is derived from the SSH user privilege.
In rpcs	The number of correct RPC requests received.
In bad rpcs	The total number of incorrect RPC messages received by the server. This includes XML parse errors and errors on the RPC layer.
Out rpcs	The total number of RPC reply messages sent by the server containing an <rpc-ok> element or <data> element.
Out rpc errors	The total number of RPC reply messages sent by the server containing an <rpc-error> element.
Edit-Config	The number of well-formed <edit-config> operations received.
Get-Config	The number of well-formed <get-config> operations received.
Get	The number of well-formed <get> operations received.
Unsupported	The number of unsupported operations received.

## Syslog messages for NETCONF

The following syslog message is generated when the NETCONF session is established.

```
SYSLOG: <14>Feb  8 01:03:00 NETCONF session [1] from 10.20.99.130 user ncradsuper has been established.
```

**Syntax:** NETCONF session *id* from *IPaddress* user *username* has been established

The following syslog message is generated when the NETCONF session is disconnected.

```
SYSLOG: <14>Feb  8 01:03:00 NETCONF session [1] from 10.20.99.130 user ncradsuper has been disconnected.
```

**Syntax:** NETCONF session *id* from *IPaddress* user *username* has been disconnected

## Clearing NETCONF statistics

To clear the NETCONF server level statistics, enter the following command.

```
device# clear netconf server-stats
```

**Syntax:** clear netconf server-stats

To clear the NETCONF session level statistics, enter the following command.

```
device# clear netconf session-stats
```

**Syntax:** clear netconf session-stats

## System limitations for NETCONF

The following are the system limitations for NETCONF.

- Only one NETCONF session is supported at a time. Any new NETCONF connection requests are rejected after the first session is established.
- Only the <running> configuration data store is supported.
- The <running> configuration data store displays the commands that are currently supported by NETCONF.
- The NETCONF notifications are not supported.
- A partial set of configuration and state display commands are supported.
- The XPATH filtering is not supported.
- A 32K response size limit is supported. An error is returned, if the response size limit is exceeded.
- A 16K request buffer limit is supported. An error is returned, if the request size limit is exceeded.
- Only a subset of the subtree filtering is supported.

## Clients establishing a NETCONF session with NetIron devices

### PuTTY Link

The PuTTY Link client allows a user to establish a NETCONF session with the NetIron device on the network.

- Configure Secure Shell (SSH). Refer to the *Brocade NetIron Security Configuration Guide* for more information.
  - Configure NETCONF server.
1. Connect to the device using Putty PLINK and provide the user name and password credentials.

```
D:\>D:\putty\plink -s -P 830 lab@192.0.2.0 netconf
Using keyboard-interactive authentication.
Password:
<?xml version="1.0" encoding="UTF-8"?> <hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0"> <capabilities> <capability>urn:ietf:params:netconf:base:1.0</capability> <capability>urn:ietf:params:netconf:base:1.1</capability> <capability>urn:ietf:params:netconf:capability:writeable-running:1.0</capability> </capabilities> <session-id>1</session-id> </hello>]]]]>
```

2. Copy and paste the following hello message to complete session negotiation.

#### NOTE

To avoid any special formatting characters getting pasted, please copy and paste the message to a plain text editor such as Microsoft® Notepad first. Later, copy the message from Notepad and paste the text to the session.

```
<?xml version="1.0" encoding="UTF-8"?>
  <hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
    <capabilities>
      <capability>urn:ietf:params:netconf:base:1.0</capability>
    </capabilities>
  </hello>
]]]]>
```

3. Confirm that the session has been negotiated successfully.

```
device# show log
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)

...

Dynamic Log Buffer (5000 lines):
Mar  8 15:53:39:I:NETCONF session [1] from 192.0.2.0 user lab has been established.

...

If you have debugging turned on (#debug ip netconf), then you will see the following message:

"NETCONF[0]: Hello message exchanged successfully."
```

4. Send the NETCONF Remote Procedure Call (RPC) on the newly established NetCONF session. To obtain the default state data, copy and paste the following code.

#### NOTE

To avoid any special formatting characters getting pasted, please copy and paste the message to a plain text editor such as Microsoft® Notepad first. Later, copy the message from Notepad and paste the text to the session.

```
<nc:rpc message-id="25" xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
  <nc:get xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/">
    </nc:get>
  </nc:rpc>
]]]]>
```

- Observe the output which is the response to the request issued in step 4.

```
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0"
xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/" message-id="25">
  <nc:data>
    <netiron-statedata xmlns="http://brocade.com/ns/netconf/config/netiron-config/"

    <brcd:version-statedata>
      <brcd:system>NetIron CER</brcd:system>
      <brcd:system-id>
        <brcd:serial>P00524F075</brcd:serial>
        <brcd:part>40-1000347-04</brcd:part>
      </brcd:system-id>
      <brcd:license>
        <brcd:software-packaging-type>ADV_SVCS_PREM</brcd:software-packaging-type>
        <brcd:license-id>rFFKHJhFMK</brcd:license-id>
      </brcd:license>
      <brcd:cpld-version>16</brcd:cpld-version>
      <brcd:micro-controller-version>13</brcd:micro-controller-version>
```

- Enter **Ctrl-C** command to disconnect the client connection.

## Netopeer

The Netopeer client allows users to establish a NETCONF session with the NetIron device on a network.

- Configure Secure Shell (SSH). Refer to the *Brocade NetIron Security Configuration Guide* for more information.
- Configure NETCONF server.

See the following example log that has a detailed debugging information for a NETCONF session with the device to obtain the VLAN configuration.

```
$ cat get-config-filter.txt
<base10:get-config xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/"
  xmlns:base10="urn:ietf:params:xml:ns:netconf:base:1.0">
  <base10:source>
    <base10:running/>
  </base10:source>
  <base10:filter>
    <brcd:netiron-config>
      <brcd:vlan-config>
    </brcd:vlan-config>
    </brcd:netiron-config>
  </base10:filter>
</base10:get-config>
$

$ netopeer-cli

netconf> debug
Verbose level set to DEBUG
netconf> connect --login lab 192.0.2.0
libnetconf DEBUG: child proces with PID 25163 forked
libnetconf DEBUG: waiting for a password request
libnetconf DEBUG: writing the password to ssh
Password:
libnetconf DEBUG: XML message begin found, waiting for the password finished
libnetconf DEBUG: Writing message (session ): <?xml version="1.0" encoding="UTF-8"?>
<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
....

netconf> user-rpc --file get-config-filter.txt
libnetconf DEBUG: Writing message (session 1): <?xml version="1.0" encoding="UTF-8"?>
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="2">
  <base10:get-config xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/"
    xmlns:base10="urn:ietf:params:xml:ns:netconf:base:1.0">
    <base10:source>
```

```

    <base10:running/>
  </base10:source>
</base10:filter>
<brcd:netiron-config>
  <brcd:vlan-config>
  </brcd:vlan-config>
</brcd:netiron-config>
</base10:filter>
</base10:get-config>
</rpc>

libnetconf DEBUG: Received message (session 1): <nc:rpc-reply
xmlns:nc="urn:iETF:params:xml:ns:netconf:base:1.0"
xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/" message-id="2">
<nc:data>
<brcd:netiron-config>
<brcd:vlan-config>
<brcd:vlan>
  <brcd:vlan-id>1</brcd:vlan-id>
  <brcd:vlan-name>DEFAULT-VLAN</brcd:vlan-name>
  <brcd:untagged>ethernet 1/1 to 1/24 </brcd:untagged>
</brcd:vlan>
<brcd:vlan>
  <brcd:vlan-id>4095</brcd:vlan-id>
  <brcd:vlan-name>CONTROL-VLAN</brcd:vlan-name>
</brcd:vlan>
<brcd:default-vlan-id>1</brcd:default-vlan-id>
</brcd:vlan-config>
</brcd:netiron-config>
</nc:data>
</nc:rpc-reply>

Result:
<brcd:netiron-config>
  <brcd:vlan-config>
  <brcd:vlan>
  <brcd:vlan-id>1</brcd:vlan-id>
  <brcd:vlan-name>DEFAULT-VLAN</brcd:vlan-name>
  <brcd:untagged>ethernet 1/1 to 1/24 </brcd:untagged>
  </brcd:vlan>
  <brcd:vlan>
  <brcd:vlan-id>4095</brcd:vlan-id>
  <brcd:vlan-name>CONTROL-VLAN</brcd:vlan-name>
  </brcd:vlan>
  <brcd:default-vlan-id>1</brcd:default-vlan-id>
  </brcd:vlan-config>
</brcd:netiron-config>
netconf> quit
$

```

## Linux OpenSSH

The Linux OpenSSH client allows a user to establish a NETCONF session with the NetIron device on the network.

- Configure Secure Shell (SSH). Refer to the *Brocade NetIron Security Configuration Guide* for more information.
  - Configure NETCONF server.
1. Connect to the device using Linux OpenSSH and provide the user name and password credentials.

```

lab@monroe{347}: ssh -p 830 -s lab@10.24.12.69 netconf
Password:
<?xml version="1.0" encoding="UTF-8"?> <hello xmlns="urn:iETF:params:xml:ns:netconf:base:1.0">
<capabilities> <capability>urn:iETF:params:netconf:base:1.0</capability>
<capability>urn:iETF:params:netconf:base:1.1</capability>
<capability>urn:iETF:params:netconf:capability:writeable-running:1.0</capability> </capabilities>
<session-id>1</session-id> </hello>]]>]]>

```

- Copy and paste the following hello message to complete session negotiation.

**NOTE**

To avoid any special formatting characters getting pasted, please copy and paste the message to a plain text editor such as Microsoft® Notepad first. Later, copy the message from Notepad and paste the text to the session.

```
<?xml version="1.0" encoding="UTF-8"?>
  <hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
    <capabilities>
      <capability>urn:ietf:params:netconf:base:1.0</capability>
    </capabilities>
  </hello>
]>]]>
```

- Confirm that the session has been negotiated successfully.

```
device# show log
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
```

...

```
Dynamic Log Buffer (5000 lines):
Mar  8 15:53:39:I:NETCONF session [1] from 192.0.2.0 user lab has been established.
```

...

If you have debugging turned on (#debug ip netconf), then you will see the following message:

```
"NETCONF[0]: Hello message exchanged successfully."
```

- Send the NETCONF Remote Procedure Call (RPC) on the newly established NetCONF session. To obtain the default state data, copy and paste the following code.

**NOTE**

To avoid any special formatting characters getting pasted, please copy and paste the message to a plain text editor such as Microsoft® Notepad first. Later, copy the message from Notepad and paste the text to the session.

```
<nc:rpc message-id="25" xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
  <nc:get xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/">
    </nc:get>
  </nc:rpc>
]>]]>
```

- Observe the output which is the response to the request issued in step 4.

```
<nc:rpc-reply xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0"
xmlns:brcd="http://brocade.com/ns/netconf/config/netiron-config/" message-id="25">
  <nc:data>
    <netiron-statedata xmlns="http://brocade.com/ns/netconf/config/netiron-config/">
      <brcd:version-statedata>
        <brcd:system>NetIron CER</brcd:system>
        <brcd:system-id>
          <brcd:serial>P00524F075</brcd:serial>
          <brcd:part>40-1000347-04</brcd:part>
        </brcd:system-id>
        <brcd:license>
          <brcd:software-packaging-type>ADV_SVCS_PREM</brcd:software-packaging-type>
          <brcd:license-id>rFFKHJhFMK</brcd:license-id>
        </brcd:license>
        <brcd:cpld-version>16</brcd:cpld-version>
        <brcd:micro-controller-version>13</brcd:micro-controller-version>
```

- Enter **Ctrl-C** command to disconnect the client connection.

## Data models and mapping

YANG is a data modeling language used to model configuration and state data manipulated by the NETCONF protocol, NETCONF remote procedure calls, and NETCONF notifications. In order for NETCONF to be an interoperable protocol, models must be defined in a vendor-neutral language. YANG provides the language and rules for defining models for use with NETCONF.

The YANG language is currently being developed by the IETF NETCONF Data Modeling Language Working Group (NETMOD) and is defined in RFC 6020.

Each block of YANG data is encapsulated as a module, containing a header statement, linkage information, meta information, and revision history. Modules can contain one or more submodules with the same structure.

The following code example shows the structure of a header statement, along with linkage and meta information, which contains contact information and a high-level description of the module.

```
module netiron-config
{
  namespace "http://brocade.com/ns/netconf/config/netiron-config/";
  prefix "brcd";
  include common-defs;
  include vlan-config;
  include interface-config;
  include mpls-config;
  organization
    "Brocade Communications Inc.";
  contact
    "Technical Support Center"+
    "130 Holger Way,"+
    "San Jose, CA 95134"+
    "Email: ipsupport@brocade.com"+
    "Phone: 1-800-752-8061"+
    "URL: www.brocade.com";
  description
    "NetIron Config module. VERSION: ";

  revision 2011-04-20
  {
    description "Initial revision";
  }
}
```

## Example in YANG, XML, and CLI

Table 35 provides an example to describe the VLAN name in the YANG model and the equivalent XML and CLI.

**TABLE 35** Example in YANG, XML, and CLI

YANG	XML	CLI
<pre>leaf vlan-name {   type string   {     length "1..31";   }   description "VLAN Name"; }</pre>	<pre>&lt;brcd:vlan-name &gt;example&lt;/brcd:vlan-name &gt;</pre>	<pre>[no] vlan vlan-id [ name vlan-name ]</pre>

For further examples and information on the YANG model, refer to the *Brocade NetIron MLX Series and Brocade NetIron Family YANG Guide*.



# Foundry Direct Routing and CAM Partition Profiles for the NetIron XMR and the Brocade MLX Series

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## Configuring CAM mode globally

### NOTE

There is no configuration support for **cam-mode** in NetIron CES and NetIron CER. Foundry Direct Routing (FDR) is enabled by default.

The default CAM mode currently supported in static CAM mode, also known as FDR. You can set the CAM mode to dynamic IP CAM using the following command:

```
device(config)# cam-mode ip dynamic
```

You must reload the device for this command to take effect.

**Syntax:** [no] **cam-mode ip** [ **dynamic**| **static** ]

The **dynamic** parameter sets the IP CAM mode to dynamic.

The **static** parameter sets the IP CAM mode to static. This is the default state.

## Configuring Density Mode for the 2x100G and 20x10G CAM

Setting the CAM to double density mode will automatically disable uRPF. The uRPF is allowed under single density mode. The default setting for the XMR is double density. The default setting for the MLX is single density. You can set the density mode using the following command:

```
device(config)# cam-mode ip urpf-100g
```

You must reload the device for this command to take effect.

### NOTE

There is no configuration support for **cam-mode** in NetIron CES and NetIron CER.

From 05.8.00a release onwards, you can achieve -X2 CAM profile numbers by enabling Algorithmic mode using the **cam-mode amod** command (available only on BR-MLX-100Gx2-CFP2-X2, BR-MLX-10Gx20-X2, or BR-MLX-1GX20-U10G-X2 cards). In Algorithmic mode, the line card runs in single density mode and also supports uRPF mode to work without reducing the route scale.

**NOTE**

By default, BR-MLX-100Gx2-CFP2-X2, BR-MLX-10Gx20-X2, or BR-MLX-1GX20-U10G-X2 cards boot up with -M CAM profile numbers and if uRPF is enabled, the number of routes are reduced by half.

For more information about CAM profile support and uRPF impact with and without Algorithmic mode, refer to [Configuring -X2 Algorithmic CAM profiles](#) on page 242.

**Syntax:** `[no] cam-mode ip [ urpf |urpf-100g]`

The **urpf** parameter sets the IP CAM partition to single density mode.

The **urpf-100g** parameter sets the IP CAM partition to single density mode.

## Configuring IPv6 host CAM mode

**NOTE**

There is no configuration support for **cam-mode** in NetIron CES and NetIron CER.

The CAM mode for IPv6 routes can be configured to host. You can set the CAM mode to *host* by using the following command.

```
device(config)# cam-mode ipv6 host
```

You must reload the device for this command to take effect.

**Syntax:** `[no] cam-mode ipv6 host`

The *host* parameter programs the complete 128 bit IPv6 address into the CAM.

## Configuring IPv6 host drop CAM limit

To limit the usage of CAM by IPV6 hosts with unresolved ND, enter the **ipv6 max-host-drop-cam** command.

```
device(config)# ipv6 max-host-drop-cam 5
```

**Syntax:** `[no] ipv6 max-host-drop-cam [ limit]`

The optional *limit* variable is the IPv6 drop CAM limit for a port per packet processor (PPCR). The limit value can be from 0 through 65535.

## Configuring -X2 Algorithmic CAM profiles

The CAM profile numbers for BR-MLX-100Gx2-CFP2-X2, BR-MLX-10Gx20-X2, and BR-MLX-1GX20-U10G-X2 cards are much higher than the actual physical CAM capacity. Algorithmic mode, which employs a prefix-based software algorithm to optimize the CAM space, can be used to accommodate large numbers of longest prefix match (LPM) entries. Algorithmic mode also ensures reduced power consumption.

Depending on the -X2 CAM partition profile configuration, Algorithmic mode supports up to a maximum of 2448K IPv4, 1840K IPv6, 2048K IPv4 VPN, and 400K IPv6 VPN CAM entries.

From 05.8.00a release onwards, Algorithmic mode is available (disabled by default) on BR-MLX-100Gx2-CFP2-X2, BR-MLX-10Gx20-X2, and BR-MLX-1GX20-U10G-X2 cards.

## NOTE

Brocade recommends enabling Algorithmic mode only on BR-MLX-100Gx2-CFP2-X2, BR-MLX-10Gx20-X2, or BR-MLX-1GX20-U10G-X2 cards as the cards come with the required factory-installed license. There is no license enforcement to enable Algorithmic mode on BR-MLX-100Gx2-CFP2-M, BR-MLX-10Gx20-M, or BR-MLX-1GX20-U10G-M cards.

By default, BR-MLX-100Gx2-CFP2-X2, BR-MLX-10Gx20-X2, and BR-MLX-1GX20-U10G-X2 cards boot up with -M CAM profile numbers and if uRPF is enabled, the number of routes are reduced by half. You must enable Algorithmic mode using the **cam-mode amod** command to achieve -X2 CAM profile numbers. Algorithmic mode also supports uRPF mode to work without reducing the route scale.

The line card must be reloaded for Algorithmic mode to take effect.

Refer to [Table 43](#) on page 251 for information about -X2 CAM profile partitions.

**TABLE 36** CAM profile support and uRPF impact with and without Algorithmic mode

Modules	CAM profile support	uRPF impact
BR-MLX-100Gx2-CFP2-M, BR-MLX-10Gx20-M, and BR-MLX-1GX20-U10G-M	<ul style="list-style-type: none"> <li>Non-Algorithmic mode (default): -M CAM profile type</li> <li>Algorithmic mode: Not supported</li> </ul>	The number of routes are reduced by half if uRPF mode is enabled.
BR-MLX-100Gx2-CFP2-X2, BR-MLX-10Gx20-X2, and BR-MLX-1GX20-U10G-X2	<ul style="list-style-type: none"> <li>Non-Algorithmic mode (default): -M CAM profile type</li> <li>Algorithmic mode: -X2 CAM profile type (supported from 05.8.00a release onwards)</li> </ul>	<ul style="list-style-type: none"> <li>Non-Algorithmic mode: The number of routes are reduced by half if uRPF mode is enabled.</li> <li>Algorithmic mode: No change in route scale even if uRPF is enabled.</li> </ul>

The system-max values for ip-cache, ip-route, ipv6-cache, and ipv6-route is limited to the maximum value supported by the specific CAM profile. For example, for the multi-service-3 CAM profile, ip-cache system-max is limited to IPv4 + IPv4 VPN size of the profile which is 768k + 608k.

Refer to [Table 43](#) on page 251 for information about -X2 CAM profile partitions.

If the system has a mix of BR-MLX-100Gx2-CFP2-M or BR-MLX-10Gx20-M and BR-MLX-100Gx2-CFP2-X2 or BR-MLX-10Gx20-X2 cards, Algorithmic mode can be enabled on the BR-MLX-100Gx2-CFP2-X2 or BR-MLX-10Gx20-X2 cards by specifying the slot.

To enable Algorithmic mode, enter the following command:

```
device(config)# cam-mode amod slot 2
```

## CAM partition profiles

CAM is partitioned on the device by a variety of profiles that you can select depending on your application. The available profiles are described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module).

To implement a CAM partition profile, enter the following command.

```
device(config)# cam-partition profile ipv4
```

## NOTE

You must reload your device for this command to take effect.

**Syntax:** `cam-partition profile [ ipv4 | ipv4-ipv6 | ipv4-ipv6-2 | ipv4-vpls | ipv4-vpn | ipv6 | l2-metro | l2-metro-2 | mpls-l3vpn | mpls-l3vpn-2 | mpls-vpls | mpls-vpls-2 | mpls-vpn-vpls | multi-service | multi-service-2 | multi-service-3 | multi-service-4 ]`

The **ipv4** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module), to optimize the device for IPv4 applications.

The **ipv4-ipv6** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module), to optimize the device for IPv4 and IPv6 dual stack applications.

The **ipv4-ipv6-2** option that was introduced in NetIron O3.7.00 adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module), to optimize the device for increased IPv4 routes with room for IPv6.

The **ipv4-vpls** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module), to optimize the device for IPv4 and MPLS VPLS applications.

The **ipv4-vpn** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module), to optimize the device for IPv4 and MPLS Layer 3 VPN applications.

The **ipv6** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module), to optimize the device for IPv6 applications.

The **l2-metro** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers, to optimize the device for Layer 2 Metro applications.

The **l2-metro-2** option provides another alternative to **l2-metro** to optimize the device for Layer 2 Metro applications. It adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers.

The **mpls-l3vpn** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers, to optimize the device for Layer 3, BGP, or MPLS VPN applications.

The **mpls-l3vpn-2** option provides another alternative to **mpls-l3vpn** to optimize the device for Layer 3, BGP, or MPLS VPN applications. It adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers.

The **mpls-vpls** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers, to optimize the device for MPLS VPLS applications.

The **mpls-vpls-2** option provides another alternative to **mpls-vpls** to optimize the device for MPLS VPLS applications. It adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers.

The **mpls-vpn-vpls** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers, to optimize the device for MPLS Layer 3 and Layer 2 VPN applications.

The **multi-service** option adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers, to optimize the device for Multi-Service applications.

The **multi-service-2** option provides another alternative to **multi-service** to optimize the device for Multi-Service applications. It adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers.

The **multi-service-3** option provides another alternative to **multi-service** to optimize the device for Multi-Service applications to support IPv6 VRF. It adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers.

The **multi-service-4** option provides another alternative to **multi-service** to optimize the device for Multi-Service applications to support IPv6 VRF. It adjusts the CAM partitions, as described in [Table 37](#) for the Brocade MLX Series (MR2-X management module) and [Table 38](#) for the Brocade MLX Series (MR2-M management module) routers.

There are eighteen CAM partitioning profiles for the Brocade NetIron XMR Series and for the Brocade NetIron MLX Series routers. The profiles for routers are described in Brocade MLX Series (MR2-X management module) [Table 37](#) and the profiles for Brocade MLX Series (MR2-M management module) routers are described in [Table 38](#).

**TABLE 37** CAM partitioning profiles available for Brocade MLX Series (MR2-X management module) routers

Profile	IPv4	IPv6	MAC or VPLS MAC	IPv4 VPN	IPv6 VPN	IPv4 or L2 Inbound ACL	IPv6 Inbound ACL	IPv4 or L2 Outbound ACL	IPv6 Outbound ACL
Default Profile	Logical size: 512K	Logical size: 64K	Logical size: 128K	Logical size: 128K	0	Logical size: 48K	Logical size: 4K	Logical size: 48K	Logical size: 4K
ipv4 Profile	Logical size: 1M	0	Logical size: 32K	0	0	Logical size: 112K	0	Logical size: 64K	0
ipv6 Profile	Logical size: 64K	Logical size: 240K	Logical size: 32K	0	0	Logical size: 16K	Logical size: 24K	Logical size: 16K	Logical size: 12K
l2-metro Profile	Logical size: 256K	0	Logical size: 512K	0	0	Logical size: 64K	0	Logical size: 64K	0
mpls-l3vpn Profile	Logical size: 256K	0	Logical size: 32K	Logical size: 480K	0	Logical size: 64K	0	Logical size: 64K	0
mpls-vpls Profile	Logical size: 256K	0	Logical size: 512K	0	0	Logical size: 64K	0	Logical size: 64K	0
multi-service Profile	Logical size: 256K	Logical size: 32K	Logical size: 192K	Logical size: 256K	0	Logical size: 32K	Logical size: 8K	Logical size: 32K	Logical size: 8K
multi-service-2 Profile	512K	64K	128K	128K	0	48K	4K	48K	4K
multi-service-3 Profile	256K	32K	128K	192K	32K	32K	8K	32K	8K
multi-service-4 Profile	768K	32K	64K	64K	8K	32K	8K	48K	4K
mpls-vpn-vpls Profile	Logical size: 128K	0	Logical size: 224K	Logical size: 384K	0	Logical size: 48K	0	Logical size: 64K	0
ipv4-vpn Profile	Logical size: 320K	0	Logical size: 32K	Logical size: 448K	0	Logical size: 64K	0	Logical size: 64K	0
l2-metro-2 Profile	Logical size: 64K	0	Logical size: 608K	0	0	Logical size: 64K	0	Logical size: 64K	0
mpls-l3vpn-2 Profile	Logical size: 128K	0	Logical size: 32K	Logical size: 544K	0	Logical size: 64K	0	Logical size: 64K	0
mpls-vpls-2 Profile	Logical size: 128K	0	Logical size: 576K	0	0	Logical size: 64K	0	Logical size: 64K	0
ipv4-ipv6 Profile	Logical size: 320K	Logical size: 160K	Logical size: 32K	0	0	Logical size: 48K	Logical size: 20K	Logical size: 32K	Logical size: 8K

**TABLE 37** CAM partitioning profiles available for Brocade MLX Series (MR2-X management module) routers (continued)

Profile	IPv4	IPv6	MAC or VPLS MAC	IPv4 VPN	IPv6 VPN	IPv4 or L2 Inbound ACL	IPv6 Inbound ACL	IPv4 or L2 Outbound ACL	IPv6 Outbound ACL
ipv4-vpls Profile	Logical size: 320K	0	Logical size: 480K	0	0	Logical size: 64K	0	Logical size: 64K	0
ipv4-ipv6-2 Profile	Logical size: 768K	Logical size: 64K	Logical size: 64K	0	0	Logical size: 64K	Logical size: 8K	Logical size: 48K	Logical size: 4K

**TABLE 38** CAM partitioning profiles available for Brocade MLX Series (MR2-M management module) routers

Profile	IPv4	IPv6	MAC or VPLS MAC	IPv4 VPN	IPv6 VPN	IPv4 or L2 Inbound ACL	IPv6 Inbound ACL	IPv4 or L2 Outbound ACL	IPv6 Outbound ACL
Default Profile	Logical size: 256K	Logical size: 32K	Logical size: 64K	Logical size: 64K	0	Logical size: 24K	Logical size: 2K	Logical size: 48K	Logical size: 4K
ipv4 Profile	Logical size: 512K	0	Logical size: 16K	0	0	Logical size: 56K	0	Logical size: 64K	0
ipv6 Profile	Logical size: 64K	Logical size: 112K	Logical size: 16K	0	0	Logical size: 8K	Logical size: 12K	Logical size: 16K	Logical size: 12K
l2-metro Profile	Logical size: 128K	0	Logical size: 256K	0	0	Logical size: 32K	0	Logical size: 64K	0
mpls-l3vpn Profile	Logical size: 128K	0	Logical size: 16K	Logical size: 240K	0	Logical size: 32K	0	Logical size: 64K	0
mpls-vpls Profile	Logical size: 128K	0	Logical size: 256K	0	0	Logical size: 32K	0	Logical size: 64K	0
multi-service Profile	Logical size: 128K	Logical size: 16K	Logical size: 96K	Logical size: 128K	0	Logical size: 16K	Logical size: 4K	Logical size: 32K	Logical size: 8K
multi-service-2 Profile	448K	16K	32K	32K	0	24K	2K	48K	4K
multi-service-3 Profile	128K	16K	64K	96K	32K	16K	4K	32K	8K
multi-service-4 Profile	448K	8K	0	32K	8K	16K	4K	48K	4K
mpls-vpn-vpls Profile	Logical size: 64K	0	Logical size: 112K	Logical size: 192K	0	Logical size: 24K	0	Logical size: 64K	0
ipv4-vpn Profile	Logical size: 160K	0	16K	Logical size: 224K	0	Logical size: 32K	0	Logical size: 64K	0
l2-metro-2 Profile	Logical size: 64K	0	Logical size: 288K	0	0	Logical size: 32K	0	Logical size: 64K	0
mpls-l3vpn-2 Profile	Logical size: 64K	0	Logical size: 16K	Logical size: 272K	0	Logical size: 32K	0	Logical size: 64K	0
mpls-vpls-2 Profile	Logical size: 64K	0	Logical size: 288K	0	0	Logical size: 32K	0	Logical size: 64K	0
ipv4-ipv6 Profile	Logical size: 160K	Logical size: 80K	Logical size: 16K	0	0	Logical size: 24K	Logical size: 10K	Logical size: 32K	Logical size: 8K
ipv4-vpls Profile	Logical size: 160K	0	Logical size: 240K	0	0	Logical size: 32K	0	Logical size: 64K	0

**TABLE 38** CAM partitioning profiles available for Brocade MLX Series (MR2-M management module) routers (continued)

Profile	IPv4	IPv6	MAC or VPLS MAC	IPv4 VPN	IPv6 VPN	IPv4 or L2 Inbound ACL	IPv6 Inbound ACL	IPv4 or L2 Outbound ACL	IPv6 Outbound ACL
ipv4-ipv6-2 Profile	480K	8K	32K	0	0	32K	4K	48K	4K

**TABLE 39** CAM partitioning profiles available for the NI-MLX-10Gx8-D modules

Profile	IPv4	IPv6	MAC or VPLS MAC	IPv4 VPN	IPv6 VPN	IPv4 or L2 Inbound ACL	IPv6 Inbound ACL	IPv4 or L2 Outbound ACL	IPv6 Outbound ACL
Default Profile	128K	16K	64K	32K	0	24K	2K	48K	4K
ipv4 Profile	256K	0	16K	0	0	56K	0	64K	0
ipv6 Profile	68K	48K	16K	0	0	8K	12K	16K	12K
l2-metro Profile	64K	0	160K	0	0	32K	0	64K	0
mpls-l3vpn Profile	64K	0	16K	144K	0	32K	0K	64K	0
mpls-vpls Profile	64K	0	160K	0	0	32K	0	64K	0
multi-service Profile	64K	8K	80K	64K	0	16K	4K	32K	8K
multi-service-2 Profile	192K	16K	32K	32K	0	24K	2K	48K	4K
multi-service-3 Profile	64K	8K	32K	48K	32K	16K	4K	32K	8K
multi-service-4 Profile	198K	8K	32K	48K	32K	16K	4K	32K	8K
mpls-vpn-vpls Profile	64K	0	80K	96K	0	24K	0	64K	0
ipv4-vpn Profile	96K	0K	16K	128K	0	32K	0	64K	0
l2-metro-2 Profile	64K	0	160K	0	0	32K	0	64K	0
mpls-l3vpn-2 Profile	64K	0	16K	144K	0	32K	0	64K	0
mpls-vpls-2 Profile	64K	0	160K	0	0	32K	0	64K	0
ipv4-ipv6 Profile	96K	32K	16K	0	0	24K	10K	32K	8K
ipv4-vpls Profile	64K	0	160K	0	0	32K	0	64K	0
ipv4-ipv6-2 Profile	192K	16K	32K	0	0	32K	4K	48K	4K

**TABLE 40** CAM partitioning profiles available for the BR-MLX-100Gx2-X modules

Profile	IPv4  Note: All IPv4 values listed are when operating in double density mode.	IPv6	MAC or VPLS MAC	IPv4 VPN	IPv6 VPN	L2 Inbound ACL	IPv4 Inbound ACL	IPv6 Inbound ACL	IPv4 or L2 Outbound ACL	IPv6 Outbound ACL
Default Profile	512K	64K	160K	256K	0	16K	96K	16K	48K	8K
ipv4 Profile	1024K	0	160K	0	0	16K	128K	0	64K	0
ipv6 Profile	64K	240K	160K	0	0	16K	32K	48K	16K	24K
l2-metro Profile	1024K	0	160K	0	0	16K	128K	0	64K	0
l2-metro-2 Profile	1024K	0	160K	0	0	16K	128K	0	64K	0
multi-service Profile	288K	40K	160K	576K	0	16K	64K	32K	32K	16K
multi-service-2 Profile	512K	64K	160K	128K	0	96K	96K	16K	48K	8K
multi-service-3 Profile	256K	32K	160K	384K	64K	16K	80K	24K	32K	16K
multi-service-4 Profile	768K	16K	160K	32K	32K	16K	64K	32K	48K	8K
mpls-vpn-vpls Profile	128K	0	160K	896K	0	16K	128K	0	64K	0
mpls-l3vpn Profile	128K	0	160K	896K	0	16K	128K	0	64K	0
mpls-l3vpn-2 Profile	1024K	0	160K	0	0	16K	128K	0	64K	0
mpls-vpls Profile	1024K	0	160K	0	0	16K	128K	0	64K	0
mpls-vpls-2 Profile	1024K	0	160K	0	0	16K	128K	0	64K	0
ipv4-vpn Profile	320K	0	160K	704K	0	16K	128K	0	64K	0
ipv4-ipv6 Profile	320K	176K	160K	0	0	16K	48K	40K	32K	16K
ipv4-vpls Profile	1024K	0	160K	0	0	16K	96K	16K	64K	0
ipv4-ipv6-2 Profile	768K	65K	160K	0	0	16K	96K	16K	48K	8K

**TABLE 41** CAM partitioning profiles available for the BR-MLX-10GX24-DM modules

Profile	IPv4	IPv6	MAC	IPv4 VPN	IPv4 ACL/ MCAST VPLS	IPv6 VPN	IPv6 DAVC	IPv6 ACL	OUT ACL	OUT_ IPv6 ACL	Src_In grs Chk	MCAST VPLS	OUT_ LBL ACL	SRVC LKUP	L2 ACL
Default Profile	128K	16K	128K	32K	48K	0	0	16K	48K	8K	0	NA	NA	64K	16K
ipv4 Profile	256K	0	128K	0	80K	0	0	0	64K	0	0	NA	NA	64K	16K
ipv6 Profile	32K	56K	128K	0	16K	0	0	32K	16K	24K	0	NA	NA	64K	16K
mpls- vpn Profile	64K	0	128K	96K	80K	0	0	0	64K	0	0	NA	NA	64K	16K
mpls- vpls Profile	256K	0	128K	0	80K	0	0	0	64K	0	0	NA	NA	64K	16K
l2-metro Profile	256K	0	128K	0	80K	0	0	0	64K	0	0	NA	NA	64K	16K
l2- metro-2 Profile	256K	0	128K	0	80K	0	0	0	64K	0	0	NA	NA	64K	16K
mpls- vpn-2 Profile	32K	0	128K	112K	80K	0	0	0	64K	0	0	NA	NA	64K	16K
mpls- vpls-2 Profile	256K	0	128K	0	80K	0	0	0	64K	0	0	NA	NA	64K	16K
multi- service Profile	96K	8	128K	64K	48K	0	0	16K	32K	16K	0	NA	NA	64K	16K
mpls- vpn-vpls Profile	64K	0	128K	96K	80K	0	0	0	64K	0	0	NA	NA	64K	16K
ipv4-vpn Profile	64K	0	128K	96K	80K	0	0	0	64K	0	0	NA	NA	64K	16K
ipv4- ipv6 Profile	96K	40	128K	0	64K	0	0	8K	32K	16K	0	NA	NA	64K	16K
ipv4- vpls Profile	256K	0	128K	0	80K	0	0	0	64K	0	0	NA	NA	64K	16K
ipv4- ipv6-2 Profile	224K	8K	128K	0	48K	0	0	16K	48K	8K	0	NA	NA	64K	16K
multi- service- 2 Profile	6K	8K	128K	16K	64K	0	0	8K	48K	8K	0	NA	NA	64K	16K
multi- service- 3 Profile	192K	8K	128K	48K	48K	16K	0	16K	32K	16K	0	NA	NA	64K	16K
multi- service- 4 Profile	128K	8K	128K	32K	48K	8K	0	16K	48K	8K	0	NA	NA	64K	16K

**TABLE 42** CAM partitioning profiles available for the BR-MLX-10GX20-M (1G/10G combo), or BR-MLX-1GX20-U10G-M, and BR-MLX-100GX2-CFP2-M

Profile	IPv4	IPv6	MAC or VPLS MAC	IPv4 VPN	IPv6 VPN	L2 Inbound ACL	IPv6 Inbound ACL	IPv4 or L2 Outbound ACL	IPv6 Outbound ACL
Default Profile	512K	64K	128K	128K	0	48K	4K	48K	4K
ipv4 Profile	1024K	0	32K	0	0	112K	0	64K	0
ipv6 Profile	64K	240K	32K	0	0	16K	24K	16K	12K
l2-metro Profile	384K	0	512K	0	0	32K	0	64K	0
l2-metro-2 Profile	128K	0	640K	0	0	32K	0	64K	0
multi-service Profile	256K	32K	192K	256K	0	32K	8K	32K	8K
multi-service-2 Profile	512K	64K	128K	128K	0	48K	4K	40K	6K
multi-service-3 Profile	256K	32K	128K	192K	64K	32K	8K	32K	8K
multi-service-4 Profile	768K	32K	64K	64K	32K	32K	8K	48K	4K
multi-service-5 Profile	768K	32K	64K	0	0	96K	8K	48K	4K
multi-service-6 Profile	640K	96K	32K	32K	16K	48K	8K	48K	4K
telemetry-1 Profile	512K	64K	32K	0	0	96K	20K	32K	8K
mpls-vpn-vpls Profile	128K	0	224K	384K	0	48K	0	64K	0
mpls-l3vpn Profile	256K	0	32K	480K	0	64K	0	64K	0
mpls-l3vpn-2 Profile	128K	0	32K	544K	0	64K	0	64K	0
mpls-vpls Profile	256K	0	512K	0	0	64K	0	64K	0
mpls-vpls-2 Profile	128K	0	576K	0	0	64K	0	64K	0
ipv4-vpn Profile	320K	0	32K	448K	0	64K	0	64K	0
ipv4-ipv6 Profile	320K	160K	32K	0	0	48K	20K	32K	8K
ipv4-vpls Profile	320K	0	480K	0	0	64K	0	64K	0
ipv4-ipv6-2 Profile	768K	64K	64K	0	0	64K	8K	40K	6K

**TABLE 43** CAM partitioning profiles available for the BR-MLX-10GX20-X2 (1G/10G combo), or BR-MLX-1GX20-U10G-X2, and BR-MLX-100GX2-CFP2-X2

Profile	IPv4	IPv6	MAC or VPLS MAC	IPv4 VPN	IPv6 VPN	L2 Inbound ACL	IPv6 Inbound ACL	IPv4 or L2 Outbound ACL	IPv6 Outbound ACL
Default Profile	1424K	416K	224K	608K	0	144K	12K	48K	4K
ipv4 Profile	2448K	48K	64K	0	0	272K	4K	64K	0
ipv6 Profile	256K	1840K	64K	0	0	32K	60K	16K	12K
l2-metro Profile	2048K	0	544K	0	0	32K	0	64K	0
l2-metro-2 Profile	2048K	0	640K	0	0	16K	0	64K	0
multi-service Profile	1024K	704K	192K	704K	0	128K	20K	32K	8K
multi-service-2 Profile	1328K	512K	256K	608K	0	128K	12K	40K	6K
multi-service-3 Profile	768K	512K	192K	608K	400K	128K	20K	32K	8K
multi-service-4 Profile	1024K	304K	128K	768K	304K	144K	24K	48K	4K
multi-service-5 Profile	1840K	704K	128K	0	0	128K	28K	48K	4K
multi-service-6 Profile	1120K	768K	128K	368K	224K	144K	24K	48K	4K
telemetry-1 Profile	1936K	608K	64K	0	0	160K	28K	32K	8K
mpls-vpn-vpls Profile	512K	0	416K	1840K	0	96K	0	64K	0
mpls-l3vpn Profile	704K	0	128K	1712K	0	240K	0	64K	0
mpls-l3vpn-2 Profile	512K	0	128K	2048K	0	240K	0	64K	0
mpls-vpls Profile	2048K	0	416K	0	0	96K	0	64K	0
mpls-vpls-2 Profile	2048K	0	544K	0	0	32K	0	64K	0
ipv4-vpn Profile	1024K	0	160K	1424K	0	224K	0	64K	0
ipv4-ipv6 Profile	1536K	1024K	64K	0	0	128K	36K	32K	8K
ipv4-vpls Profile	2048K	0	416K	0	0	96K	0	64K	0
ipv4-ipv6-2 Profile	2048K	1024K	32K	0	0	16K	4K	40K	6K

**TABLE 44** CAM partitioning profiles available for the Brocade BR-MLX-40Gx4-M module

Profile	IPv4	IPv6	MAC	IPv4 VPN	IPv6 VPN	IPv4 or L2 Inbound ACL	IPv6 Inbound ACL	IPv4 or L2 Outbound ACL	IPv6 Outbound ACL
Default Profile	256K	32K	64K	64K	0	36K	6K	48K	8K
IPv4 Optimized	512K	0	16K	0	0	60K	0	64K	0
IPv6 Optimized	64K	112K	16K	0	0	12K	24K	16K	12K
MPLS VPN Optimized	128K	0	16K	192K	0	60K	0	64K	0
MPLS VPLS Optimized	512K	0	192K	0	0	16K	0	64K	0
L2 Metro Optimized	512K	0	192K	0	0	16K	0	64K	0
L2 Metro Optimized #2	512K	0	224K	0	0	8K	0	64K	0
MPLS VPN Optimized #2	64K	0	16K	224K	0	60K	0	64K	0
MPLS VPLS Optimized #2	512K	0	192K	0	0	16K	0	64K	0
Multi-Service	128K	16K	96K	160K	0	28K	6K	32K	16K
MPLS VPN +VPLS	128K	0	112K	192K	0	36K	0	64K	0
IPv4 + VPN	160K	0	16K	176K	0	60K	0	64K	0
IPv6 + IPv4	160K	88K	16K	0	0	24K	18K	32K	16K
IPv4 + VPLS	512K	0	192K	0	0	16K	0	64K	0
IPv4 + IPv6 #2	480K	8K	32K	0	0	40K	8K	40K	12K
Multi-service 2	448K	8K	32K	16K	0	40K	8K	40K	12K
Multi-service 3	128K	16K	64K	112K	24K	32K	8K	32K	16K
Multi-service 4	416K	8K	32K	16K	8K	40K	8K	48K	8K
Multi-Service 5	448K	16K	32K	0	0	48K	4K	48K	8K

## Supernet CAM partition sharing

TCAM sharing within a particular CAM Section is supported.

TCAM allocation is optimized to allow dynamic allocation of resources to each level within a particular resource pool. If one level runs out of TCAM resources, it can use resources that have been allocated to another level and remain unused. This feature is applicable to IPv4, IPv6, and L-3 VPN routes.

#### NOTE

CAM Sharing is not shared across resource pools, such as IPv4, IPv6 or L-3 VPN. Only shared between levels of each pool. For example: IPv4 may not use CAM resources from the IPv6 resource pool.

## Displaying CAM partition

The **show cam-partition** command provides information about available CAM in three formats: raw size, user size, and reserved size.

```
device# show cam-partition
CAM partitioning profile: default
Slot 1 XPP20SP 0:
# of CAM device                = 4
Total CAM Size                 = 917504 entries (63Mbits)
IP: Raw Size 524288, User Size 524288(0 reserved)
  Subpartition 0: Raw Size 12288, User Size 12288, (0 reserved)
  Subpartition 1: Raw Size 468107, User Size 468107, (0 reserved)
  Subpartition 2: Raw Size 37335, User Size 37335, (0 reserved)
  Subpartition 3: Raw Size 5140, User Size 5140, (0 reserved)
  Subpartition 4: Raw Size 778, User Size 778, (0 reserved)
IPv6: Raw Size 131072, User Size 65536(0 reserved)
  Subpartition 0: Raw Size 12288, User Size 6144, (0 reserved)
  Subpartition 1: Raw Size 107496, User Size 53748, (0 reserved)
  Subpartition 2: Raw Size 9332, User Size 4666, (0 reserved)
  Subpartition 3: Raw Size 1284, User Size 642, (0 reserved)
  Subpartition 4: Raw Size 384, User Size 192, (0 reserved)
IP VPN Raw Size 131072, User Size 131072(0 reserved)
  Subpartition 0: Raw Size 2048, User Size 2048, (0 reserved)
  Subpartition 1: Raw Size 116886, User Size 116886, (0 reserved)
  Subpartition 2: Raw Size 9333, User Size 9333, (0 reserved)
  Subpartition 3: Raw Size 1285, User Size 1285, (0 reserved)
  Subpartition 4: Raw Size 384, User Size 384, (0 reserved)
MAC: Raw Size 131072, User Size 131072(0 reserved)
  Subpartition 0: Raw Size 10, User Size 10, (0 reserved)
  Subpartition 1: Raw Size 32, User Size 32, (0 reserved)
  Subpartition 2: Raw Size 131030, User Size 131030, (0 reserved)
Session: Raw Size 98304, User Size 49152(0 reserved)
  Subpartition 0: Raw Size 79872, User Size 39936, (0 reserved)
  Subpartition 1: Raw Size 2048, User Size 1024, (0 reserved)
  Subpartition 2: Raw Size 16384, User Size 8192, (0 reserved)
IPv6 Session: Raw Size 32768, User Size 4096(0 reserved)
  Subpartition 0: Raw Size 15872, User Size 1984, (0 reserved)
  Subpartition 1: Raw Size 512, User Size 64, (0 reserved)
  Subpartition 2: Raw Size 16384, User Size 2048, (0 reserved)
Out Session: Raw Size 196608, User Size 98304(49152 reserved)
Out IPv6 Session: Raw Size 65536, User Size 8192(4096 reserved)
Slot 1 XPP20SP 0:
IP Section(Left):              0(000000) - 262143(03ffff)
IP Section(Right):             0(000000) - 262143(03ffff)
IP SNet 0:(Left):              0(000000) - 12287(002fff)
IP SNet 1:(Left):              12288(003000) - 262143(03ffff)
IP SNet 1:(Right):             0(000000) - 218250(03548a)
IP SNet 2:(Right):             218251(03548b) - 255585(03e661)
IP SNet 3:(Right):             255586(03e662) - 260725(03fa75)
IP SNet 4:(Right):             260726(03fa76) - 261503(03fd7f)
IP SNet 5:(Right):             261504(03fd80) - 261631(03fdfd)
IP SNet 6:(Right):             261632(03fe00) - 261695(03fe3f)
IP SNet 7:(Right):             261696(03fe40) - 261727(03fe5f)
IP SNet 8:(Right):             261728(03fe60) - 261759(03fe7f)
IP SNet 9:(Right):             261760(03fe80) - 261791(03fe9f)
IP SNet 10:(Right):            261792(03fea0) - 261807(03feaf)
IP SNet 11:(Right):            261808(03feb0) - 261823(03febf)
IP SNet 12:(Right):            261824(03fec0) - 261839(03fecf)
IP SNet 13:(Right):            261840(03fed0) - 261855(03fedf)
```

```

IP SNet 14:(Right): 261856 (03fee0) - 261871 (03feef)
IP SNet 15:(Right): 261872 (03fef0) - 261887 (03feff)
IP SNet 16:(Right): 261888 (03ff00) - 261903 (03ff0f)
IP SNet 17:(Right): 261904 (03ff10) - 261919 (03ff1f)
IP SNet 18:(Right): 261920 (03ff20) - 261935 (03ff2f)
IP SNet 19:(Right): 261936 (03ff30) - 261951 (03ff3f)
IP SNet 20:(Right): 261952 (03ff40) - 261967 (03ff4f)
IP SNet 21:(Right): 261968 (03ff50) - 261983 (03ff5f)
IP SNet 22:(Right): 261984 (03ff60) - 261999 (03ff6f)
IP SNet 23:(Right): 262000 (03ff70) - 262015 (03ff7f)
IP SNet 24:(Right): 262016 (03ff80) - 262031 (03ff8f)
IP SNet 25:(Right): 262032 (03ff90) - 262047 (03ff9f)
IP SNet 26:(Right): 262048 (03ffa0) - 262063 (03ffaaf)
IP SNet 27:(Right): 262064 (03ffb0) - 262079 (03ffbf)
IP SNet 28:(Right): 262080 (03ffc0) - 262095 (03ffcf)
IP SNet 29:(Right): 262096 (03ffd0) - 262111 (03ffdf)
IP SNet 30:(Right): 262112 (03ffe0) - 262127 (03ffef)
IP SNet 31:(Right): 262128 (03fff0) - 262143 (03ffff)
IPV6 Section : 262144 (040000) - 393215 (05ffff)
IPV6 SNet 0: 262144 (040000) - 274431 (042fff)
IPV6 SNet 1: 274432 (043000) - 381927 (05d3e7)
IPV6 SNet 2: 381928 (05d3e8) - 391259 (05f85b)
IPV6 SNet 3: 391260 (05f85c) - 392543 (05fd5f)
IPV6 SNet 4: 392544 (05fd60) - 392927 (05fedf)
IPV6 SNet 5: 392928 (05fee0) - 393055 (05ff5f)
IPV6 SNet 6: 393056 (05ff60) - 393119 (05ff9f)
IPV6 SNet 7: 393120 (05ffa0) - 393151 (05ffbf)
IPV6 SNet 8: 393152 (05ffc0) - 393183 (05ffdf)
IPV6 SNet 9: 393184 (05ffe0) - 393215 (05ffff)
IP VPN Section: 393216 (060000) - 524287 (07ffff)
IP VPN SNet 0: 393216 (060000) - 395263 (0607ff)
IP VPN SNet 1: 395264 (060800) - 512149 (07d095)
IP VPN SNet 2: 512150 (07d096) - 521482 (07f50a)
IP VPN SNet 3: 521483 (07f50b) - 522767 (07fa0f)
IP VPN SNet 4: 522768 (07fa10) - 523151 (07fb8f)
IP VPN SNet 5: 523152 (07fb90) - 523279 (07fc0f)
IP VPN SNet 6: 523280 (07fc10) - 523343 (07fc4f)
IP VPN SNet 7: 523344 (07fc50) - 523375 (07fc6f)
IP VPN SNet 8: 523376 (07fc70) - 523407 (07fc8f)
IP VPN SNet 9: 523408 (07fc90) - 523439 (07fc9f)
IP VPN SNet 10: 523440 (07fcb0) - 523455 (07fcbf)
IP VPN SNet 11: 523456 (07fcc0) - 523471 (07fccf)
IP VPN SNet 12: 523472 (07fcd0) - 523487 (07fcd9)
IP VPN SNet 13: 523488 (07fce0) - 523503 (07fce9)
IP VPN SNet 14: 523504 (07fcf0) - 523519 (07fcff)
IP VPN SNet 15: 523520 (07fd00) - 523535 (07fd09)
IP VPN SNet 16: 523536 (07fd10) - 523551 (07fd19)
IP VPN SNet 17: 523552 (07fd20) - 523567 (07fd29)
IP VPN SNet 18: 523568 (07fd30) - 523583 (07fd39)
IP VPN SNet 19: 523584 (07fd40) - 523599 (07fd49)
IP VPN SNet 20: 523600 (07fd50) - 523615 (07fd59)
IP VPN SNet 21: 523616 (07fd60) - 523631 (07fd69)
IP VPN SNet 22: 523632 (07fd70) - 523647 (07fd79)
IP VPN SNet 23: 523648 (07fd80) - 523663 (07fd89)
IP VPN SNet 24: 523664 (07fd90) - 523679 (07fd99)
IP VPN SNet 25: 523680 (07fda0) - 523695 (07fda9)
IP VPN SNet 26: 523696 (07fdb0) - 523711 (07fdb9)
IP VPN SNet 27: 523712 (07fdc0) - 523727 (07fddf)
IP VPN SNet 28: 523728 (07fdd0) - 523743 (07fddf)
IP VPN SNet 29: 523744 (07fde0) - 523759 (07fdef)
IP VPN SNet 30: 523760 (07fdf0) - 523775 (07fdf9)
IP VPN SNet 31: 523776 (07ffe0) - 524287 (07ffff)
MAC Section : 524288 (080000) - 655359 (09ffff)
MAC Forwarding: 524288 (080000) - 655317 (09ffd5)
MAC Flooding : 655318 (09ffd6) - 655327 (09ffdf)
Misc Protocol : 655330 (09fff6) - 655381 (0a0015)
Session Section : 655360 (0a0000) - 753663 (0b7fff)
IP Multicast : 655360 (0a0000) - 671743 (0a3fff)
Broadcast ACL : 673792 (0a4800) - 675839 (0a4fff)

Receive ACL : 671744 (0a4000) - 673791 (0a47ff)
Rule-based ACL: 673792 (0a4800) - 753663 (0b7fff)

```

```
IPv6 Session Sec: 753664 (0b8000) - 786431 (0bffff)
IP Multicast : 753664 (0b8000) - 770047 (0bbfff)
Receive ACL : 770048 (0bc000) - 770559 (0bc1ff)
Rule-based ACL: 770560 (0bc200) - 786431 (0bffff)
Out Session : 786432 (0c0000) - 983039 (0effff)
Out IPv6 Session: 983040 (0f0000) - 104857 (0fffff)
...
```

**Syntax: show cam-partition**

The output displays the CAM partitioning profile name, slot number, number of CAM device, and total CAM size. It also displays the raw size, user size, and reserved size for each of the CAM sub-partitions.

In Algorithmic mode, the subpartitions and subnets for IP, IP VPN, IPv6, and IPv6 VPN are not displayed in the output of the **show cam-partition** command.

```
device# show cam-partition
CAM partitioning profile: default

XPP100GEXE 0:
# of CAM device           = 1
Total CAM Size            = 4456448 entries (340Mbits)

MAC: Raw Size 229376, User Size 229376(0 reserved)
  Subpartition 0: Raw Size 4, User Size 4, (0 reserved)
  Subpartition 1: Raw Size 8, User Size 8, (0 reserved)
  Subpartition 2: Raw Size 229354, User Size 229354, (0 reserved)
  Subpartition 3: Raw Size 10, User Size 10, (0 reserved)

Session: Raw Size 294912, User Size 147456(0 reserved)
  Subpartition 0: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 1: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 2: Raw Size 276480, User Size 138240, (0 reserved)
  Subpartition 3: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 4: Raw Size 2048, User Size 1024, (0 reserved)
  Subpartition 5: Raw Size 16384, User Size 8192, (0 reserved)
  Subpartition 6: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 7: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 8: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 9: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 10: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 11: Raw Size 0, User Size 0, (0 reserved)

IPv6 Session: Raw Size 98304, User Size 12288(0 reserved)
  Subpartition 0: Raw Size 81920, User Size 10240, (0 reserved)
  Subpartition 1: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 2: Raw Size 16384, User Size 2048, (0 reserved)
  Subpartition 3: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 4: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 5: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 6: Raw Size 0, User Size 0, (0 reserved)

Out Session: Raw Size 98304, User Size 49152(0 reserved)

Out IPv6 Session: Raw Size 32768, User Size 4096(0 reserved)

Internal Forwarding Lookup: Raw Size 131072, User Size 131072(0 reserved)
  Subpartition 0: Raw Size 131071, User Size 131071, (0 reserved)
  Subpartition 1: Raw Size 1, User Size 1, (0 reserved)

IP: Raw Size 1458176, User Size 1458176(0 reserved)

IP VPN Raw Size 622592, User Size 622592(0 reserved)

IPv6: Raw Size 425984, User Size 425984(0 reserved)
```

```

MAC Section      : 163840 (028000) - 393215 (05ffff)
  Misc Protocol  : 163840 (028000) - 163849 (028009)
  MAC Forwarding: 163840 (028000) - 163849 (028009)
  MAC Flooding  : 163840 (028000) - 163849 (028009)
  PORT BUM RL   : 163840 (028000) - 163849 (028009)
  Misc Protocol  : 163850 (02800a) - 393203 (05fff3)
  MAC Forwarding: 163850 (02800a) - 393203 (05fff3)
  MAC Flooding  : 163850 (02800a) - 393203 (05fff3)
  PORT BUM RL   : 163850 (02800a) - 393203 (05fff3)
  Misc Protocol  : 393204 (05fff4) - 393211 (05fffb)
  MAC Forwarding: 393204 (05fff4) - 393211 (05fffb)
  MAC Flooding  : 393204 (05fff4) - 393211 (05fffb)
  PORT BUM RL   : 393204 (05fff4) - 393211 (05fffb)
  Misc Protocol  : 393212 (05fffc) - 393215 (05ffff)
  MAC Forwarding: 393212 (05fffc) - 393215 (05ffff)
  MAC Flooding  : 393212 (05fffc) - 393215 (05ffff)
  PORT BUM RL   : 393212 (05fffc) - 393215 (05ffff)

Session Section : 393216 (060000) - 688127 (0a7fff)
  Rule-based ACL : 411648 (064800) - 688127 (0a7fff)
  Receive ACL    : 409600 (064000) - 411647 (0647ff)
  IP Multicast   : 393216 (060000) - 409599 (063fff)

IPv6 Session Sec: 688128 (0a8000) - 786431 (0bffff)
  IP Multicast   : 688128 (0a8000) - 704511 (0abfff)
  Receive ACL    : 688128 (0a8000) - 704511 (0abfff)
  Rule-based ACL: 688128 (0a8000) - 704511 (0abfff)
  IP Multicast   : 704512 (0ac000) - 786431 (0bffff)
  Receive ACL    : 704512 (0ac000) - 786431 (0bffff)
  Rule-based ACL: 704512 (0ac000) - 786431 (0bffff)

Out Session     : 786432 (0c0000) - 884735 (0d7fff)

Out IPv6 Session: 884736 (0d8000) - 917503 (0dffff)

Internal Forward: 917504 (0e0000) - 104857 (0ffffff)
  IFL Main       : 104857 (0ffffff) - 104857 (0ffffff)
  IFL Openflow C: 104857 (0ffffff) - 104857 (0ffffff)
  IFL Main       : 917504 (0e0000) - 104857 (0fffffe)
  IFL Openflow C: 917504 (0e0000) - 104857 (0fffffe)

IP Section(Left): 104857 (100000) - 250675 (263fff)

IP VPN Section: 250675 (264000) - 312934 (2fbfff)

IPV6 Section    : 312934 (2fc000) - 355532 (363fff)

XPP100GEXE 1:
# of CAM device      = 1
Total CAM Size      = 4456448 entries (340Mbits)

MAC: Raw Size 229376, User Size 229376(0 reserved)
  Subpartition 0: Raw Size 4, User Size 4, (0 reserved)
  Subpartition 1: Raw Size 8, User Size 8, (0 reserved)
  Subpartition 2: Raw Size 229354, User Size 229354, (0 reserved)
  Subpartition 3: Raw Size 10, User Size 10, (0 reserved)

Session: Raw Size 294912, User Size 147456(0 reserved)
  Subpartition 0: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 1: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 2: Raw Size 276480, User Size 138240, (0 reserved)
  Subpartition 3: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 4: Raw Size 2048, User Size 1024, (0 reserved)
  Subpartition 5: Raw Size 16384, User Size 8192, (0 reserved)

```

```

Subpartition 6: Raw Size 0, User Size 0, (0 reserved)
Subpartition 7: Raw Size 0, User Size 0, (0 reserved)
Subpartition 8: Raw Size 0, User Size 0, (0 reserved)
Subpartition 9: Raw Size 0, User Size 0, (0 reserved)
Subpartition 10: Raw Size 0, User Size 0, (0 reserved)
Subpartition 11: Raw Size 0, User Size 0, (0 reserved)

IPv6 Session: Raw Size 98304, User Size 12288(0 reserved)
  Subpartition 0: Raw Size 81920, User Size 10240, (0 reserved)
  Subpartition 1: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 2: Raw Size 16384, User Size 2048, (0 reserved)
  Subpartition 3: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 4: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 5: Raw Size 0, User Size 0, (0 reserved)
  Subpartition 6: Raw Size 0, User Size 0, (0 reserved)

Out Session: Raw Size 98304, User Size 49152(0 reserved)

Out IPv6 Session: Raw Size 32768, User Size 4096(0 reserved)

Internal Forwarding Lookup: Raw Size 131072, User Size 131072(0 reserved)
  Subpartition 0: Raw Size 131071, User Size 131071, (0 reserved)
  Subpartition 1: Raw Size 1, User Size 1, (0 reserved)

IP: Raw Size 1458176, User Size 1458176(0 reserved)

IP VPN Raw Size 622592, User Size 622592(0 reserved)

IPv6: Raw Size 425984, User Size 425984(0 reserved)

MAC Section      : 163840 (028000) - 393215 (05ffff)
  Misc Protocol  : 163840 (028000) - 163849 (028009)
  MAC Forwarding: 163840 (028000) - 163849 (028009)
  MAC Flooding   : 163840 (028000) - 163849 (028009)
  PORT BUM RL    : 163840 (028000) - 163849 (028009)
  Misc Protocol  : 163850 (02800a) - 393203 (05fff3)
  MAC Forwarding: 163850 (02800a) - 393203 (05fff3)
  MAC Flooding   : 163850 (02800a) - 393203 (05fff3)
  PORT BUM RL    : 163850 (02800a) - 393203 (05fff3)
  Misc Protocol  : 393204 (05fff4) - 393211 (05fffb)
  MAC Forwarding: 393204 (05fff4) - 393211 (05fffb)
  MAC Flooding   : 393204 (05fff4) - 393211 (05fffb)
  PORT BUM RL    : 393204 (05fff4) - 393211 (05fffb)
  Misc Protocol  : 393212 (05fffc) - 393215 (05ffff)
  MAC Forwarding: 393212 (05fffc) - 393215 (05ffff)
  MAC Flooding   : 393212 (05fffc) - 393215 (05ffff)
  PORT BUM RL    : 393212 (05fffc) - 393215 (05ffff)

Session Section : 393216 (060000) - 688127 (0a7fff)
  Rule-based ACL : 411648 (064800) - 688127 (0a7fff)
  Receive ACL    : 409600 (064000) - 411647 (0647ff)
  IP Multicast   : 393216 (060000) - 409599 (063fff)

IPv6 Session Sec: 688128 (0a8000) - 786431 (0bffff)
  IP Multicast   : 688128 (0a8000) - 704511 (0abfff)
  Receive ACL    : 688128 (0a8000) - 704511 (0abfff)
  Rule-based ACL: 688128 (0a8000) - 704511 (0abfff)
  IP Multicast   : 704512 (0ac000) - 786431 (0bffff)
  Receive ACL    : 704512 (0ac000) - 786431 (0bffff)
  Rule-based ACL: 704512 (0ac000) - 786431 (0bffff)

Out Session      : 786432 (0c0000) - 884735 (0d7fff)

Out IPv6 Session: 884736 (0d8000) - 917503 (0dffff)

Internal Forward: 917504 (0e0000) - 104857 (0ffffff)

```

```
IPL Main      : 104857 (0ffffff) - 104857 (0ffffff)
IPL Openflow C: 104857 (0ffffff) - 104857 (0ffffff)
IPL Main      : 917504 (0e0000) - 104857 (0ffffe)
IPL Openflow C: 917504 (0e0000) - 104857 (0ffffe)
```

```
IP Section(Left): 104857 (100000) - 250675 (263fff)
```

```
IP VPN Section: 250675 (264000) - 312934 (2fbfff)
```

```
IPV6 Section   : 312934 (2fc000) - 355532 (363fff)
```

Table 45 describes the output parameters of the **show cam-partition** command.

**TABLE 45** Output parameters of the show cam-partition command

Field	Description
CAM partitioning profile	Shows the CAM profile name.
Slot	Shows the slot number.
# of CAM device	Shows the number of the CAM device.
Total CAM Size	Shows the total available CAM size.
Raw Size	Shows the value double that of the CAM partition standard entry count. A standard entry contains 64 bits for the data and 64 bits for the mask. The raw size may cover invalid entries.
User Size	Shows the actual number of entries that the application can use. For a 128-bit application, such as Layer 4 ACL and IPV6, two standard entries equal one user entry. The user size may also cover invalid entries.
reserved	Shows the number of entries not usable in a specific sub-partition.
IP	Shows the raw size, user size, and reserved size for the IP CAM partition and its subpartitions. In Algorithmic mode, subpartitions are not displayed.
IPv6	Shows the raw size, user size, and reserved size for the IPv6 CAM partition and its subpartitions. In Algorithmic mode, subpartitions are not displayed.
IP VPN	Shows the raw size, user size, and reserved size for the IP VPN CAM partition and its subpartitions. In Algorithmic mode, subpartitions are not displayed.
MAC	Shows the raw size, user size, and reserved size for the MAC CAM partition and its subpartitions.
Session	Shows the raw size, user size, and reserved size for the session CAM partition and its subpartitions.
IPv6 Session	Shows the raw size, user size, and reserved size for the IPv6 session CAM partition and its subpartitions.
Out Session	Shows the raw size, user size, and reserved size for the out session CAM partition and its subpartitions.
Out IPv6 Session	Shows the raw size, user size, and reserved size for the out IPv6 session CAM partition and its subpartitions.
IP Section	Shows the CAM partition size of the IP section and its subnets. In Algorithmic mode, subnets are not displayed.
IPv6 Section	Shows the CAM partition size of the IPv6 section and its subnets. In Algorithmic mode, subnets are not displayed.
IP VPN Section	Shows the CAM partition size of the IP VPN section and its subnets. In Algorithmic mode, subnets are not displayed.
MAC Section	Shows the CAM partition size of the MAC section.
MAC Forwarding	Shows the CAM partition size of the MAC forwarding section.
MAC Flooding	Shows the CAM partition size of the MAC flooding section.
Misc Protocol	Shows the CAM partition size of the miscellaneous protocol section.
Session Section	Shows the CAM partition size of the session section.
IP Multicast	Shows the CAM partition size of the IP multicast ACL.

**TABLE 45** Output parameters of the show cam-partition command (continued)

Field	Description
Broadcast ACL	Shows the CAM partition size of the IP broadcast ACL.
Receive ACL	Shows the CAM partition size of the IP receive ACL.
Rule-based ACL	Shows the CAM partition size of the rule-based ACL.
IPv6 Session Sec	Shows the CAM partition size of the IPv6 session section.

## Displaying CAM Partition for IPv6 VPN

The IPv6 VPN CAM partition is created when multi-service-3 or multi-service-4 CAM profile is configured. The IPv6 VPN CAM partition contains 10 sub-partitions. The sub-partition is allocated with a fixed size, but can be dynamically changed. If the size of sub-partition is dynamically changed, the output from the **show cam-partition** command is affected. The following example displays information about IPv6 VPN CAM partition when the current CAM profile is multi-service-3:

```

device# show cam-partition
CAM partitioning profile: multi-service-3
Slot 1 XPP20SP 0:
# of CAM device           = 4
Total CAM Size           = 917504 entries (63Mbits)
.....
IPv6 VPN: Raw Size 131072, User Size 65536(0 reserved)
  Subpartition 0: Raw Size 2048, User Size 1024, (0 reserved)
  Subpartition 1: Raw Size 117734, User Size 58867, (0 reserved)
  Subpartition 2: Raw Size 9333, User Size 4666, (0 reserved)
  Subpartition 3: Raw Size 1285, User Size 642, (0 reserved)
  Subpartition 4: Raw Size 384, User Size 192, (0 reserved)
.....
Slot 1 XPP20SP 0:
.....
IPv6 VPN Section: 524288 (080000) - 655359 (09ffff)
  IPv6 VPN SNet 0: 524288 (080000) - 526335 (0807ff)
  IPv6 VPN SNet 1: 526336 (080800) - 644069 (09d3e5)
  IPv6 VPN SNet 2: 644070 (09d3e6) - 653402 (09f85a)
  IPv6 VPN SNet 3: 653403 (09f85b) - 654687 (09fd5f)
  IPv6 VPN SNet 4: 654688 (09fd60) - 655071 (09fedf)
  IPv6 VPN SNet 5: 655072 (09fee0) - 655199 (09ff5f)
  IPv6 VPN SNet 6: 655200 (09ff60) - 655263 (09ff9f)
  IPv6 VPN SNet 7: 655264 (09ffa0) - 655295 (09ffbf)
  IPv6 VPN SNet 8: 655296 (09ffc0) - 655327 (09ffdf)
  IPv6 VPN SNet 9: 655328 (09ffe0) - 655359 (09ffff)
    
```

### NOTE

In Algorithmic mode, the subpartitions and subnets are not displayed in the output of the **show cam-partition** command.

## Output from show CAM partition usage command

The **show cam-partition usage** command shows the CAM size available per partition, the amount free, and the percent used. This information is shown here for slot 1.

```

device# show cam-partition usage
CAM partitioning profile: multi-service-3
Slot 1 XPP20SP 0:
Slot 1 XPP20SP 0:
  [IP]262144(size), 262129(free), 00.00%(used)
  :SNet 0: 2048(size), 2036(free), 00.58%(used)
  :SNet 1:237830(size), 237828(free), 00.00%(used)
  :SNet 2: 18667(size), 18667(free), 00.00%(used)
  :SNet 3: 2570(size), 2570(free), 00.00%(used)
  :SNet 4: 389(size), 389(free), 00.00%(used)
  :SNet 5: 128(size), 128(free), 00.00%(used)
  :SNet 6: 64(size), 64(free), 00.00%(used)
    
```

```

:SNet 7: 32(size), 32(free), 00.00%(used)
:SNet 8: 32(size), 32(free), 00.00%(used)
:SNet 9: 32(size), 32(free), 00.00%(used)
:SNet 10: 16(size), 16(free), 00.00%(used)
:SNet 11: 16(size), 16(free), 00.00%(used)
:SNet 12: 16(size), 16(free), 00.00%(used)
:SNet 13: 16(size), 16(free), 00.00%(used)
:SNet 14: 16(size), 16(free), 00.00%(used)
:SNet 15: 16(size), 16(free), 00.00%(used)
:SNet 16: 16(size), 16(free), 00.00%(used)
:SNet 17: 16(size), 16(free), 00.00%(used)
:SNet 18: 16(size), 16(free), 00.00%(used)
:SNet 19: 16(size), 16(free), 00.00%(used)
:SNet 20: 16(size), 16(free), 00.00%(used)
:SNet 21: 16(size), 16(free), 00.00%(used)
:SNet 22: 16(size), 16(free), 00.00%(used)
:SNet 23: 16(size), 16(free), 00.00%(used)
:SNet 24: 16(size), 16(free), 00.00%(used)
:SNet 25: 16(size), 16(free), 00.00%(used)
:SNet 26: 16(size), 16(free), 00.00%(used)
:SNet 27: 16(size), 16(free), 00.00%(used)
:SNet 28: 16(size), 16(free), 00.00%(used)
:SNet 29: 16(size), 16(free), 00.00%(used)
:SNet 30: 16(size), 16(free), 00.00%(used)
:SNet 31: 16(size), 15(free), 06.25%(used)
[IPV6] 32768(size), 32762(free), 00.01%(used)
:SNet 0: 1024(size), 1022(free), 00.19%(used)
:SNet 1: 28756(size), 28754(free), 00.00%(used)
:SNet 2: 2332(size), 2332(free), 00.00%(used)
:SNet 3: 320(size), 320(free), 00.00%(used)
:SNet 4: 192(size), 192(free), 00.00%(used)
:SNet 5: 64(size), 64(free), 00.00%(used)
:SNet 6: 32(size), 32(free), 00.00%(used)
:SNet 7: 16(size), 16(free), 00.00%(used)
:SNet 8: 16(size), 15(free), 06.25%(used)
:SNet 9: 16(size), 15(free), 06.25%(used)
[IP VPN] 196608(size), 196532(free), 00.03%(used)
:SNet 0: 2048(size), 1999(free), 02.39%(used)
:SNet 1: 177113(size), 177086(free), 00.01%(used)
:SNet 2: 14000(size), 14000(free), 00.00%(used)
:SNet 3: 1927(size), 1927(free), 00.00%(used)
:SNet 4: 384(size), 384(free), 00.00%(used)
:SNet 5: 128(size), 128(free), 00.00%(used)
:SNet 6: 64(size), 64(free), 00.00%(used)
:SNet 7: 32(size), 32(free), 00.00%(used)
:SNet 8: 32(size), 32(free), 00.00%(used)
:SNet 9: 32(size), 32(free), 00.00%(used)
:SNet 10: 16(size), 16(free), 00.00%(used)
:SNet 11: 16(size), 16(free), 00.00%(used)
:SNet 12: 16(size), 16(free), 00.00%(used)
:SNet 13: 16(size), 16(free), 00.00%(used)
:SNet 14: 16(size), 16(free), 00.00%(used)
:SNet 15: 16(size), 16(free), 00.00%(used)
:SNet 16: 16(size), 16(free), 00.00%(used)
:SNet 17: 16(size), 16(free), 00.00%(used)
:SNet 18: 16(size), 16(free), 00.00%(used)
:SNet 19: 16(size), 16(free), 00.00%(used)
:SNet 20: 16(size), 16(free), 00.00%(used)
:SNet 21: 16(size), 16(free), 00.00%(used)
:SNet 22: 16(size), 16(free), 00.00%(used)
:SNet 23: 16(size), 16(free), 00.00%(used)
:SNet 24: 16(size), 16(free), 00.00%(used)
:SNet 25: 16(size), 16(free), 00.00%(used)
:SNet 26: 16(size), 16(free), 00.00%(used)
:SNet 27: 16(size), 16(free), 00.00%(used)
:SNet 28: 16(size), 16(free), 00.00%(used)
:SNet 29: 16(size), 16(free), 00.00%(used)
:SNet 30: 16(size), 16(free), 00.00%(used)
:SNet 31: 512(size), 512(free), 00.00%(used)
[MAC] 131072(size), 131061(free), 00.00%(used)
:Protocol: 10(size), 6(free), 40.00%(used)
:Forwarding: 131054(size), 131047(free), 00.00%(used)

```

```

: Flooding:      8 (size),      8 (free), 00.00% (used)
[IPV6 VPN] 65536 (size),      15 (free), 99.97% (used)
: SNet 0:      20 (size),      0 (free), 100.00% (used)
: SNet 1: 65500 (size),      0 (free), 100.00% (used)
: SNet 2:       2 (size),      2 (free), 00.00% (used)
: SNet 3:       2 (size),      2 (free), 00.00% (used)
: SNet 4:       2 (size),      2 (free), 00.00% (used)
: SNet 5:       2 (size),      2 (free), 00.00% (used)
: SNet 6:       2 (size),      2 (free), 00.00% (used)
: SNet 7:       2 (size),      2 (free), 00.00% (used)
: SNet 8:       2 (size),      1 (free), 50.00% (used)
: SNet 9:       2 (size),      2 (free), 00.00% (used)
[Session] 32768 (size),      32767 (free), 00.00% (used)
: IP Multicast: 8192 (size),      8192 (free), 00.00% (used)
: Receive ACL: 1024 (size),      1023 (free), 00.09% (used)
: Rule ACL: 23552 (size),      23552 (free), 00.00% (used)
: IP Source Guard Permit: 0 (size),      0 (free), 00.00% (used)
: IP Source Guard Denial: 0 (size),      0 (free), 00.00% (used)
[IPV6 Session] 8192 (size),      8192 (free), 00.00% (used)
: IP Multicast: 2048 (size),      2048 (free), 00.00% (used)
: Receive ACL: 0 (size),      0 (free), 00.00% (used)
: Rule ACL: 6144 (size),      6144 (free), 00.00% (used)
[Internal Forwarding Lookup] 8192 (size),      8185 (free), 00.08% (used)
[Out Session] 28672 (size),      28672 (free), 00.00% (used)
[Out V6 Session] 8192 (size),      8192 (free), 00.00% (used)

```

The type of CAM partitioning profile configured is displayed in the "CAM partitioning profile line. The "multi-service-3" or "multi-service-4" profile indicates that the system will allocate a partition for IPV6 VPN.

The output displays the size of the available CAM, amount of CAM currently free, and what percentage of the available CAM is used currently.

**(size)**: The effective user size obtained by subtracting the reserved size from the user size.

**(free)**: The amount of CAM currently available.

**(used)**: The percentage of CAM currently being used.

In Algorithmic mode, the subnets of IP, IP VPN, IPv5, and IPv6 VPN are not displayed in the output of the **show cam-partition usage** command.

```

device# show cam-partition usage
CAM partitioning profile: default

```

```

XPP100GEXE 0:

```

```

[MAC] 229376 (size), 229371 (free), 0.0% (used)
: Protocol: 10 (size), 5 (free), 50.0% (used)
: Forwarding: 229354 (size), 229354 (free), 0.0% (used)
: Flooding: 8 (size), 8 (free), 0.0% (used)
: Port BUM RL: 4 (size), 4 (free), 0.0% (used)

```

```

[Session] 147456 (size), 147455 (free), 0.0% (used)
: IP Source Guard Denial: 0 (size), 0 (free), 0.0% (used)
: IP Source Guard Permit: 0 (size), 0 (free), 0.0% (used)
: Rule-based ACL: 138240 (size), 138240 (free), 0.0% (used)
: Broadcast ACL: 0 (size), 0 (free), 0.0% (used)
: Receive ACL: 1024 (size), 1023 (free), 0.9% (used)
: IP Multicast: 8192 (size), 8192 (free), 0.0% (used)
: IP Multicast 1G: 0 (size), 0 (free), 0.0% (used)
: IP Multicast 2GM: 0 (size), 0 (free), 0.0% (used)
: Open Flow CatchAll: 0 (size), 0 (free), 0.0% (used)
: Open Flow UnProtected: 0 (size), 0 (free), 0.0% (used)
: Open Flow Normal: 0 (size), 0 (free), 0.0% (used)
: Open Flow Protected: 0 (size), 0 (free), 0.0% (used)

[IPV6 Session] 12288 (size), 12288 (free), 0.0% (used)
: Rule ACL: 10240 (size), 10240 (free), 0.0% (used)
: Receive ACL: 0 (size), 0 (free), 0.0% (used)

```

```

        :IPv6 Multicast:    2048(size),    2048(free),    0. 0%(used)
        :IPv6 Open Flow CatchAll:    0(size),    0(free),    0. 0%(used)
:IPv6 Open Flow UnProtected:    0(size),    0(free),    0. 0%(used)
        :IPv6 Open Flow Normal:    0(size),    0(free),    0. 0%(used)
        :IPv6 Open Flow Protected:    0(size),    0(free),    0. 0%(used)

[Out Session]  49152(size),  49152(free),  0. 0%(used)

[Out V6 Session]  4096(size),  4096(free),  0. 0%(used)

[Internal Forwarding Lookup] 131072(size), 131072(free), 0. 0%(used)
        :IFL Main: 131071(size), 131071(free), 0. 0%(used)
        :IFL Openflow CatchAll:    1(size),    1(free),    0. 0%(used)

        [IP]1458176(size), 1458165(free), 0. 0%(used)

        [IP VPN] 622592(size), 622592(free), 0. 0%(used)

        [IPV6] 425984(size), 425982(free), 0. 0%(used)

XPP100GEXE 1:

        [MAC] 229376(size), 229371(free), 0. 0%(used)
        :Protocol:    10(size),    5(free),    50. 0%(used)
        :Forwarding: 229354(size), 229354(free), 0. 0%(used)
        :Flooding:    8(size),    8(free),    0. 0%(used)
        :Port BUM RL: 4(size),    4(free),    0. 0%(used)

        [Session] 147456(size), 147455(free), 0. 0%(used)
:IP Source Guard Denial:    0(size),    0(free),    0. 0%(used)
:IP Source Guard Permit:    0(size),    0(free),    0. 0%(used)
        :Rule-based ACL: 138240(size), 138240(free), 0. 0%(used)
        :Broadcast ACL:    0(size),    0(free),    0. 0%(used)
        :Receive ACL:    1024(size), 1023(free), 0. 9%(used)
        :IP Multicast:    8192(size), 8192(free), 0. 0%(used)
        :IP Multicast 1G:    0(size),    0(free),    0. 0%(used)
        :IP Multicast 2GM:    0(size),    0(free),    0. 0%(used)
        :Open Flow CatchAll:    0(size),    0(free),    0. 0%(used)
:Open Flow UnProtected:    0(size),    0(free),    0. 0%(used)
        :Open Flow Normal:    0(size),    0(free),    0. 0%(used)
        :Open Flow Protected:    0(size),    0(free),    0. 0%(used)

[IPV6 Session] 12288(size), 12288(free), 0. 0%(used)
        :Rule ACL: 10240(size), 10240(free), 0. 0%(used)
        :Receive ACL:    0(size),    0(free),    0. 0%(used)
        :IPv6 Multicast:    2048(size), 2048(free), 0. 0%(used)
        :IPv6 Open Flow CatchAll:    0(size),    0(free),    0. 0%(used)
:IPv6 Open Flow UnProtected:    0(size),    0(free),    0. 0%(used)
        :IPv6 Open Flow Normal:    0(size),    0(free),    0. 0%(used)
        :IPv6 Open Flow Protected:    0(size),    0(free),    0. 0%(used)

[Out Session]  49152(size),  49152(free),  0. 0%(used)

[Out V6 Session]  4096(size),  4096(free),  0. 0%(used)

[Internal Forwarding Lookup] 131072(size), 131072(free), 0. 0%(used)
        :IFL Main: 131071(size), 131071(free), 0. 0%(used)
        :IFL Openflow CatchAll:    1(size),    1(free),    0. 0%(used)

        [IP]1458176(size), 1458165(free), 0. 0%(used)

        [IP VPN] 622592(size), 622592(free), 0. 0%(used)

        [IPV6] 425984(size), 425982(free), 0. 0%(used)

```

**Syntax:** `show cam-partition usage slot slot-number`

## Displaying CAM information

The following commands display CAM information.

### Show cam l2vpn

To display all VLL or VPLS MAC entries, including local entries (Port or VLAN or MAC from end points) and remote entries (VC or MAC from VLL or VPLS peers) enter the following command.

```
device# show cam l2vpn 2/1
Slot Index      MAC                Age  Port  IFL/  VC Label  Out Port Remote DA/  PRAM
  (Hex)                (Hex)                (Hex)                (Hex)
2     9fff6     0000.0034.5678  Dis  2/4   4096   74565    2/2     0    DA   8f
2     9fff7     0000.0034.5566  Dis  2/2   500    N/A      Filter   0    DA   8e
```

**Syntax:** `show cam l2vpn slot/port [ MAC address ]`

### Show cam ipvpn

To display IPv4 VPN CAM entries, including local (Port+VLAN+IP) and remote (VC+IP) entries, enter the following command.

```
device# show cam ipvpn 2/1
Slot Index  IP_Address      Port  Vlan  VC Lbl MAC                Age Out Vlan Out Port
2     0x60000  10.2.3.4/32    2/6   18   N/A   N/A                Dis 10   3/5
2     0x60001  224.7.8.9/32  N/A   N/A   4660  0000.0080.0600  Dis 20   3/5
```

**Syntax:** `show cam ipvpn slot/port [ IP prefix ]`

### Show cam l4

To display all CAM entries on a Layer 4 interface, enter the following command.

```
device# show cam l4 4/1
LP Index Src IP          SPort Pro Age IFL/  Out IF Group PRAM
  (Hex) (Dest IP)  DPort)  VLAN Action
4     a4000  0.0.0.0    0     17  Dis 0    CPU   31   00084
      (10.0.0.0 3784 )
4     a4800  0.0.0.0    0     0   Dis 0    Pass  0   000c1
      (10.9.4.255 0 )
4     a4802  0.0.0.0    0     0   Dis 0    Pass  0   000c2
      (10.10.4.255 0 )
4     a4804  0.0.0.0    0     0   Dis 0    Pass  0   000c3
      (10.33.33.255 0 )
4     a4806  0.0.0.0    0     0   Dis 0    Pass  0   000c4
      (10.10.10.255 0 )
4     a4808  0.0.0.0    0     0   Dis 0    Pass  0   000c5
      (10.20.20.255 0 )
4     a480a  0.0.0.0    0     0   Dis 0    Pass  0   000c6
      (10.13.13.255 0 )
4     a480c  0.0.0.0    0     0   Dis 0    Pass  0   000c7
      (10.41.41.255 0 )
4     a480e  0.0.0.0    0     0   Dis 0    Pass  0   000c8
      (10.21.21.21 0 )
4     a4810  0.0.0.0    0     0   Dis 0    Pass  0   000c9
      (10.55.55.255 0 )
```

**Syntax:** `show cam l4 slot/port`

The `slot/port` parameter specifies the port for which you want to display the CAM entries.

[Table 46](#) describes the output parameters of the `show cam l4 slot/port` command.

**TABLE 46** Output parameters of the show cam l4 command

Field	Description
LP	Shows the number of the interface module.
Index (Hex)	Shows the row number of this entry in the IP route table.
Src IP Dest IP	Shows the source IP address and the destination IP address.
SPort DPort	Shows the source port ID and the destination port ID.
Pro	Shows the type of the protocol (TCP, UDP) used.
Age	Shows whether the age is enabled or disabled.
IFL/ VLAN	Shows the VLAN to which the port belongs.
Out IF Action	Shows the state of outgoing interface action.
Group	Shows the group address.
PRAM (Hex)	Shows the ACL PRAM entries.

### Show cam label-out

To display Outbound Label ACL CAMs, enter the following command.

```
device# show cam label-out 2/1
Slot Index  Port  Outer Lbl  Inner Lbl  MAC              Action
2      0xc0000  2/1   1024      1025      0000.0034.5678  Drop
2      0xc0002  2/1   1027      1028      0000.0034.5577  Drop
```

**Syntax:** show cam label-out *slot/port*

### Show IFL CAM partition

To display information about the IFL CAM partition, enter the following command.

```
device#show cam ifl 2/1
Slot Index  Port  Outer VLAN  Inner VLAN  PRAM  IFL ID
      (Hex)
2      00c5fff  2/1   100         200        185fff  4096
```

**Syntax:** show cam ifl *slot/port*

### Show CAM IP

To display IP CAM information, enter the following command.

```
device# show cam ip 3/1
LP Index      IP Address          MAC              Age IFL/ Out IF PRAM
      (Hex)          VLAN
3  02fef(L)    10.33.32.0/32      N/A              Dis N/A Drop  00094
3  02ff0(L)    10.33.32.255/32    N/A              Dis N/A Mgmt  0009d
3  02ff1(L)    10.33.32.1/32      N/A              Dis N/A Mgmt  0009c
3  02ff2(L)    10.11.11.0/32      N/A              Dis N/A Drop  00094
3  02ff3(L)    10.11.11.255/32    N/A              Dis N/A Mgmt  0009b
3  02ff4(L)    10.11.11.3/32      N/A              Dis N/A Mgmt  0009a
3  02ff5(L)    10.5.5.5/32        N/A              Dis N/A Mgmt  00096
3  02ff6(L)    224.0.0.22/32      N/A              Dis N/A Mgmt  00093
3  02ff7(L)    224.0.0.18/32      N/A              Dis N/A Mgmt  00092
3  02ff8(L)    224.0.0.13/32      N/A              Dis N/A Mgmt  00091
3  02ff9(L)    224.0.0.9/32       N/A              Dis N/A Mgmt  00090
3  02ffa(L)    224.0.0.6/32       N/A              Dis N/A Mgmt  0008f
3  02ffb(L)    224.0.0.5/32       N/A              Dis N/A Mgmt  0008e
3  02ffc(L)    224.0.0.4/32       N/A              Dis N/A Mgmt  0008d
3  02ffd(L)    224.0.0.2/32       N/A              Dis N/A Mgmt  0008c
3  02ffe(L)    224.0.0.1/32       N/A              Dis N/A Mgmt  0008b
```

```

3 02fff(L) 10.255.255.255/32 N/A Dis N/A Mgmt 0008a
3 35488(R) 10.33.32.0/24 N/A Dis N/A CPU 0009f
3 35489(R) 10.11.11.0/24 N/A Dis N/A CPU 0009e
3 3548a(R) 10.5.5.5/32 N/A Dis N/A Drop 00094
3 3ffff(R) 0.0.0.0/0 N/A Dis N/A Drop 00094
    
```

**Syntax:** `show cam ip slot/port`

The *slot/port* parameter specifies the port for which you want to display the CAM entries.

Table 47 describes the output parameters of the `show cam ip slot/port` command.

**TABLE 47** Output parameters of the show cam ip command

Field	Description
LP	Shows the number of the interface module.
Index (Hex)	Shows the row number of this entry in the IP route table.
IP Address	Shows the IP address of the interface.
MAC	Shows the MAC address of the interface.
Age	Shows whether the age is enabled or disabled.
IFL/ VLAN	Shows the VLAN to which the port belongs.
Out IF	Shows the state of outgoing interface action.
PRAM (Hex)	Shows the ACL PRAM entries.

## Show CAM IPv6

To display IPv6 CAM information, enter the following command

```

device# show cam ipv6 3/20
LP Index IPV6 Address MAC Age IFL/ Out IF PRAM
(Hex) VLAN (Hex)
3 22ffc 2001:db8::/128 N/A Dis N/A Mgmt 000dc
3 22ffe 2001:db8::1/128 N/A Dis N/A Mgmt 000db
3 2e8a6 2001:db8::/64 N/A Dis N/A CPU 000dd
3 2ffde fe80::/10 N/A Dis N/A CPU 00086
3 2fffe ::/0 N/A Dis N/A Drop 00085
    
```

**Syntax:** `show cam ipv6 slot/port`

The *slot/port* parameter specifies the port for which you want to display the CAM entries.

Table 48 describes the output parameters of the `show cam ipv6 slot/port` command.

**TABLE 48** Output parameters of the show cam ipv6 command

Field	Description
LP	Shows the number of the interface module.
Index (Hex)	Shows the row number of this entry in the IP route table.
IPV6 Address	Shows the IPv6 address of the interface.
MAC	Shows the MAC address of the interface.
Age	Shows whether the age is enabled or disabled.
IFL/ VLAN	Shows the VLAN to which the port belongs.
Out IF	Shows the state of outgoing interface action.
PRAM (Hex)	Shows the ACL PRAM entries.

## Displaying IPv6 VPN CAM information

The **show cam ipv6-vpn** command displays CAM information for an IPv6 VPN CAM entry on a single port, or for all ports on a device. IPv6 VPN CAM contains the destination IPv6 VPN address and layer 3 VPN ID. To display information for an IPv6 VPN CAM entry, enter the following command:

```
device# show cam ipv6-vpn 1/1
LP Index IPv6 VPN Address      MAC          Age
      (Hex)                    IFL ID      Out IF      PRAM
1  407f0 2001:db8:1::/128          N/A          Filter     Dis
                                     (21847)     1d615)
1  407f2 2001:db8:2::/128          N/A          Drop       Dis
                                     (21846)     5af6d)
```

**Syntax:** `show cam ipv6-vpn slot/port`

## Show cam v6acl

The **show cam v6acl** command displays IPv6 ACL CAM sessions configured on the device. The VLAN column is expanded to display either VLAN or IFL ID as shown in the example below:

```
device# show cam v6acl 1/1
LP Index Src IP Addr          SPort IFL/VLAN ID
      Dst IP Addr          DPort Pro Age Out IF PRAM
1  74000 2001:db8:1::/64             0     536977
      2001:db8:2::/64       0     6 Dis Pass 000a4
1  74008 2001:db8:1::/64             0     536977
      2001:db8:2::/64       0     6 Dis Pass 000a5
1  74010 2001:db8:1::/64             0     536977
      2001:db8:2::/6       0     6 Dis Pass 000a6
1  74018 2001:db8:1::/64             0     536977
      2001:db8:2::/64       0     6 Dis Pass 000a7
1  74020 2001:db8:1::/64             0     536977
      2001:db8:2::/64       0     6 Dis Pass 000a8
1  74028 2001:db8:1::/64             0     536977
```

**Syntax:** `show cam ipv6-vpn slot/port`

## Displaying IPv6 host drop CAM limit

Run the **show ipv6** command to display information about the IPv6 host drop CAM limit.

```
device# show ipv6
Global Settings
IPv6 Router-Id: 10.23.23.1 load-sharing path: 4
unicast-routing enabled, ipv6 allowed to run, hop-limit 64
reverse-path-check disabled
host drop cam limit 5
urpf-exclude-default disabled
session-logging-age 5
No Inbound Access List Set
No Outbound Access List Set
source-route disabled, forward-source-route disabled, icmp-redirect disabled
Configured Static Routes: 2
```

**Syntax:** `show ipv6`

## Show IFL CAM ISID partition

To display information about 802.1AH for ISID, enter the following command:

```
device# show cam ifl-isid 1/1
Slot Index Port Outer VLAN Itag ISID PRAM IFL ID IPv4/V6
```

	(Hex)				(Hex)		Routing
1	0085fe8	1/14	27	37	185fe8	1	0/0
1	0085fe9	1/13	26	36	185fe9	1	0/1
1	0085fea	1/16	25	35	185fea	1	1/0
1	0085feb	1/15	24	34	185feb	1	1/1

**Syntax:** `show cam ifl-isis slot/port`

This output includes an IPv4/ IPv6 Routing column. The IPv4/IPv6 Routing column indicates whether IPv4 or IPv6 is enabled or disabled on the interface. The number 1 represents enabled, and the number 0 represents disabled. For example, if 0/0 is displayed, then IPv4/IPv6 is disabled. If 0/1 is displayed, then IPv4 is disabled/ IPv6 is enabled. The IPv4/IPv6 Routing column is also displayed in the output of the `show cam ifl` command and `show cam ifl-mpls` command.

## Configuring CAM partition size

When you configure a tftp file size into the device, the device can only perform a parameter check based on the default CAM profile configured. In this situation, it is possible that you have configured a CAM partition size that conflicts with the physical CAM size. The following `system-max` commands may cause a conflict with the physical CAM size:

- `system-max`
  - `ifl-cam`
  - `ip-source-guard-cam`
  - `ipv4-mcast-cam`
  - `ipv6-mcast-cam`
  - `lsp-out-acl-cam`
  - `subnet-broadcast-acl-cam`
  - `receive cam`

When you have configured a CAM size that conflicts with the physical CAM size, a partition is created with the maximum possible CAM indices assigned to it. The following Syslog message is generated:

```
device# show log
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 27 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning
Dynamic Log Buffer (50 lines):
Sep  9 18:48:23:A:CAM IPv6 VPN SNet 9 partition warning: request 32, actual 0, sl
ot 1, ppcr 0
```

## CAM overflow logging

At system initialization, a threshold value is calculated for each sub-partition. If a partition does not have any sub-partitions, the value is based on the entire partition size. If a partition has movable sub-partition boundaries, the threshold value is also based on the entire partition size. By default, the threshold value is 5% of the total entry count. A minimum logging interval (default of 5 minutes) is also set for each partition to check usage. For example, let us say CAM overflow logging duration was set to 5 minutes and the overflow log is generated during a CAM write at 2:00 pm, then any further CAM writes will not cause an overflow log until 5 minutes have elapsed. So the next CAM overflow logging would occur on a CAM write after 2:05 pm. When the interval elapses, if the number of unused CAM entries drops below the threshold percentage value, a log message is generated during a CAM write.

```
CAM partition <partition name including sub-partition ID if applicable> warning: total <total count>
, free <current free count>
, slot <1 based slot number>
, ppcr <0 based ppcr id>
```

After the log message is generated, the sub-partition time stamp is updated to the current time.

## Configuring minimum logging interval and threshold value

You can configure a minimum logging interval and threshold value for CAM partition logging using the following command.

```
device(config)# cam-partition logging 10% 5
```

**Syntax:** `[no] cam-partition logging threshold percentage % | interval in minutes`

You can configure the *threshold percentage %* variable to change the threshold value from the default 95%.

The *interval in minutes* variable allows you to set the minimum logging interval. Default 5 minutes.

### NOTE

Because IP and IPv6 sub-partitions can dynamically grow and shrink, for these partitions, logging is implemented at the entire partition level. An SNMP trap is generated with the logging message.

# Using Syslog

---

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This appendix describes how to display Syslog messages and how to configure the Syslog facility, and lists the Syslog messages that a Brocade device can display during standard operation.

## NOTE

This appendix does not list Syslog messages that can be displayed when a debug option is enabled.

A device's software can write syslog messages to provide information at the following severity levels:

- Emergencies
- Alerts
- Critical

- Errors
- Warnings
- Notifications
- Informational
- Debugging

The device writes the messages to a local buffer, which can hold up to 5000 entries.

You also can specify the IP address or host name of up to six Syslog servers. When you specify a Syslog server, the device writes the messages both to the system log and to the Syslog server.

Using a Syslog server ensures that the messages remain available even after a system reload. The device's local Syslog buffer is cleared during a system reload or reboot, but the Syslog messages sent to the Syslog server remain on the server.

The Syslog service on a Syslog server receives logging messages from applications on the local host or from devices such as a Brocade NetIron MLX Series. Syslog adds a time stamp to each received message and directs messages to a log file. Most Unix workstations come with Syslog configured. Some third party vendor products also provide Syslog running on NT.

Syslog uses UDP port 514 and each Syslog message thus is sent with destination port 514. Each Syslog message is one line with Syslog message format. The message is embedded in the text portion of the Syslog format. There are several subfields in the format. Keywords are used to identify each subfield, and commas are delimiters. The subfield order is insensitive except that the text subfield should be the last field in the message. All the subfields are optional.

## Displaying Syslog messages

To display the Syslog messages in the device's local buffer, enter the following command at any level of the CLI.

```
device# show logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 3 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning
Static Log Buffer:
Dec 15 19:04:14:A:Fan 1, fan on right connector, failed
Dynamic Log Buffer (50 entries):
Dec 15 18:46:17:I:Interface ethernet 1/4, state up
Dec 15 18:45:21:I:Bridge topology change, vlan 4095, interface 4, changed
state to forwarding
Dec 15 18:45:15:I:Warm start
```

For information about the Syslog configuration information, time stamps, and dynamic and static buffers, refer to [Displaying the Syslog configuration](#) on page 271.

## Enabling real-time display of Syslog messages

By default, to view Syslog messages generated by a device, you need to display the Syslog buffer or the log on a Syslog server used by the device.

You can enable real-time display of Syslog messages on the management console. When you enable this feature, the software displays a Syslog message on the management console when the message is generated.

When you enable the feature, the software displays Syslog messages on the serial console when they occur. However, to enable display of real-time Syslog messages in Telnet or SSH sessions, you also must enable display within the individual sessions.

To enable real-time display of Syslog messages, enter the following command at the global CONFIG level of the CLI.

```
device(config)# logging console
```

**Syntax: [no] logging console**

This command enables the real-time display of Syslog messages on the serial console. You can enter this command from the serial console or a Telnet or SSH session.

To also enable the real-time display for a Telnet or SSH session, enter the following command from the Privileged EXEC level of the session.

```
telnet@device# terminal monitor
Syslog trace was turned ON
```

**Syntax: [no] terminal monitor**

Notice that the CLI displays a message to indicate the status change for the feature. To disable the feature in the management session, enter the **terminal monitor** command again. The command toggles the feature on and off.

```
telnet@device# terminal monitor
Syslog trace was turned OFF
```

Here is an example of how the Syslog messages are displayed.

```
telnet@device# terminal monitor
Syslog trace was turned ON
SYSLOG: <9>device, Power supply 2, power supply on left connector, failed
SYSLOG: <14>device, Interface ethernet 1/6, state down
SYSLOG: <14>device, Interface ethernet 1/2, state up
```

## Configuring the Syslog service

The procedures in this section describe how to perform the following Syslog configuration tasks:

- Specify a Syslog server. You can configure the device to use up to six Syslog servers. (Use of a Syslog server is optional. The system can hold up to 5000 Syslog messages in an internal buffer.)
- Change the level of messages the system logs.
- Change the number of messages the local Syslog buffer can hold.
- Display the Syslog configuration.
- Clear the local Syslog buffer.

Logging is enabled by default, with the following settings:

- Messages of all severity levels (Emergencies - Debugging) are logged.
- By default, up to 50 messages are retained in the local Syslog buffer. This can be changed.
- No Syslog server is specified.

## Displaying the Syslog configuration

To display the Syslog parameters currently in effect on a device, enter the following command from any level of the CLI.

```
device> show logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 3 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning
Static Log Buffer:
Dec 15 19:04:14:A:Fan 1, fan on right connector, failed
Dynamic Log Buffer (50 entries):
Dec 15 18:46:17:I:Interface ethernet 1/4, state up
Dec 15 18:45:21:I:Bridge topology change, vlan 4095, interface 4, changed
```

```
state to forwarding
Dec 15 18:45:15:I:Warm start
```

### Syntax: show logging

The Syslog display shows the following configuration information, in the rows above the log entries themselves.

**TABLE 49** CLI Display of Syslog buffer configuration

This field...	Displays...
Syslog logging	The state (enabled or disabled) of the Syslog buffer.
messages dropped	The number of Syslog messages dropped due to user-configured filters. By default, the software logs messages for all Syslog levels. You can disable individual Syslog levels, in which case the software filters out messages at those levels. Refer to <a href="#">Disabling logging of a message level</a> on page 277. Each time the software filters out a Syslog message, this counter is incremented.
flushes	The number of times the Syslog buffer has been cleared by the <b>clear logging</b> command. refer to <a href="#">Clearing the Syslog messages from the local buffer</a> on page 279.
overruns	The number of times the dynamic log buffer has filled up and been cleared to hold new entries. For example, if the buffer is set for 100 entries, the 101st entry causes an overrun. After that, the 201st entry causes a second overrun.
level	The message levels that are enabled. Each letter represents a message type and is identified by the key (level code) below the value. If you disable logging of a message level, the code for that level is not listed.
messages logged	The total number of messages that have been logged since the software was loaded.
level code	The message levels represented by the one-letter codes.

## Static and dynamic buffers

The software provides two separate buffers:

- **Static** - logs power supply failures, fan failures, and temperature warning or shutdown messages
- **Dynamic** - logs all other message types. In previous releases, power supply messages were displayed in static logs only, with only the last event logged in. The power supply messages are now displayed in both static and dynamic logs.

In the static log, new messages replace older ones, so only the most recent message is displayed. For example, only the most recent temperature warning message will be present in the log. If multiple temperature warning messages are sent to the log, the latest one replaces the previous one. The static buffer is not configurable.

The message types that appear in the static buffer do not appear in the dynamic buffer. The dynamic buffer contains up to the maximum number of messages configured for the buffer (50 by default), then begins removing the oldest messages (at the bottom of the log) to make room for new ones.

The static and dynamic buffers are both displayed when you display the log.

```
device(config)# show logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 3 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning
Static Log Buffer:
Dec 15 19:04:14:A:Fan 1, fan on right connector, failed
Dec 15 19:00:14:A:Fan 2, fan on left connector, failed
Dynamic Log Buffer (50 entries):
Dec 15 18:46:17:I:Interface ethernet 1/4, state up
Dec 15 18:45:21:I:Bridge topology change, vlan 4095, interface 4, changed
state to forwarding
Dec 15 18:45:15:I:Warm start
```

Notice that the static buffer contains two separate messages for fan failures. Each message of each type has its own buffer. Thus, if you replace fan 1 but for some reason that fan also fails, the software replaces the first message about the failure of fan 1 with the newer message. The software does not overwrite the message for fan 2, unless the software sends a newer message for fan 2.

When you clear log entries, you can selectively clear the static or dynamic buffer, or you can clear both. For example, to clear only the dynamic buffer, enter the following command at the Privileged EXEC level.

```
device# clear logging dynamic-buffer
```

**Syntax:** clear logging [ dynamic-buffer | static-buffer ]

You can specify **dynamic-buffer** to clear the dynamic buffer or **static-buffer** to clear the static buffer. If you do not specify a buffer, both buffers are cleared.

## Time stamps

The contents of the time stamp differ depending on whether you have set the time and date on the onboard system clock:

- If you have set the time and date on the onboard system clock, the date and time are shown in the following format: *mm dd hh:mm:ss* where:
  - *mm* - abbreviation for the name of the month
  - *dd* - day
  - *hh* - hours
  - *mm* - minutes
  - *ss* - seconds

For example, "Oct 15 17:38:03" means October 15 at 5:38 PM and 3 seconds.

- If you have not set the time and date on the onboard system clock, the time stamp shows the amount of time that has passed since the device was booted, in the following format: *numdnumhnummnumms* where:
  - *numd* - day
  - *numh* - hours
  - *numm* - minutes
  - *numms* - seconds

For example, "188d1h01m00s" means the device had been running for 188 days, 11 hours, one minute, and zero seconds when the Syslog entry with this time stamp was generated.

## Example of Syslog messages on a device whose onboard clock is set

The example shows the format of messages on a device whose onboard system clock has been set. Each time stamp shows the month, the day, and the time of the system clock when the message was generated. For example, the system time when the most recent message (the one at the top) was generated was October 15 at 5:38 PM and 3 seconds.

```
device(config)# show log
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 38 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning
Static Log Buffer:
Dec 15 19:04:14:A:Fan 1, fan on right connector, failed
Dec 15 19:00:14:A:Fan 2, fan on left connector, failed
Dynamic Log Buffer (50 entries):
Oct 15 17:38:03:warning:list 101 denied tcp 10.157.22.191(0) (Ethernet 4/18
0000.001f.77ed) -> 10.99.4.69(http), 1 event(s)
Oct 15 07:03:30:warning:list 101 denied tcp 10.157.22.26(0) (Ethernet 4/18
0000.001f.77ed) -> 10.99.4.69(http), 1 event(s)
Oct 15 06:58:30:warning:list 101 denied tcp 10.157.22.198(0) (Ethernet 4/18
0000.001f.77ed) -> 10.99.4.69(http), 1 event(s)
```

### Example of Syslog messages on a device whose onboard clock is not set

The example shows the format of messages on a device whose onboard system clock is not set. Each time stamp shows the amount of time the device had been running when the message was generated. For example, the most recent message, at the top of the list of messages, was generated when the device had been running for 21 days, seven hours, two minutes, and 40 seconds.

```
device(config)# show log
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 38 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning
Static Log Buffer:
Dynamic Log Buffer (50 entries):
21d07h02m40s:warning:list 101 denied tcp 10.157.22.191(0) (Ethernet 4/18
0000.001f.77ed) -> 10.99.4.69(http), 1 event(s)
19d07h03m30s:warning:list 101 denied tcp 10.157.22.26(0) (Ethernet 4/18
0000.001f.77ed) -> 10.99.4.69(http), 1 event(s)
17d06h58m30s:warning:list 101 denied tcp 10.157.22.198(0) (Ethernet 4/18
0000.001f.77ed) -> 10.99.4.69(http), 1 event(s)
```

## Configuring an encrypted syslog server

You can configure up to six encrypted syslog servers, but only one is active at any time, with the other servers acting as standby. When you add an encrypted syslog server, if there is no active syslog server, a session is established with the configured server. If a new connection is added when an active session exists, a new session with another encrypted syslog server is not attempted.

A new syslog server session is attempted in the following scenarios:

- Current active encrypted syslog server configuration is removed or the SSL connection to the active syslog server is closed
- During a device reload
- During switch over of the management module
- No active syslog server is found when the device sends syslog messages

Attempts to connect to a new syslog server starts with the first configured syslog server. The device attempts to establish an SSL connection with a server until a successful SSL connection is established. During this interval, the trap hold down timer is started and all the syslog messages are queued. When the timer expires, the device sends queued log messages to the connected syslog server.

Configuring encrypted syslog servers requires two steps:

- Installing the SSL Client certificate from a remote machine
- Adding encrypted syslog servers

### Installing the SSL client certificate

Before you can configure an encrypted syslog server for the device, you must install the SSL client certificate. Do one of the following to install the SSL client certificate.

#### Using TFTP:

Use TFTP to copy the SSL Client Certificate and private key from the remote machine if TFTP is enabled on the device. Enter the following commands in sequence in any order:

```
device# copy tftp flash 10.25.101.121 cert.p12 client-certificate
device# copy tftp flash 10.25.101.121 privkeyfile client-private-key
```

**Syntax:** `copy tftp flash remote_ip cert_file client-certificate`

and

**Syntax:** `copy tftp flash remote_ippriv_key_file client-private-key`

The *remote\_ip* keyword specifies the IP address of the remote host where the SSL Client certificate and private key are present. The *cert\_file* keyword specifies the filename of the SSL Client Certificate, and the *priv\_key\_file* keyword specifies the filename of the private key.

## Using SCP

Use SCP to copy the SSL Client Certificate and private key from the remote machine. Enter the following commands in sequence in any order at the remote host where the SSL Client Certificate and private key are present:

```
Host# scp cert.p12 user@10.25.105.121:sslclientcert
Host# scp privkeyfile user@10.25.105.121:sslclientprivkey
```

**Syntax:** `scp cert_file user@remote_ip:sslclientcert`

and

**Syntax:** `scp priv_key_file user@ remote_ip:sslclientprivkey`

The *remote\_ip* keyword specifies the IP address of the device. The *cert\_file* keyword specifies the filename of the SSL Client Certificate, and the *priv\_key\_file* keyword specifies the filename of the private key.

## Adding an encrypted syslog server

To configure an encrypted server connection, enter the following command:

```
device(config)# logging host 10.25.105.201 ssl-port 60514
```

**Syntax:** `logging host [ ipv6 ] ip_address | ipv6_address ssl-port port`

The *ip-address* variable specifies the syslog server. The **port** variable specifies the SSL port that will be used to connect to the specified syslog server.

### NOTE

You can configure an encrypted syslog server connection only after the device has been placed in the Common Criteria mode. While you can configure these when the device is in the Administrative mode, the configuration takes effect only after the device is put in the Common Criteria Operational mode.

## Displaying the configured server connections

You can display the active encrypted syslog server connection with the **show ip ssl** command:

```
device# show ip ssl

Session Source IP      Source Port      Remote IP      Remote Port
0        10.25.105.80 633             10.25.105.201 60514
```

In addition, you can use the `show logging` command to display the active SSL-encrypted syslog server along with the logging level information.

```
device# show logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 27 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning

Current active SSL syslog server: 10.25.105.201:60514
```

## Ascending or descending option for show log command

A new option was added to the **show log** command that allows you to display the log in either ascending or descending order based on time. The command will still work without the option selected and will display the log in default descending chronological order. The command is executed as shown

```
device# show log ascending
```

**Syntax:** **show log** [ **ascending** | **descending** ]

The **ascending** option displays the oldest log entry first.

The **descending** option displays the most recent log entry first. This is the default condition and consistent with previous versions of the Multi-Service IronWare.

## Disabling or re-enabling Syslog

Syslog is enabled by default. To disable it, enter the following command at the global CONFIG level.

```
device(config)# no logging on
```

**Syntax:** **[no] logging on** [ *udp-port* ]

The *udp-port* parameter specifies the application port used for the Syslog facility. The default is 514.

To re-enable logging, enter the following command.

```
device(config)# logging on
```

This command enables local Syslog logging with the following defaults:

- Messages of all severity levels (Emergencies - Debugging) are logged.
- Up to 50 messages are retained in the local Syslog buffer.
- No Syslog server is specified.

## Disabling Syslog of an event

Enter the **no logging enable** command to disable syslogs of a particular event. In the following example, the **nologging enable** command disables the syslog for SNMP authentication failure.

```
device(config) # no logging enable snmp-auth-failure
```

**Syntax:** **[no] logging enable** [**bfd** | **cfm** | **config-changed** | **fan-speed-change** | **fan-state-change** | **link-state-change** | **mgmt-mod-redun-state-change** | **module-hotswap** | **mpls** | **mvrp-vlan** | **ntp** | **ospf**] **snmp-auth-failure** [**temp-error** | **user-login** | **vrrp-if-state-change**]

The **bfd** option defines the log of changes in the status of the BFD session.

The **cfm** option defines the log of changes in the CFM operations.

The **config-changed** option defines the log of changes in the configuration data.

The **fan-speed-change** option defines the log of changes in the speed of the fan.

The **fan-state-change** option defines the log of changes in the state of the fan.

The **link-state-change** option defines the log of changes in the state of the link.

The **mgmt-mod-redun-state-change** option defines the log of changes in the redundant state of the management module.

The **module-hotswap** option defines the log of insertion and removal of modules.

The **mpls** option defines the log of changes in the state of MPLS VPLS and MPLS VLL.

The **mvrp-vlan** defines the log of changes in the state of MVRP VLAN.

The **ntp** option defines the log of changes in the state of the NTP response.

The **ospf** option defines the log of changes in the state of OSPF.

The **snmp-auth-failure** option defines the log of SNMP authentication failure events.

The **temp-error** option defines the log of temporary errors.

The **user-login** option defines the log of user names for login.

The **vrrp-if-state-change** option defines the log of changes in the state of VRRP interface.

## Specifying a Syslog server

To specify a Syslog server, enter a command such as the following

```
device(config)# logging host 10.0.0.99
```

For backward compatibility, the software reads the old command syntax from the startup configuration, and converts it to the new command syntax in the running configuration.

**Syntax:** **[no] logging host** *ip-address* | *server-name*

## Specifying an additional Syslog server

To specify an additional Syslog server, enter the **logging host***ip-addr* command again, as in the following example. You can specify up to six Syslog servers.

Enter a command such as the following

```
device(config)# logging host 10.0.0.99
```

For backward compatibility, the software reads the old command syntax from the startup configuration, and converts it to the new command syntax in the running configuration.

**Syntax:** **[no] logging host** *ip-address* | *server-name*

## Disabling logging of a message level

If you want to disable the logging of a message level, you must disable each message level individually.

For example, to disable logging of debugging and informational messages, enter the following commands

```
device(config)# no logging buffered debugging
device(config)# no logging buffered informational
```

**Syntax:** **[no] logging buffered** *level* *num-entries*

The *level* parameter can have one of the following values:

- *alerts*
- *critical*
- *debugging*
- *emergencies*
- *errors*
- *informational*

- *notifications*
- *warnings*

The commands in the example above change the log level to notification messages or higher. The software will not log informational or debugging messages. The changed message level also applies to the Syslog servers.

On a NetIron XMR and NetIron MLX, enter 1 - 5000 for *num-entries*.

On a NetIron CES and NetIron CER 2000, enter 1 - 5000 for *num-entries*.

## Changing the number of entries for the local buffer

You also can use the **logging buffered** command to change the number of entries the local Syslog buffer can store.

```
device(config)# logging buffered 100
```

**Syntax:** **[no] logging buffered** *level*/*num-entries*

On a NetIron XMR and NetIron MLX, enter 1 - 5000 for *num-entries*.

The default number of messages is 50. The change takes effect immediately and does not require you to reload the software.

## Changing the log facility

The Syslog daemon on the Syslog server uses a facility to determine where to log the messages from the device. The default facility for messages the device sends to the Syslog server is "user". You can change the facility using the following command.

### NOTE

You can specify only one facility. If you configure the device to use two Syslog servers, the device uses the same facility on both servers.

```
device(config)# logging facility local0
```

**Syntax:** **[no] logging facility** *facility-name*

The *facility-name* can be one of the following:

- kern - kernel messages
- user - random user-level messages
- mail - mail system
- daemon - system daemons
- auth - security or authorization messages
- syslog - messages generated internally by Syslog
- lpr - line printer subsystem
- news - netnews subsystem
- uucp - uucp subsystem
- sys9 - cron or at subsystem
- sys10 - reserved for system use
- sys11 - reserved for system use
- sys12 - reserved for system use
- sys13 - reserved for system use
- sys14 - reserved for system use

- cron - cron or at subsystem
- local0 - reserved for local use
- local1 - reserved for local use
- local2 - reserved for local use
- local3 - reserved for local use
- local4 - reserved for local use
- local5 - reserved for local use
- local6 - reserved for local use
- local7 - reserved for local use

## Displaying the interface name in Syslog messages

By default, an interface's slot number (if applicable) and port number are displayed when you display Syslog messages. If you want to display the name of the interface instead of its number, enter the following command.

```
device(config)# ip show-portname
```

This command is applied globally to all interfaces on the device.

### Syntax: [no] ip show-portname

When you display the messages in the Syslog, you refer to the interface name under the Dynamic Log Buffer section. The actual interface number is appended to the interface name. For example, if the interface name is "lab" and its port number is "2", you refer to "lab2" displayed as in the example below.

```
device# show logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 3 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning
Static Log Buffer:
Dec 15 19:04:14:A:Fan 1, fan on right connector, failed
Dynamic Log Buffer (50 entries):
Dec 15 18:46:17:I:Interface ethernet Lab2
, state up
Dec 15 18:45:15:I:Warm start
```

## Clearing the Syslog messages from the local buffer

To clear the Syslog messages stored in the device's local buffer, use the following command.

```
device# clear logging
```

### Syntax: clear logging

## Logging all CLI commands to Syslog

This feature allows you to log all valid CLI command from each user session into the system log.

To enable CLI command logging, enter the following command.

```
device(config)# logging cli-command
```

### Syntax: [no] logging cli-command

## Example of CLI command logging

In the following example, two CLI sessions are run. In the first example, a telnet session enables CLI command logging and configures **router bgp** and the BGP **no neighbor** command as shown.

```
telnet@ device(config)# logging cli-command
telnet@ device(config)# router bgp
telnet@ device(config-bgp)# no nei 10.1.1.8 remote 10
```

In the next example, a console session configures **router bgp** and the BGP **neighbor** command as shown.

```
device(config)# router bgp
device(config-bgp)# nei 10.1.1.8 remote 10
```

Using the **show log** command, you would refer to a series of log records as shown in the following.

```
device(config-bgp)# show log
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 24 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning
Dynamic Log Buffer (50 lines):
Sep 9 18:38:23:I:CLI CMD: "nei 10.1.1.8 remote 10" from console
Sep 9 18:38:21:I:CLI CMD: "router bgp" from console
Sep 9 18:38:07:I:CLI CMD: "no nei 10.1.1.8 remote 10" from telnet client 10.1.1.1
Sep 9 18:38:05:I:CLI CMD: "router bgp" from telnet client 10.1.1.1
```

## Syslog messages

The tables that follow list all of the Syslog messages. The messages are listed by message level, in the following order:

- Emergencies (none)
- Alerts
- Critical
- Errors
- Warnings
- Notifications
- Informational
- Debugging

## Syslog messages system

<b>Message</b>	ISIS Memory Limit Exceeded
<b>Explanation</b>	IS-IS is requesting more memory than is available.
<b>Message Level</b>	Alert
<b>Message</b>	System Power supply num, location , failed
<b>Explanation</b>	A power supply has failed.
	The <i>num</i> is the power supply number.
	The <i>location</i> describes where the failed power supply is in the chassis.
<b>Message Level</b>	Alert
<b>Message</b>	System power type Power Supply num, location , state
<b>Explanation</b>	The <i>power type</i> refers to AC or DC power supply.

The *num* is the power supply number as positioned in the chassis.

The *location* describes where the power supply is in the chassis in relation to its state.

The *state* refers to how the power supply is functioning in the chassis.

The *state* can be one of the following:

- Installed (OK) - The power supply is installed and ok.
- Installed (Failed or Disconnected)- The power supply has failed, or the power cord is disconnected.
- Not Installed (FAILED) - The power supply is physically removed from the chassis.

**Message Level** Alert

**Message** System Fan num , location , failed

**Explanation** A fan has failed.

The *num* is the power supply number.

The *location* describes where the failed power supply is in the chassis. The location can be one of the following

**Message Level** Alert

**Message** System Management module at slot slot-num state changed from module-state to module-state due to reason .

**Explanation** Indicates a state change in a management module.

The *slot-num* indicates the chassis slot containing the module.

The *module-state* can be one of the following:

- active
- standby
- crashed
- coming-up
- unknown

A **due to** clause has been added to this message. The *reason* variable can be either or the following:

- MP upgrade to ver *version number* where *version number* is the version number of the Multi-Service IronWare software that the management module was upgraded to.
- Active Reboot

**Message Level** Alert

**Message** System Temperature degrees C degrees, warning level warn-degrees C degrees, shutdown level shutdown-degrees C degrees

**Explanation** Indicates an overtemperature condition on the active module.

The *degrees* value indicates the temperature of the module.

The *warn-degrees* value is the warning threshold temperature configured for the module.

The *shutdown-degrees* value is the shutdown temperature configured for the module.

**Message Level** Alert

**Message** System num-modules modules and 1 power supply, need more power supply!

**Explanation** Indicates that the chassis needs more power supplies to run the modules in the chassis.

The *num-modules* parameter indicates the number of modules in the chassis.

**Message Level** Alert

<b>Message</b>	System: Health Monitoring: FE access failure detected on SFM num /FE num (NetIron XMR and NetIron MLX only)
<b>Explanation</b>	The management processor is unable to access the specified fabric element. This syslog message will be generated a maximum of once per ten minute period.  The SFM and FE <i>num</i> parameters indicate the number of the switch fabric module and fabric element that could not be accessed
<b>Message Level</b>	Alert
<b>Message</b>	System: Health Monitoring: TM Egress data errors detected on LP num /TM num
<b>Explanation</b>	The system has detected egress data errors on the specified line processor and traffic manager.  The LP and TM <i>num</i> parameters indicate the number of the line processor and traffic manager on which the errors were detected.
<b>Message Level</b>	Alert
<b>Message</b>	Error Failed to shutdown Power Supply PS-Num . Write Failed (offset 0x2, value 44, size 2).( Brocade NetIron XMR and Brocade MLX only).
<b>Explanation</b>	A power supply failed to shutdown because of its failure to access its registers.
<b>Message Level</b>	Error
<b>Message</b>	Error Module down in slot 3, reason CARD_DOWN_REASON_BOOT_FAILED.Error Code (1).
<b>Explanation</b>	<ul style="list-style-type: none"> <li>• The error message displayed on the Management Module console when the Interface Module fails to boot up. The message will display the error code reason.</li> <li>• When the Interface Module is in DOWN state, the error code is included in the dynamic buffer.</li> </ul> <p>The error code is 0 when there is no error code reported from the Interface Module.</p>
<b>Message Level</b>	Error
<b>Message</b>	CAM partition partition name warning total total-count , free current free-count, slot slot-number , ppcr ppcr-id
<b>Explanation</b>	Indicates that the CAM partition specified by the <i>partition name</i> has exceeded a threshold (configurable with a default value of within 5% of the capacity of the partition) and may soon overflow the threshold. The <i>free-count</i> specifies the amount of free space still available in the partition. The <i>slot-number</i> and ppcr <i>ppcr-id</i> indicate where the overflow is occurring.  The <i>partition-name</i> includes the sub-partition ID if applicable.
<b>Message Level</b>	Warning
<b>Message</b>	System Not enough power to power on module in slot num
<b>Explanation</b>	There is not enough power available in the chassis to power on the module in the specific slot number.  The slot <i>num</i> refers to the slot number in the chassis.
<b>Message Level</b>	Warning
<b>Message</b>	System Module up in slot n
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	System Module down in slot n reason
<b>Explanation</b>	Indicates that the module in the slot specified by the <i>n</i> variable is down for one of the following reasons as specified by the <i>reason</i> variable: <ul style="list-style-type: none"> <li>• CARD_DOWN_REASON_NONE</li> <li>• CARD_DOWN_REASON_ADMIN_DOWN</li> <li>• CARD_DOWN_REASON_CONFIG_MISMATCH</li> </ul>

- CARD\_DOWN\_REASON\_LOSS\_HEARTBEAT
- CARD\_DOWN\_REASON\_BOOT\_FAILED
- CARD\_DOWN\_REASON\_TIMEOUT
- CARD\_DOWN\_REASON\_STRIPE\_SYNC\_FAILED
- CARD\_DOWN\_REASON\_REBOOTED
- CARD\_DOWN\_REASON\_OVER\_HEAT
- CARD\_DOWN\_REASON\_POWERED\_OFF\_BY\_USER
- CARD\_DOWN\_REASON\_LINK\_DOWN

<b>Message Level</b>	Notification
<b>Message</b>	System Module <i>n</i> powered on
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	System Module <i>n</i> powered off
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	System Switch fabric <i>n</i> powered on
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	System Switch fabric <i>n</i> powered off
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	System Enough power available to power on module in slot <i>num</i> .
<b>Explanation</b>	There is enough power available in the chassis to power on the module in the specific slot number.  The slot <i>num</i> refers to the slot number in the chassis.
<b>Message Level</b>	Notification
<b>Message</b>	System Module was inserted to slot <i>slot-num</i>
<b>Explanation</b>	Indicates that a module was inserted into a chassis slot.  The <i>slot-num</i> is the number of the chassis slot into which the module was inserted.
<b>Message Level</b>	Notification
<b>Message</b>	System Module was removed from slot <i>slot-num</i>
<b>Explanation</b>	Indicates that a module was removed from a chassis slot.  The <i>slot-num</i> is the number of the chassis slot from which the module was removed.
<b>Message Level</b>	Notification
<b>Message</b>	System Set fan speed to <i>speed percentage</i>
<b>Explanation</b>	Indicates that the fan speed has been changed to the value described in the <i>speed</i> variable and that the fan is now operating at the <i>percentage</i> of capacity described.  The possible <i>speedpercentage</i> values are:
	<ul style="list-style-type: none"> <li>• LOW (50%)</li> <li>• MEDIUM (75%)</li> <li>• MEDIUM-HIGH (90%)</li> <li>• HIGH (100%)</li> </ul>

<b>Message Level</b>	Notification
<b>Message</b>	System Cold start
<b>Explanation</b>	The device has been powered on.
<b>Message Level</b>	Informational
<b>Message</b>	System Warm start
<b>Explanation</b>	The system software (flash code) has been reloaded.
<b>Message Level</b>	Informational
<b>Message</b>	System Interface portnum , state up
<b>Explanation</b>	A port has come up.  The <i>portnum</i> is the port number.
<b>Message Level</b>	Informational
<b>Message</b>	System Interface portnum , state down
<b>Explanation</b>	A port has gone down.  The <i>portnum</i> is the port number.
<b>Message Level</b>	Informational
<b>Message</b>	System Interface portnum , line protocol up
<b>Explanation</b>	The line protocol on a port has come up.  The <i>portnum</i> is the port number.
<b>Message Level</b>	Informational
<b>Message</b>	System Interface portnum , line protocol down
<b>Explanation</b>	The line protocol on a port has gone down.  The <i>portnum</i> is the port number.
<b>Message Level</b>	Informational
<b>Message</b>	System Interface portnum is down (remote fault)
<b>Explanation</b>	The interface is down due to Remote Fault. This is indicated as "(remote fault)".  The <i>portnum</i> is the port number of the interface.
<b>Message Level</b>	Informational
<b>Message</b>	System portnum is down (local fault)
<b>Explanation</b>	The port is down due to Local Fault. This is indicated as "(local fault)".  The <i>portnum</i> is the port number of the interface.
<b>Message Level</b>	Informational
<b>Message</b>	System Syslog server IP-address deleted   added   modified from console   telnet   ssh   web   snmp OR Syslog operation enabled   disabled from console   telnet   ssh   web   snmp
<b>Explanation</b>	A user made Syslog configuration changes to the specified Syslog server address, or enabled or disabled a Syslog operation through the Web, SNMP, console, SSH, or Telnet session.
<b>Message Level</b>	Informational
<b>Message</b>	System SSH   telnet server enabled   disabled from console   telnet   ssh   web   snmp session [by user username ]
<b>Explanation</b>	A user enabled or disabled an SSH or Telnet session, or changed the SSH enable or disable configuration through the Web, SNMP, console, SSH, or Telnet session.

<b>Message Level</b>	Informational
<b>Message</b>	System Module n CPU m crashed
<b>Explanation</b>	
<b>Message Level</b>	Informational
<b>Message</b>	System IfIndex assignment was changed.)
<b>Explanation</b>	The maximum number of ifIndex per module has been changed.
<b>Message Level</b>	Informational
<b>Message</b>	System Power Supply PS-Num will be shutdown due to flapping next time it becomes available. ( Brocade NetIron XMR and Brocade MLX only).
<b>Explanation</b>	A power supply will shutdown because of flapping the next time it is available.  The <i>PS-Num</i> is the power supply number.
<b>Message Level</b>	Informational
<b>Message</b>	System Power Supply PS-Num is shutdown due to flapping.( Brocade XMR and Brocade MLX only).
<b>Explanation</b>	A power supply is shut down because of flapping.  The <i>PS-Num</i> is the power supply number.
<b>Message Level</b>	Informational
<b>Message</b>	sys-np-mac-224 IFSR: Soft Error at TCAM index 0x0002211a of PPCR 1.
<b>Explanation</b>	The syslog message is generated when the TCAM entry error is observed by the user.
<b>Message Level</b>	Informational
<b>Message</b>	sys-np-mac-224 IFSR: Error FIFO Overflow on PPCR 1.
<b>Explanation</b>	The syslog message is generated when the first in first out (FIFO) overflow error is observed by the user.
<b>Message Level</b>	Informational

## Syslog messages security

<b>Message</b>	Security Port security violation at interface portnum , address mac , vlan id
<b>Explanation</b>	
<b>Message Level</b>	Warning
<b>Message</b>	Security Interface portnum was shut down due to port security violation
<b>Explanation</b>	
<b>Message Level</b>	Warning
<b>Message</b>	Security console login {by user I null } to USER EXEC mode Security {telnet I ssh} login {by user I null } from src {IP ip I IPv6 ipv6-addr } to USER EXEC mode
<b>Explanation</b>	A user has logged into the USER EXEC mode of the CLI.  The <i>user</i> is the user name.
<b>Message Level</b>	Informational
<b>Message</b>	Security console logout {by user I null } from USER EXEC mode Security {telne I ssh} logout {by user I null } from src {IP ip I IPv6 ipv6-addr } from USER EXEC mode
<b>Explanation</b>	A user has logged out of the USER EXEC mode of the CLI.  The <i>user</i> is the user name.
<b>Message Level</b>	Informational

<b>Message</b>	Security console login {by user I null } to Privileged EXEC mode Security {telnet I ssh} login {by user I null } from src {IP ip I IPv6 ipv6-addr } to Privileged EXEC mode
<b>Explanation</b>	A user has logged into the Privileged EXEC mode of the CLI.  The <i>user</i> is the user name.
<b>Message Level</b>	Informational
<b>Message</b>	Security console logout {by user I null } from Privileged EXEC mode Security {telnet I ssh} logout {by user I null } from src {IP ip I IPv6 ipv6-addr } from Privileged EXEC mode
<b>Explanation</b>	A user has logged out of Privileged EXEC mode of the CLI.  The <i>user</i> is the user name.
<b>Message Level</b>	Informational
<b>Message</b>	Security outbound telnet session number login to server IP ip from SSH session session number
<b>Explanation</b>	A user has initiated an outbound Telnet session from an inbound SSH session.  The first <i>session number</i> is the number of the outbound Telnet session.  The <i>ip</i> is the IP address to which the Telnet session is connected.  The second <i>sessions number</i> is the number of the inbound SSH session.
<b>Message Level</b>	Informational
<b>Message</b>	Security outbound telnet session number logout from server IP ip from SSH session session number
<b>Explanation</b>	A user has terminated an outbound Telnet session initiated from an inbound SSH session.  The first <i>session number</i> is the number of the outbound Telnet session.  The <i>ip</i> is the IP address from which the Telnet session has disconnected.  The second <i>sessions number</i> is the number of the inbound SSH session.
<b>Message Level</b>	Informational
<b>Message</b>	Security startup-config was changed {by user } from {web management I snmp management I ssh client ip I telnet client ip }
<b>Explanation</b>	A configuration change was saved to the startup configuration file.  The <i>user</i> is the user's ID, if they entered a user ID to log in.
<b>Message Level</b>	Informational
<b>Message</b>	Security running-config was changed {by user } from {web management I snmp management I ssh client ip I telnet client ip }
<b>Explanation</b>	A configuration change was saved to the running configuration file.  The <i>user</i> is the user's ID, if they entered a user ID to log in.
<b>Message Level</b>	Informational
<b>Message</b>	Security telnet   SSH   web access [by username ] from src IP source ip address , src MAC source MAC address rejected, n attempts
<b>Explanation</b>	There were failed web, SSH, or Telnet login access attempts from the specified source IP and MAC address. <ul style="list-style-type: none"> <li>• [by <i>user username</i>] does not appear if telnet or SSH clients are specified.</li> </ul>

- *n* is the number of times this SNMP trap occurred in the last five minutes, or other configured number of minutes.

<b>Message Level</b>	Informational
<b>Message</b>	Security user username added   deleted   modified from console   telnet   ssh   web   snmp
<b>Explanation</b>	A user created, modified, or deleted a local user account through the Web, SNMP, console, SSH, or Telnet session.
<b>Message Level</b>	Informational
<b>Message</b>	Security Enable super   port-config   read-only password deleted   added   modified from console   telnet   ssh   web   snmp OR Line password deleted   added   modified from console   telnet   ssh   web   snmp
<b>Explanation</b>	A user created, re-configured, or deleted an Enable or Line password through the Web, SNMP, console, SSH, or Telnet session.
<b>Message Level</b>	Informational
<b>Message</b>	Apr 2 11:00:39:I:Security: telnet access from src IP <b>ip address</b> rejected, 1 attempt(s).
<b>Explanation</b>	A user sees this message when attempting to login with Telnet when the standby MP is in SYNC_SW State.
<b>Message Level</b>	Informational
<b>Message</b>	Apr 2 11:00:39:I:Security:SSH access from src IP <b>ip address</b> rejected, 1 attempt(s).
<b>Explanation</b>	A user sees this message when attempting to login with SSH when the standby MP is in SYNC_SW State.
<b>Message Level</b>	Informational

## Syslog messages VLAN

<b>Message</b>	VLAN Id vlan-id added   deleted   modified from console   telnet   ssh   web   snmp session
<b>Explanation</b>	A user created, modified, or deleted a VLAN through the Web, SNMP, console, SSH, or Telnet session.
<b>Message Level</b>	Informational

## Syslog messages STP

<b>Message</b>	STP VLAN id - New RootBridge string RootPort portnum (reason )
<b>Explanation</b>	A Spanning Tree Protocol (STP) topology change has occurred.  The <i>id</i> is the ID of the VLAN in which the STP topology change occurred.  The <i>portnum</i> is the number of the port connected to the new root bridge.
<b>Message Level</b>	Informational
<b>Message</b>	STP VLAN id - Bridge is RootBridge string (reason )
<b>Explanation</b>	A Spanning Tree Protocol (STP) topology change has occurred, resulting in the device becoming the root bridge.  The <i>id</i> is the ID of the VLAN in which the STP topology change occurred.
<b>Message Level</b>	Informational
<b>Message</b>	STP VLAN id Port portnum - Bridge TC Event (reason )
<b>Explanation</b>	A Spanning Tree Protocol (STP) topology change has occurred on a port.  The <i>id</i> is the ID of the VLAN in which the STP topology change occurred.

<b>Message Level</b>	The <i>portnum</i> is the port number. Informational
<b>Message</b>	STP VLAN <i>vlanid</i> Port <i>portnum</i> - State <i>state</i> ( <i>reason</i> )
<b>Explanation</b>	
<b>Message Level</b>	Informational
<b>Message</b>	STP Root Guard Port <i>portnum</i> , VLAN <i>vlan-id</i> inconsistent (Received superior BPDU)
<b>Explanation</b>	The specified port was blocked because it has Root Guard enabled and received a superior BPDU.
<b>Message Level</b>	Informational
<b>Message</b>	STP Root Guard Port <i>portnum</i> , VLAN <i>vlan-id</i> consistent (Timeout)
<b>Explanation</b>	The specified block Root Guard-protected port was unblocked.
<b>Message Level</b>	Informational
<b>Message</b>	STP BPDU Guard port <i>portnum</i> disable System Interface ethernet <i>portnum</i> , state down - disabled
<b>Explanation</b>	The <b>spanning-tree protect do-disable</b> command is configured on the specified port and the port became disabled due to a receipt of a BPDU packet.
<b>Message Level</b>	Informational
<b>Message</b>	STP BPDU Guard re-enabled on ports ethe <i>portnum</i> System Interface ethernet <i>portnum</i> , state up
<b>Explanation</b>	The <b>spanning-tree protect re-enable</b> was issued to re-enable the specified port
<b>Message Level</b>	Informational

## Syslog messages RSTP

<b>Message</b>	RSTP VLAN <i>id</i> Port <i>portnum</i> - Bridge TC Event ( <i>reason</i> )
<b>Explanation</b>	802.1W recognized a topology change event in the bridge. The topology change event is the forwarding action that started on a non-edge Designated port or Root port.
<b>Message Level</b>	Informational
<b>Message</b>	RSTP VLAN <i>id</i> Port <i>portnum</i> - STP State <i>state</i> ( <i>reason</i> )
<b>Explanation</b>	802.1W changed the state of a port to a new state forwarding, learning, blocking. If the port changes to blocking, the bridge port is in discarding state.
<b>Message Level</b>	Informational
<b>Message</b>	RSTP VLAN <i>id</i> - New RootPort <i>portnum</i> ( <i>reason</i> )
<b>Explanation</b>	802.1W changed the port's role to Root port, using the root selection computation.
<b>Message Level</b>	Informational
<b>Message</b>	RSTP VLAN <i>id</i> - New RootBridge string <i>RootPort</i> <i>portnum</i> ( <i>reason</i> )
<b>Explanation</b>	802.1W selected a new root bridge as a result of the BPDUs received on a bridge port.
<b>Message Level</b>	Informational
<b>Message</b>	RSTP VLAN <i>id</i> - Bridge is RootBridge string ( <i>reason</i> )
<b>Explanation</b>	802.1W changed the current bridge to be the root bridge of the given topology due to administrative change in bridge priority.
<b>Message Level</b>	Informational
<b>Message</b>	vlan <i>vlan-id</i> Bridge is RootBridge <i>mac-address</i> ( <i>MsgAgeExpiry</i> )
<b>Explanation</b>	The message age expired on the Root port so 802.1W changed the current bridge to be the root bridge of the topology.

**Message Level** Informational

## Syslog messages LAG

**Message** LAG group ( ports ) created by 802.3ad link-aggregation module.

**Explanation** 802.3ad link aggregation is configured on the device, and the feature has dynamically created a LAG group (aggregate link).

The *ports* is a list of the ports that were aggregated to make the LAG group.

**Message Level** Informational

## Syslog messages MRP

**Message** MRP interface ethernet portnum vlan vlan-master , changing to state-string

**Explanation**

**Message Level** Informational

**Message** MRP metro ring ring-id cannot be enabled. No free CAM entries

**Explanation**

**Message Level** Informational

## Syslog messages UDLD

**Message** UDLD Logical link on interface ethernet portnum is up

**Explanation**

**Message Level** Informational

**Message** UDLD Logical link on interface ethernet portnum is down

**Explanation**

**Message Level** Informational

## Syslog messages VSRP

**Message** VSRP VLAN *vlanid* VRID *id* - transition to *state-string*

**Explanation**

**Message Level** Informational

**Message** VSRP VLAN *vlanid* VRID *id* - aware change *old-portnum* -> *new-portnum*\n

**Explanation**

**Message Level** Informational

**Message** VSRP VLAN *vlanid* VRID *id* - aware learn portnum

**Explanation**

**Message Level** Informational

## Syslog messages VRRP

**Message** VRRP intf state changed, intf portnum , vrid virtual-router-id ,state vrrp-state

**Explanation** A state change has occurred in a Virtual Router Redundancy Protocol (VRRP) interface.

The *portnum* is the port.

The *virtual-router-id* is the virtual router ID (VRID) configured on the interface.

The *vrrp-state* can be one of the following:

- init
- master
- backup
- unknown

**Message Level** Notification

## Syslog messages IP

**Message** IP Dup IP *ip-addr* detected, sent from MAC *mac-addr* interface *portnum*

**Explanation** Indicates that the device received a packet from another device on the network with an IP address that is also configured on the device.

The *ip-addr* is the duplicate IP address.

The *mac-addr* is the MAC address of the device with the duplicate IP address.

The *portnum* is the port that received the packet with the duplicate IP address. The address is the packet's source IP address.

**Message Level** Warning

## Syslog messages ICMP

**Message** ICMP Local ICMP exceeds *burst-max* *burst* packets, stopping for *lockup* seconds!

**Explanation** The number of ICMP packets exceeds the *burst-max* threshold set by the **ip icmp burst** command. The device may be the victim of a Denial of Service (DoS) attack.

All ICMP packets will be dropped for the number of seconds specified by the *lockup* value. When the lockup period expires, the packet counter is reset and measurement is restarted.

**Message Level** Notification

**Message** ICMP Transit ICMP in interface *portnum* exceeds *num* *burst* packets, stopping for *num* seconds!

**Explanation** Threshold parameters for ICMP transit (through) traffic have been configured on an interface, and the maximum burst size for ICMP packets on the interface has been exceeded.

The *portnum* is the port number.

The first *num* is the maximum burst size (maximum number of packets allowed).

The second *num* is the number of seconds during which additional ICMP packets will be blocked on the interface.

### NOTE

This message can occur in response to an attempted Smurf attack.

**Message Level** Notification

## Syslog messages ACL

<b>Message</b>	<code>ACL list <i>acl-num</i> denied ip-<i>proto</i> <i>src-ip-addr</i> (<i>src-tcp/udp-port</i>) (Ethernet <i>portnummac-addr</i>) -&gt; <i>dst-ip-addr</i> (<i>dst-tcp/udp-port</i>), 1 events</code>
<b>Explanation</b>	<p>Indicates that an Access Control List (ACL) denied (dropped) packets.</p> <p>The <i>acl-num</i> indicates the ACL number. Numbers 1 - 99 indicate standard ACLs. Numbers 100 - 199 indicate extended ACLs.</p> <p>The <i>ip-<i>proto</i></i> indicates the IP protocol of the denied packets.</p> <p>The <i>src-ip-addr</i> is the source IP address of the denied packets.</p> <p>The <i>src-tcp/udp-port</i> is the source TCP or UDP port, if applicable, of the denied packets.</p> <p>The <i>portnum</i> indicates the port number on which the packet was denied.</p> <p>The <i>mac-addr</i> indicates the source MAC address of the denied packets.</p> <p>The <i>dst-ip-addr</i> indicates the destination IP address of the denied packets.</p> <p>The <i>dst-tcp/udp-port</i> indicates the destination TCP or UDP port number, if applicable, of the denied packets.</p>
<b>Message Level</b>	Warning
<b>Message</b>	<code>ACL:rip filter list <i>list-num</i> direction V1   V2 denied ip-<i>addr</i> , num packets</code>
<b>Explanation</b>	<p>Indicates that a RIP route filter denied (dropped) packets.</p> <p>The <i>list-num</i> is the ID of the filter list.</p> <p>The <i>direction</i> indicates whether the filter was applied to incoming packets or outgoing packets. The value can be one of the following:</p> <ul style="list-style-type: none"> <li>• in</li> <li>• out</li> </ul> <p>The V1 or V2 value specifies the RIP version (RIPv1 or RIPv2).</p> <p>The <i>ip-addr</i> indicates the network number in the denied updates.</p> <p>The <i>num</i> indicates how many packets matching the values above were dropped during the five-minute interval represented by the log entry.</p>
<b>Message Level</b>	Warning
<b>Message</b>	<code>ACL insufficient L4 session resource, using flow based ACL instead</code>
<b>Explanation</b>	<p>The device does not have enough Layer 4 session entries.</p> <p>To correct this condition, allocate more memory for sessions. To allocate more memory, enter the following command at the global CONFIG level of the CLI interface</p> <p><b>system-max session-limit <i>num</i></b></p>
<b>Message Level</b>	Notification
<b>Message</b>	<code>ACL system fragment packet inspect rate <i>rate</i> exceeded</code>
<b>Explanation</b>	<p>The fragment rate allowed on the device has been exceeded.</p> <p>The <i>rate</i> indicates the maximum rate allowed.</p> <p>This message can occur if fragment throttling is enabled.</p>
<b>Message Level</b>	Notification
<b>Message</b>	<code>AC port fragment packet inspect rate <i>rate</i> exceeded on port <i>portnum</i></code>

<b>Explanation</b>	The fragment rate allowed on an individual interface has been exceeded. The <i>rate</i> indicates the maximum rate allowed. The <i>portnum</i> indicates the port. This message can occur if fragment throttling is enabled.
<b>Message Level</b>	Notification
<b>Message</b>	ACL Port portnum , exceed configured L4 rule-based CAM size, larger L4 partition size required
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	ACL Port portnum , exceed configured L2 ACL rule-based CAM size, larger partition size is required
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	ACL Port portnum , exceed configured outbound L4 rule-based CAM size, larger outbound L4 partition size required
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	ACL Port portnum , exceed configured IPv6 L4 rule-based CAM size, larger IPv6 L4 partition size required
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	ACL Port portnum , exceed configured IPv6 outbound L4 rule-based CAM size, larger IPv6 outbound L4 partition size required
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	ACL Port portnum, error in allocating inbound L4 rule-based ACL CAM entry
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	ACL Port portnum , error in allocating outbound L4 rule-based ACL CAM entry
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	ACL Port portnum , inbound ACL CAM programming incomplete
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	ACL Port portnum , outbound ACL CAM programming incomplete
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	ACL aclid added   deleted   modified from console   telnet   ssh   web   snmp session
<b>Explanation</b>	A user created, modified, deleted, or applied an ACL through the Web, SNMP, console, SSH, or Telnet session.
<b>Message Level</b>	Informational

## Syslog messages RACL

**Message** RACL Port portnum , IP Receive ACL exceed configured CAM size, larger partition size required

**Explanation**

**Message Level** Notification

**Message** RACL Port portnum , IP Receive ACL exceed configured RL class limit

**Explanation**

**Message Level** Notification

**Message** RACL Port portnum , IP Receive ACL CAM malloc error

**Explanation**

**Message Level** Notification

## Syslog messages OSPF

**Message** OSPF Memory Overflow

**Explanation** OSPF has run out of memory.

**Message Level** Alert

**Message** OSPF LSA Overflow, LSA Type = lsa-type

**Explanation** Indicates an LSA database overflow.

The *lsa-type* parameter indicates the type of LSA that experienced the overflow condition. The LSA type is one of the following:

- 1 - Router
- 2 - Network
- 3 - Summary
- 4 - Summary
- 5 - External

**Message Level** Alert

**Message** OSPF interface state changed,rid router-id , intf addr ip-addr , state ospf-state

**Explanation** Indicates that the state of an OSPF interface has changed.

The *router-id* is the router ID of the device.

The *ip-addr* is the interface's IP address.

The *ospf-state* indicates the state to which the interface has changed and can be one of the following:

- down
- loopback
- waiting
- point-to-point
- designated router
- backup designated router
- other designated router
- unknown

**Message Level** Notification

**Message** OSPF virtual intf state changed, rid router-id , area area-id , nbr ip-addr , state ospf-state

**Explanation** Indicates that the state of an OSPF virtual routing interface has changed.

The *router-id* is the router ID of the router the interface is on.

The *area-id* is the area the interface is in.

The *ip-addr* is the IP address of the OSPF neighbor.

The *ospf-state* indicates the state to which the interface has changed and can be one of the following:

- down
- loopback
- waiting
- point-to-point
- designated router
- backup designated router
- other designated router
- unknown

**Message Level** Notification

**Message** OSPF nbr state changed, rid router-id , nbr addr ip-addr , nbr rid nbr-router-Id , state ospf-state

**Explanation** Indicates that the state of an OSPF neighbor has changed.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the neighbor.

The *nbr-router-id* is the router ID of the neighbor.

The *ospf-state* indicates the state to which the interface has changed and can be one of the following:

- down
- attempt
- initializing
- 2-way
- exchange start
- exchange
- loading
- full
- unknown

**Message Level** Notification

**Message** OSPF virtual nbr state changed, rid router-id , nbr addr ip-addr , nbr rid nbr-router-id , state ospf-state

**Explanation** Indicates that the state of an OSPF virtual neighbor has changed.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the neighbor.

The *nbr-router-id* is the router ID of the neighbor.

The *ospf-state* indicates the state to which the interface has changed and can be one of the following:

- down
- attempt
- initializing
- 2-way
- exchange start
- exchange
- loading
- full
- unknown

**Message Level**

Notification

**Message**

OSPF intf config error, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , error type error-type , pkt type pkt-type

**Explanation**

Indicates that an OSPF interface configuration error has occurred.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *src-ip-addr* is the IP address of the interface from which the device received the error packet.

The *error-type* can be one of the following:

- bad version
- area mismatch
- unknown NBMA neighbor
- unknown virtual neighbor
- authentication type mismatch
- authentication failure
- network mask mismatch
- hello interval mismatch
- dead interval mismatch
- option mismatch
- unknown

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

**Message Level**

Notification

<b>Message</b>	OSPF virtual intf config error, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , error type error-type , pkt type pkt-type
<b>Explanation</b>	<p>Indicates that an OSPF virtual routing interface configuration error has occurred.</p> <p>The <i>router-id</i> is the router ID of the device.</p> <p>The <i>ip-addr</i> is the IP address of the interface on the device.</p> <p>The <i>src-ip-addr</i> is the IP address of the interface from which the device received the error packet.</p> <p>The <i>error-type</i> can be one of the following:</p> <ul style="list-style-type: none"> <li>• bad version</li> <li>• area mismatch</li> <li>• unknown NBMA neighbor</li> <li>• unknown virtual neighbor</li> <li>• authentication type mismatch</li> <li>• authentication failure</li> <li>• network mask mismatch</li> <li>• hello interval mismatch</li> <li>• dead interval mismatch</li> <li>• option mismatch</li> <li>• unknown</li> </ul> <p>The <i>packet-type</i> can be one of the following:</p> <ul style="list-style-type: none"> <li>• hello</li> <li>• database description</li> <li>• link state request</li> <li>• link state update</li> <li>• link state ack</li> <li>• unknown</li> </ul>
<b>Message Level</b>	Notification
<b>Message</b>	OSPF intf authen failure, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , error type error-type , pkt type pkt-type
<b>Explanation</b>	<p>Indicates that an OSPF interface authentication failure has occurred.</p> <p>The <i>router-id</i> is the router ID of the device.</p> <p>The <i>ip-addr</i> is the IP address of the interface on the device.</p> <p>The <i>src-ip-addr</i> is the IP address of the interface from which the device received the authentication failure.</p> <p>The <i>error-type</i> can be one of the following:</p> <ul style="list-style-type: none"> <li>• bad version</li> <li>• area mismatch</li> <li>• unknown NBMA neighbor</li> <li>• unknown virtual neighbor</li> <li>• authentication type mismatch</li> </ul>

- authentication failure
- network mask mismatch
- hello interval mismatch
- dead interval mismatch
- option mismatch
- unknown

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

**Message Level**

Notification

**Message**

OSPF virtual intf authen failure,rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , error type error-type , pkt type pkt-type

**Explanation**

Indicates that an OSPF virtual routing interface authentication failure has occurred.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *src-ip-addr* is the IP address of the interface from which the device received the authentication failure.

The *error-type* can be one of the following:

- bad version
- area mismatch
- unknown NBMA neighbor
- unknown virtual neighbor
- authentication type mismatch
- authentication failure
- network mask mismatch
- hello interval mismatch
- dead interval mismatch
- option mismatch
- unknown

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

<b>Message Level</b>	Notification
<b>Message</b>	OSPF intf rcvd bad pkt, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , pkt type pkt-type
<b>Explanation</b>	<p>Indicates that an OSPF interface received a bad packet.</p> <p>The <i>router-id</i> is the router ID of the device.</p> <p>The <i>ip-addr</i> is the IP address of the interface on the device.</p> <p>The <i>src-ip-addr</i> is the IP address of the interface from which the device received the authentication failure.</p> <p>The <i>packet-type</i> can be one of the following:</p> <ul style="list-style-type: none"> <li>• hello</li> <li>• database description</li> <li>• link state request</li> <li>• link state update</li> <li>• link state ack</li> <li>• unknown</li> </ul> <p><b>NOTE</b></p> <p>This message is typically generated during BFD or OSPF reconverge within the following scenarios:</p> <ul style="list-style-type: none"> <li>• The router is undergoing hitless upgrade</li> <li>• Management module switchover,</li> <li>• Interface module CPU utilization is at 95% or more,</li> <li>• The <b>clear ip ospf neighbor all</b> command is issued.</li> </ul> <p>During these processes, OSPF adj is deleted due to BFD time out while the router can still receive OSPF packets destined to a previous session from its neighbor because the neighbor has an inconsistent OSPF state due to timing. This message will go away shortly when BFD or OSPF re-establishes neighbor.</p>
<b>Message Level</b>	Notification
<b>Message</b>	OSPF virtual intf rcvd bad pkt, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , pkt type pkt-type
<b>Explanation</b>	<p>Indicates that an OSPF interface received a bad packet.</p> <p>The <i>router-id</i> is the router ID of the device.</p> <p>The <i>ip-addr</i> is the IP address of the interface on the device.</p> <p>The <i>src-ip-addr</i> is the IP address of the interface from which the device received the authentication failure.</p> <p>The <i>packet-type</i> can be one of the following:</p> <ul style="list-style-type: none"> <li>• hello</li> <li>• database description</li> <li>• link state request</li> <li>• link state update</li> <li>• link state ack</li> <li>• unknown</li> </ul>
<b>Message Level</b>	Notification

**Message** OSPF intf retransmit, rid router-id , intf addr ip-addr , nbr rid nbr-router-id ,pkt type is pkt-type , LSA type lsa-type ,LSA id lsa-id , LSA rid lsa-router-id

**Explanation** An OSPF interface on the device has retransmitted a Link State Advertisement (LSA).

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *nbr-router-id* is the router ID of the neighbor router.

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

The *lsa-type* is the type of LSA.

The *lsa-id* is the LSA ID.

The *lsa-router-id* is the LSA router ID.

**Message Level** Notification

**Message** OSPF virtual intf retransmit, rid router-id , intf addr ip-addr , nbr rid nbr-router-id , pkt type is pkt-type , LSA type lsa-type ,LSA id lsa-id , LSA rid lsa-router-id

**Explanation** An OSPF interface on the device has retransmitted a Link State Advertisement (LSA).

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *nbr-router-id* is the router ID of the neighbor router.

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

The *lsa-type* is the type of LSA.

The *lsa-id* is the LSA ID.

The *lsa-router-id* is the LSA router ID.

**Message Level** Notification

**Message** OSPF originate LSA, rid router-id , area area-id , LSA type lsa-type , LSA id lsa-id , LSA router id lsa-router-id

**Explanation** An OSPF interface has originated an LSA.

The *router-id* is the router ID of the device.

The *area-id* is the OSPF area.

The *lsa-type* is the type of LSA.

The *lsa-id* is the LSA ID.

The *lsa-router-id* is the LSA router ID.

**Message Level**

Notification

**Message**

OSPF max age LSA, rid router-id , area area-id , LSA type lsa-type , LSA id lsa-id , LSA rid lsa-router-id

**Explanation**

An LSA has reached its maximum age.

The *router-id* is the router ID of the device.

The *area-id* is the OSPF area.

The *lsa-type* is the type of LSA.

The *lsa-id* is the LSA ID.

The *lsa-router-id* is the LSA router ID.

**Message Level**

Notification

**Message**

OSPF LSDB overflow, rid router-id , limit num

**Explanation**

A Link State Database Overflow (LSDB) condition has occurred.

The *router-id* is the router ID of the device.

The *num* is the number of LSAs.

**Message Level**

Notification

**Message**

OSPF LSDB approaching overflow, rid router-id , limit num

**Explanation**

The software is close to an LSDB condition.

The *router-id* is the router ID of the device.

The *num* is the number of LSAs.

**Message Level**

Notification

**Message**

OSPF intf rcvd bad pkt Bad Checksum, rid ip-addr , intf addr ip-addr , pkt size num , checksum num , pkt src addr ip-addr , pkt type type

**Explanation**

The device received an OSPF packet that had an invalid checksum.

The rid *ip-addr* is device's router ID.

The intf addr *ip-addr* is the IP address of the interface that received the packet.

The pkt size *num* is the number of bytes in the packet.

The checksum *num* is the checksum value for the packet.

The pkt src addr *ip-addr* is the IP address of the neighbor that sent the packet.

The pkt type *type* is the OSPF packet type and can be one of the following:

- hello
- database description
- link state request

- link state update
- link state acknowledgement
- unknown (indicates an invalid packet type)

**Message Level** Notification

**Message** OSPF intf rcvd bad pkt Bad Packet type, rid ip-addr , intf addr ip-addr , pkt size num , checksum num , pkt src addr ip-addr , pkt type type

**Explanation** The device received an OSPF packet with an invalid type.

The parameters are the same as for the Bad Checksum message. The *pkt type* value is "unknown", indicating that the packet type is invalid.

**Message Level** Notification

**Message** OSPF intf rcvd bad pkt Unable to find associated neighbor, rid ip-addr , intf addr ip-addr , pkt size num , checksum num , pkt src addr ip-addr , pkt type type

**Explanation** The neighbor IP address in the packet is not on the device's list of OSPF neighbors.

The parameters are the same as for the Bad Checksum message.

**Message Level** Notification

**Message** OSPF intf rcvd bad pkt Invalid packet size, rid ip-addr , intf addr ip-addr , pkt size num , checksum num , pkt src addr ip-addr , pkt type type

**Explanation** The device received an OSPF packet with an invalid packet size.

The parameters are the same as for the Bad Checksum message.

**Message Level** Notification

## Syslog messages OSPFv3

**Message** OSPFv3 Memory Overflow

**Explanation** OSPF has run out of memory.

**Message Level** Alert

**Message** OSPFv3 LSA Overflow, LSA Type = lsa-type

**Explanation** Indicates an LSA database overflow.

The *lsa-type* parameter indicates the type of LSA that experienced the overflow condition. The LSA type is one of the following:

- 1 - Router
- 2 - Network
- 3 - Summary
- 4 - Summary
- 5 - External

**Message Level** Alert

**Message** OSPFv3 interface state changed, rid router-id , intf addr ip-addr , state ospf-state

**Explanation** Indicates that the state of an OSPF interface has changed.

The *router-id* is the router ID of the device.

The *ip-addr* is the interface's IP address.

The *ospf-state* indicates the state to which the interface has changed and can be one of the following:

- down
- loopback
- waiting
- point-to-point
- designated router
- backup designated router
- other designated router
- unknown

**Message Level**

Notification

**Message**

OSPFv3 virtual intf state changed, rid router-id , area area-id , nbr ip-addr , state ospf-state

**Explanation**

Indicates that the state of an OSPF virtual routing interface has changed.

The *router-id* is the router ID of the router the interface is on.

The *area-id* is the area the interface is in.

The *ip-addr* is the IP address of the OSPF neighbor.

The *ospf-state* indicates the state to which the interface has changed and can be one of the following:

- down
- loopback
- waiting
- point-to-point
- designated router
- backup designated router
- other designated router
- unknown

**Message Level**

Notification

**Message**

OSPFv3 nbr state changed, rid router-id , nbr addr ip-addr , nbr rid nbr-router-Id , state ospf-state

**Explanation**

Indicates that the state of an OSPF neighbor has changed.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the neighbor.

The *nbr-router-id* is the router ID of the neighbor.

The *ospf-state* indicates the state to which the interface has changed and can be one of the following:

- down
- attempt
- initializing
- 2-way
- exchange start
- exchange
- loading

- full
- unknown

**Message Level**

Notification

**Message**

OSPFv3 virtual nbr state changed, rid router-id , nbr addr ip-addr , nbr rid nbr-router-id , state ospf-state

**Explanation**

Indicates that the state of an OSPF virtual neighbor has changed.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the neighbor.

The *nbr-router-id* is the router ID of the neighbor.

The *ospf-state* indicates the state to which the interface has changed and can be one of the following:

- down
- attempt
- initializing
- 2-way
- exchange start
- exchange
- loading
- full
- unknown

**Message Level**

Notification

**Message**

OSPFv3 intf config error, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , error type error-type , pkt type pkt-type

**Explanation**

Indicates that an OSPF interface configuration error has occurred.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *src-ip-addr* is the IP address of the interface from which the device received the error packet.

The *error-type* can be one of the following:

- bad version
- area mismatch
- unknown NBMA neighbor
- unknown virtual neighbor
- authentication type mismatch
- authentication failure
- network mask mismatch
- hello interval mismatch
- dead interval mismatch
- option mismatch
- unknown

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

**Message Level**

Notification

**Message**

OSPFv3 virtual intf config error, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , error type error-type , pkt type pkt-type

**Explanation**

Indicates that an OSPF virtual routing interface configuration error has occurred.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *src-ip-addr* is the IP address of the interface from which the device received the error packet.

The *error-type* can be one of the following:

- bad version
- area mismatch
- unknown NBMA neighbor
- unknown virtual neighbor
- authentication type mismatch
- authentication failure
- network mask mismatch
- hello interval mismatch
- dead interval mismatch
- option mismatch
- unknown

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

**Message Level**

Notification

**Message**

OSPFv3 intf authen failure, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , error type error-type , pkt type pkt-type

**Explanation**

Indicates that an OSPF interface authentication failure has occurred.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *src-ip-addr* is the IP address of the interface from which the device received the authentication failure.

The *error-type* can be one of the following:

- bad version
- area mismatch
- unknown NBMA neighbor
- unknown virtual neighbor
- authentication type mismatch
- authentication failure
- network mask mismatch
- hello interval mismatch
- dead interval mismatch
- option mismatch
- unknown

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

<b>Message Level</b>	Notification
<b>Message</b>	OSPFv3 virtual intf authen failure,rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , error type error-type , pkt type pkt-type
<b>Explanation</b>	Indicates that an OSPF virtual routing interface authentication failure has occurred.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *src-ip-addr* is the IP address of the interface from which the device received the authentication failure.

The *error-type* can be one of the following:

- bad version
- area mismatch
- unknown NBMA neighbor
- unknown virtual neighbor
- authentication type mismatch
- authentication failure
- network mask mismatch
- hello interval mismatch
- dead interval mismatch
- option mismatch
- unknown

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

**Message Level**

Notification

**Message**

OSPFv3 intf rcvd bad pkt, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , pkt type pkt-type

**Explanation**

Indicates that an OSPF interface received a bad packet.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *src-ip-addr* is the IP address of the interface from which the device received the authentication failure.

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

**Message Level**

Notification

**Message**

OSPFv3 virtual intf rcvd bad pkt, rid router-id , intf addr ip-addr , pkt src addr src-ip-addr , pkt type pkt-type

**Explanation**

Indicates that an OSPF interface received a bad packet.

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *src-ip-addr* is the IP address of the interface from which the device received the authentication failure.

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

**Message Level**

Notification

**Message**

OSPFv3 intf retransmit, rid router-id , intf addr ip-addr , nbr rid nbr-router-id , pkt type is pkt-type , LSA type lsa-type , LSA id lsa-id , LSA rid lsa-router-id

**Explanation**

An OSPF interface on the device has retransmitted a Link State Advertisement (LSA).

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *nbr-router-id* is the router ID of the neighbor router.

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

The *lsa-type* is the type of LSA.

The *lsa-id* is the LSA ID.

The *lsa-router-id* is the LSA router ID.

**Message Level**

Notification

**Message**

OSPFv3 virtual intf retransmit, rid router-id , intf addr ip-addr , nbr rid nbr-router-id , pkt type is pkt-type , LSA type lsa-type , LSA id lsa-id , LSA rid lsa-router-id

**Explanation**

An OSPF interface on the device has retransmitted a Link State Advertisement (LSA).

The *router-id* is the router ID of the device.

The *ip-addr* is the IP address of the interface on the device.

The *nbr-router-id* is the router ID of the neighbor router.

The *packet-type* can be one of the following:

- hello
- database description
- link state request
- link state update
- link state ack
- unknown

The *lsa-type* is the type of LSA.

The *lsa-id* is the LSA ID.

The *lsa-router-id* is the LSA router ID.

**Message Level**

Notification

**Message**

OSPFv3 originate LSA, rid router-id , area area-id , LSA type lsa-type , LSA id lsa-id , LSA router id lsa-router-id

**Explanation**

An OSPF interface has originated an LSA.

The *router-id* is the router ID of the device.

The *area-id* is the OSPF area.

	The <i>lsa-type</i> is the type of LSA.
	The <i>lsa-id</i> is the LSA ID.
	The <i>lsa-router-id</i> is the LSA router ID.
<b>Message Level</b>	Notification
<b>Message</b>	OSPFv3 max age LSA, rid router-id , area area-id , LSA type lsa-type , LSA id lsa-id , LSA rid lsa-router-id
<b>Explanation</b>	An LSA has reached its maximum age.
	The <i>router-id</i> is the router ID of the device.
	The <i>area-id</i> is the OSPF area.
	The <i>lsa-type</i> is the type of LSA.
	The <i>lsa-id</i> is the LSA ID.
	The <i>lsa-router-id</i> is the LSA router ID.
<b>Message Level</b>	Notification
<b>Message</b>	OSPFv3 LSDB overflow, rid router-id , limit num
<b>Explanation</b>	A Link State Database Overflow (LSDB) condition has occurred.
	The <i>router-id</i> is the router ID of the device.
	The <i>num</i> is the number of LSAs.
<b>Message Level</b>	Notification
<b>Message</b>	OSPFv3 LSDB approaching overflow, rid router-id , limit num
<b>Explanation</b>	The software is close to an LSDB condition.
	The <i>router-id</i> is the router ID of the device.
	The <i>num</i> is the number of LSAs.
<b>Message Level</b>	Notification
<b>Message</b>	OSPFv3 intf rcvd bad pkt Bad Checksum, rid ip-addr , intf addr ip-addr , pkt size num , checksum num , pkt src addr ip-addr , pkt type type
<b>Explanation</b>	The device received an OSPF packet that had an invalid checksum.
	The rid <i>ip-addr</i> is device's device ID.
	The intf addr <i>ip-addr</i> is the IP address of the interface that received the packet.
	The pkt size <i>num</i> is the number of bytes in the packet.
	The checksum <i>num</i> is the checksum value for the packet.
	The pkt src addr <i>ip-addr</i> is the IP address of the neighbor that sent the packet.
	The pkt type <i>type</i> is the OSPF packet type and can be one of the following:
	<ul style="list-style-type: none"> <li>• hello</li> <li>• database description</li> <li>• link state request</li> <li>• link state update</li> <li>• link state acknowledgement</li> </ul>

	<ul style="list-style-type: none"> <li>unknown (indicates an invalid packet type)</li> </ul>
<b>Message Level</b>	Notification
<b>Message</b>	OSPFv3 intf rcvd bad pkt Bad Packet type, rid ip-addr , intf addr ip-addr , pkt size num , checksum num , pkt src addr ip-addr , pkt type type
<b>Explanation</b>	The device received an OSPF packet with an invalid type.  The parameters are the same as for the Bad Checksum message. The pkt type <i>type</i> value is "unknown", indicating that the packet type is invalid.
<b>Message Level</b>	Notification
<b>Message</b>	OSPFv3 intf rcvd bad pkt Unable to find associated neighbor, rid ip-addr , intf addr ip-addr , pkt size num , checksum num , pkt src addr ip-addr , pkt type type
<b>Explanation</b>	The neighbor IP address in the packet is not on the device's list of OSPF neighbors.  The parameters are the same as for the Bad Checksum message.
<b>Message Level</b>	Notification
<b>Message</b>	OSPFv3 intf rcvd bad pkt Invalid packet size, rid ip-addr , intf addr ip-addr , pkt size num , checksum num , pkt src addr ip-addr , pkt type type
<b>Explanation</b>	The device received an OSPF packet with an invalid packet size.  The parameters are the same as for the Bad Checksum message.
<b>Message Level</b>	Notification

## Syslog messages IS-IS

<b>Message</b>	ISIS Memory Limit Exceeded
<b>Explanation</b>	IS-IS is requesting more memory than is available.
<b>Message Level</b>	Alert
<b>Message</b>	ISIS ENTERED INTO OVERLOAD STATE
<b>Explanation</b>	The device has set the overload bit to on (1), indicating that the device's IS-IS resources are overloaded.
<b>Message Level</b>	Notification
<b>Message</b>	ISIS Entered Overload State Due to overload-reason
<b>Explanation</b>	The device has set the overload bit to on (1), indicating that the device's IS-IS resources are Overloaded.  Reasons for the overload as expressed in the <i>overload-reason</i> variable are: <ul style="list-style-type: none"> <li>Configuration</li> <li>Startup Configuration</li> <li>LSP Buffer Allocation Failure</li> <li>LSP Header Allocation Failure</li> <li>Maximum Number of LSPs Exceeded</li> <li>LSP Fragmentation Count Exceeded</li> <li>LSP Sequence Number Wrap Around</li> <li>LSP Option Allocation Failure</li> <li>Path Entry Allocation Failure</li> <li>Route Entry Allocation Failure</li> </ul>

Definitions of the *overload-reason* values are described in [Table 50](#).

<b>Message Level</b>	Notification
<b>Message</b>	ISIS Exited Overload State
<b>Explanation</b>	The device has set the overload bit to off (0), indicating that the device's IS-IS resources are no longer overloaded.
<b>Message Level</b>	Notification
<b>Message</b>	ISIS L1 ADJACENCY DOWN system-id on circuit circuit-id
<b>Explanation</b>	The device's adjacency with this Level-1 IS has gone down.  The <i>system-id</i> is the system ID of the IS.  The <i>circuit-id</i> is the ID of the circuit over which the adjacency was established.
<b>Message Level</b>	Notification
<b>Message</b>	ISIS L1 ADJACENCY UP system-id on circuit circuit-id
<b>Explanation</b>	The device's adjacency with this Level-1 IS has come up.  The <i>system-id</i> is the system ID of the IS.  The <i>circuit-id</i> is the ID of the circuit over which the adjacency was established.
<b>Message Level</b>	Notification
<b>Message</b>	ISIS L2 ADJACENCY DOWN system-id on circuit circuit-id
<b>Explanation</b>	The device's adjacency with this Level-2 IS has gone down.  The <i>system-id</i> is the system ID of the IS.  The <i>circuit-id</i> is the ID of the circuit over which the adjacency was established.
<b>Message Level</b>	Notification
<b>Message</b>	ISIS L2 ADJACENCY UP system-id on circuit circuit-id
<b>Explanation</b>	The device's adjacency with this Level-2 IS has come up.  The <i>system-id</i> is the system ID of the IS.  The <i>circuit-id</i> is the ID of the circuit over which the adjacency was established.
<b>Message Level</b>	Notification
<b>Message</b>	ISIS LSP-type LSP LSP-ID Seq sequence-number Len length LifeTime lifetime on interface-name dropped due to LSP-drop-reason
<b>Explanation</b>	The device has dropped the received LSP.  The <i>LSP-Type</i> can be one of the following: <ul style="list-style-type: none"> <li>• L1</li> <li>• L2</li> </ul> The <i>LSP-ID</i> variable is in the 8 byte LSP ID value.  The <i>sequence-number</i> is a 4 byte value that is associated with each LSP ID.  The <i>length</i> is the length of the LSP PDU.  The <i>lifetime</i> is the life period of the LSP.  The <i>interface-name</i> is the name of the interface and is displayed in the following form "Ethernet 1/1".  The <i>LSP-drop-reason</i> variable describes the following reasons that the LSP was dropped: <ul style="list-style-type: none"> <li>• Adjacency not found</li> <li>• Adjacency Level Mismatch</li> </ul>

- IS Level Mismatch
- Length Too Short
- Length Too Large
- Authentication Failure
- Max Area Check Failure
- Zero Checksum
- Checksum Mismatch
- Invalid Length

Definitions of the *LSP-drop-reason* values are described in [Table 50](#).

**Message Level**

Notification

**Message**

ISIS NbrType Neighbor Hostname/systemID DOWN on interface-name due to neighbor-down-reason

**Explanation**

The device's Neighbor has gone down. The *NbrType* can be one of the following:

- L1
- L2
- PTPT

The *interface-name* is the name of the interface and is displayed in the following form "Ethernet 1/1".

The *neighbor-down-reason* variable can be any one of the following reasons that the Neighbor is Down:

- BFD Trigger
- Maximum Adjacencies
- User Trigger
- Hold Timer Expiry
- Adjacency ID Mismatch
- Adjacency Type Mismatch
- Interface Down
- Interface State Change

Definitions of the *neighbor-down-reason* values are described in [Table 50](#).

**Message Level**

Notification

**Message**

ISIS NbrType neighbor Hostname/systemID UP on interface-name

**Explanation**

The device's Neighbor has come up.

The *NbrType* can be one of the following:

- L1
- L2
- PTPT

The *interface-name* is the name of the interface and is displayed in the following form "Ethernet 1/1".

**Message Level**

Notification

**Message**

ISIS PTP ADJACENCY DOWN mac on interface portnum

**Explanation**

**Message Level**

Notification

**Message**            ISIS PTP ADJACENCY UP mac on interface portnum  
**Explanation**  
**Message Level**    Notification

TABLE 50 Definition of IS-IS variables

Variable	Value	Definition
<i>neighbor-down-reason</i>	BFD Trigger	BFD identified link failures and triggered IS-IS to clean the neighbors on that link.
	Maximum Adjacencies	IS-IS has reached the maximum number of adjacencies. Therefore, it has deleted the adjacency with the lowest SNPA address to accommodate the new adjacency.
	User Trigger	The user triggered to delete the adjacency using the clear <b>isis neighbor systemID</b> command or the <b>clear isis all</b> command.
	Hold Timer Expiry	The adjacency was deleted because there were no "hellos" received within the hold time period.
	Adjacency ID Mismatch	The adjacency was deleted because the new "hello" received from this adjacency has a different System ID.
	Adjacency Type Mismatch	The adjacency was deleted because the new "hello" received from this adjacency has a different adjacency Type.
	Interface Down	The adjacency was deleted because the interface went down.
	Interface State Change	The adjacency was deleted because the interface state has changed due to user configuration.
<i>overload-reason</i>	Configuration	The Overload condition was entered because of a user configuration.
	Startup Configuration	The Overload condition was entered because of the startup configuration.
	LSP Buffer Allocation Failure	The Overload condition was entered because of an LSP buffer allocation error.
	LSP Header Allocation Failure	The Overload condition was entered because of an LSP header allocation error.
	Maximum Number of LSPs Exceeded	The Overload condition was entered because the LSP count reached the maximum value.
	LSP Fragmentation Count Exceeded	The Overload condition was entered because of IS-IS trying to generate the 256th LSP fragment.
	LSP Sequence Number Wrap Around	The Overload condition was entered because the LSP numbers reached the maximum value.
	LSP Option Allocation Failure	Self LSP building failed due to an internal buffer allocation failure.
	Path Entry Allocation Failure	The SPF computation failed due to a Path Entry allocation failure.
	Route Entry Allocation Failure	The SPF computation failed due to a Route Entry allocation failure.
<i>LSP-drop-reason</i>	Adjacency not found	The LSP was dropped because the is no adjacency found on the interface.

TABLE 50 Definition of IS-IS variables (continued)

Variable	Value	Definition
	Adjacency Level Mismatch	The LSP was dropped because the adjacency is at a different level from the LSP level.
	IS Level Mismatch	The LSP was dropped because IS-IS is configured at a different level than the LSP level.
	Length Too Short	The LSP length is shorter than the LSP header length.
	Length Too Large	The LSP length is larger than the Maximum LSP buffer length.
	Authentication Failure	The LSP was dropped because of an authentication failure.
	Max Area Check Failure	The LSP has a Max Area Count different than the configured Max Area Count of the device.
	Zero Checksum	The LSP has a zero checksum.
	Checksum Mismatch	The LSP checksum is different than the computed checksum.
	Invalid Length	The LSP length is different than the sum of the option lengths in the LSP.

## Syslog messages ITC and IPC queue usage

<b>Message</b>	<code>Apr 17 05:25:19:W:ITC destination task ITC_APP_SCP : Queue Usage exceeds threshold- 80 percent of total queue length 1048576 bytes</code>
<b>Explanation</b>	Indicates that the inter-task communications (ITC) destination task queue usage has exceeded the threshold value of 80 percent of the total queue length. The syslog message is generated only on the active MP module. An SNMP trap is also generated when the ITC destination task usage is above the threshold value. ITC queue errors are sometimes seen in a highly scaled network when a system reload, system switchover, or MP Reset, and during Hitless Operating System Switchover (HLOS).
<b>Message Level</b>	Warning
<b>Message</b>	<code>Apr 17 05:26:19:I:ITC destination task ITC_APP_SCP : Queue Usage has come back to normal which is below threshold- 80 percent of total queue length 1048576 bytes</code>
<b>Explanation</b>	Indicates that the ITC destination task queue usage on the active MP module is now back to normal and below the threshold value of 80 percent of the total queue length. An SNMP trap is also generated when the ITC destination task queue is normal and below the threshold value.
<b>Message Level</b>	Informational
<b>Message</b>	<code>Apr 17 05:10:28:W:ITC source task ITC_APP_CONSOLE : Retry Queue Usage exceeds threshold- 80 percent of total queue length 16384 bytes</code>
<b>Explanation</b>	Indicates that the ITC source task retry queue usage has exceeded the threshold value of 80 percent of the total queue length. The syslog message is generated only on the active MP module. An SNMP trap is also generated when the ITC source task retry usage is above the threshold value.
<b>Message Level</b>	Warning
<b>Message</b>	<code>Apr 17 05:06:49:I:ITC source task Console : Retry Queue Usage has come back to normal which is below threshold- 80 percent of total queue length 16384 bytes</code>
<b>Explanation</b>	Indicates that the ITC source task retry queue usage on the active MP module is now back to normal and below the threshold value of 80 percent of the total queue length. An SNMP trap is also generated when the ITC source task retry queue is normal and below the threshold value.

<b>Message Level</b>	Informational
<b>Message</b>	Apr 17 05:27:10:W:IPC reliable TX Queue usage for destination slot 1 exceeds threshold- 80 percent of total queue length 1024
<b>Explanation</b>	Indicates that the Interprocessor Communications (IPC) reliable TX queue usage for destination slot 1 has exceeded the threshold value of 80 percent of the total queue length. The syslog message is generated only on the active MP module. An SNMP trap is also generated when the IPC reliable TX queue usage is above the threshold value.
<b>Message Level</b>	Warning
<b>Message</b>	Apr 17 05:28:10:I:IPC Reliable TX Queue usage for destination slot 1 has come back to normal which is below threshold- 80 percent of total queue length 1024
<b>Explanation</b>	Indicates that the IPC reliable TX queue usage on the active MP module for destination slot 1 is now back to normal and below the threshold value of 80 percent of the total queue length. An SNMP trap is also generated when the IPC reliable TX queue usage is normal and below the threshold value.
<b>Message Level</b>	Informational

## Syslog messages BGP

<b>Message</b>	BGP4 Not enough memory available to run BGP4
<b>Explanation</b>	The device could not start the BGP4 routing protocol because there is not enough memory available.
<b>Message Level</b>	Debug
<b>Message</b>	BGP No of prefixes received from BGP peer ip-addr exceeds maximum prefix-limit...shutdown
<b>Explanation</b>	The device has received more than the specified maximum number of prefixes from the neighbor, and the device is therefore shutting down its BGP4 session with the neighbor.
<b>Message Level</b>	Error
<b>Message</b>	BGP received invalid AS4_PATH attribute length (3) - entire AS4_PATH ignored
<b>Explanation</b>	Possible attribute length can be only even number and cannot be odd. If an attribute with odd length is received, this error is displayed.
<b>Message Level</b>	Error
<b>Message</b>	BGP received invalid AS4_PATH attribute flag (0x40) - entire AS4_PATH ignored
<b>Explanation</b>	If the flag that describes the attribute has unacceptable values then this error is displayed.
<b>Message Level</b>	Error
<b>Message</b>	BGP received invalid Confed info in AS4_PATH (@byte 43) - entire AS4_PATH ignored
<b>Explanation</b>	Confederation segments(AS_CONFED_SEQ/SET) must precede the (AS_SEQ/SET), if not, this error is displayed.
<b>Message Level</b>	Error
<b>Message</b>	BGP received incorrect Seq type/len in AS4_PATH (@byte 41) - entire AS4_PATH ignored
<b>Explanation</b>	Valid segment types are (AS_SEQ/SET, AS_CONFED_SEQ/SET), any other values results in an error being displayed.
<b>Message Level</b>	Error
<b>Message</b>	BGP received multiple AS4_PATH attributes - used first AS4_PATH attribute only
<b>Explanation</b>	When AS4_PATH is received more than one time in the update message, this error is displayed.
<b>Message Level</b>	Error
<b>Message</b>	BGP No of prefixes received from BGP peer ip-addr exceeds warning limit num
<b>Explanation</b>	The device has received more than the allowed percentage of prefixes from the neighbor.  The <i>ip-addr</i> is the IP address of the neighbor.

The *num* is the number of prefixes that matches the percentage you specified. For example, if you specified a threshold of 100 prefixes and 75 percent as the warning threshold, this message is generated if the device receives a 76th prefix from the neighbor.

**Message Level**

Warning

**Message**BGP Peer *ip-addr* UP (ESTABLISHED)**Explanation**

Indicates that a BGP4 neighbor has come up.

The *ip-addr* is the IP address of the neighbor's BGP4 interface with the device.

**Message Level**

Notification

**Message**BGP Peer *ip-addr* DOWN (IDLE)**Explanation**

Indicates that a BGP4 neighbor has gone down.

The *ip-addr* is the IP address of the neighbor's BGP4 interface with the device.

**Message Level**

Notification

**Message**BGP Peer *ip* DOWN ( *reasonrecv* *notif* )**Explanation****Message Level**

Notification

**Message**

Configuration (Wait for BGP)

**Explanation**

IS-IS is waiting for BGP convergence to complete.

**Message Level**

Notification

## Syslog messages NTP

**Message**NTP server *ip-addr* failed to respond**Explanation**

Indicates that a Network Time Protocol (NTP) server did not respond to the device's query for the current time.

The *ip-addr* indicates the IP address of the NTP server.

**Message Level**

Warning

**Message**

```
<server | sym_active | sym_passive> association is mobilized for <ipv4 address |
ipv6 address>
```

**Explanation**

Indicates the mobilization of a new NTP server, or symmetric active or symmetric passive association with the peer. The symmetric passive message is logged upon the arrival of the first NTP packet from the NTP peer, which is not statically configured.

**Message Level**

Informational

**Message**

```
<server | sym_active | sym_passive> association is demobilized <ipv4 address | ipv6
address>
```

**Explanation**

Indicates the NTP server and symmetric active peer demobilization messages are logged when a user removes the NTP server or peer configuration. The NTP symmetric passive demobilization is logged when the NTP packet from the symmetric passive peer results in an error or timeout.

**Message Level**

Informational

## Syslog messages TCP

**Message**TCP Local TCP exceeds *burst-max* burst packets, stopping for *lockup* seconds!**Explanation**

The number of TCP SYN packets exceeds the *burst-max* threshold set by the **ip tcp burst** command. The device may be the victim of a TCP SYN DoS attack.

All TCP SYN packets will be dropped for the number of seconds specified by the *lockup* value. When the lockup period expires, the packet counter is reset and measurement is restarted.

**Message Level**

Notification

**Message**

TCP Transit TCP in interface portnum exceeds num burst packets, stopping for num seconds!

**Explanation**

Threshold parameters for TCP transit (through) traffic have been configured on an interface, and the maximum burst size for TCP packets on the interface has been exceeded.

The *portnum* is the port number.

The first *num* is the maximum burst size (maximum number of packets allowed).

The second *num* is the number of seconds during which additional TCP packets will be blocked on the interface.

**NOTE**

This message can occur in response to an attempted TCP SYN attack.

**Message Level**

Notification

## Syslog messages DOT1X

**Message**

DOT1X security violation at port portnum , malicious mac address detected mac-address

**Explanation**

A security violation was encountered at the specified port number.

**Message Level**

Warning

**Message**

DOT1X Port portnum , AuthControlledPortStatus change restricted

**Explanation****Message Level**

Warning

**Message**

DOT1X Port portnum port default vlan-id changes to vlan-id

**Explanation****Message Level**

Notification

**Message**

DOT1X Port portnum currently used vlan-id changes to vlan-id due to move to restricted vlan

**Explanation****Message Level**

Notification

**Message**

DOT1X issues software port up indication of Port portnum to other software applications

**Explanation**

The device has indicated that the specified port has been authenticated, but the actual port may not be active.

**Message Level**

Notification

**Message**

DOT1X issues software port down indication of Port portnum to other software applications

**Explanation**

The device has indicated that the specified is no longer authorized, but the actual port may still be active.

**Message Level**

Notification

**Message**

DOT1X Port portnum , AuthControlledPortStatus change authorized

**Explanation**

The status of the interface's controlled port has changed from unauthorized to authorized.

**Message Level**

Informational

**Message**

DOT1X Port portnum , AuthControlledPortStatus change unauthorized

<b>Explanation</b>	The status of the interface's controlled port has changed from authorized to unauthorized.
<b>Message Level</b>	Informational
<b>Message</b>	<code>DOT1X Port portnum currently used vlan-id changes to vlan-id due to dot1x-RADIUS vlan assignment</code>
<b>Explanation</b>	A user has completed 802.1X authentication. The profile received from the RADIUS server specifies a VLAN ID for the user. The port to which the user is connected has been moved to the VLAN indicated by <i>vlan-id</i> .
<b>Message Level</b>	Informational
<b>Message</b>	<code>DOT1X Port portnum currently used vlan-id is set back to port default vlan-id vlan-id</code>
<b>Explanation</b>	The user connected to <i>portnum</i> has disconnected, causing the port to be moved back into its default VLAN, <i>vlan-id</i> .
<b>Message Level</b>	Informational
<b>Message</b>	<code>DOT1X Port portnum is unauthorized because system resource is not enough or the invalid information to set the dynamic assigned IP ACLs or MAC address filters</code>
<b>Explanation</b>	802.1X authentication could not take place on the port. This happened because strict security mode was enabled and one of the following occurred: <ul style="list-style-type: none"> <li>• Insufficient system resources were available on the device to apply an IP ACL or MAC address filter to the port</li> <li>• Invalid information was received from the RADIUS server (for example, the Filter-ID attribute did not refer to an existing IP ACL or MAC address filter)</li> </ul>
<b>Message Level</b>	Informational
<b>Message</b>	<code>DOT1X Not enough memory</code>
<b>Explanation</b>	There is not enough system memory for 802.1X authentication to take place. Contact device Technical Support.
<b>Message Level</b>	Debug

## Syslog messages SNMP

<b>Message</b>	<code>SNMP Auth. failure, intruder IP ip-addr</code>
<b>Explanation</b>	A user has tried to open a management session with the device using an invalid SNMP community string.  The <i>ip-addr</i> is the IP address of the host that sent the invalid community string.
<b>Message Level</b>	Informational
<b>Message</b>	<code>SNMP read-only community   read-write community   contact   location   user   group   view   engineid   trap [host] [ value -str ] deleted   added   modified from console   telnet   ssh   web   snmp session</code>
<b>Explanation</b>	A user made SNMP configuration changes through the Web, SNMP, console, SSH, or Telnet session.  [ <i>value-str</i> ] does not appear in the message if SNMP community or engineid is specified.
<b>Message Level</b>	Informational

## Syslog messages MPLS

<b>Message</b>	<code>Deleting VLL name (ID number ) at string port slot/port with peer IPv4 address ip-address</code>
<b>Explanation</b>	Sent when PW traps are generated if the PW has been deleted, i.e. when the pwRowStatus in the MIB has been set to destroy(6), the PW has been deleted by a non-MIB application, or due to auto discovery process.
<b>Message Level</b>	Informational

<b>Message</b>	MPLS Deleting VLL vll-name (ID vll-id )
<b>Explanation</b>	Sent when the specified VLL is being deleted.
<b>Message Level</b>	Informational
<b>Message</b>	MPLS Deleting VLL vll-name (ID vll-id ) at {tagged   untagged} port slot/port
<b>Explanation</b>	Sent when the specified VLL with the at the specified tagged or untagged port is being deleted.
<b>Message Level</b>	Informational
<b>Message</b>	MPLS Deleting VLL vll-name (ID vll-id ) with peer IPv4 address ip
<b>Explanation</b>	Sent when the specified VLL with the specified IPv4 peer is being deleted.
<b>Message Level</b>	Informational
<b>Message</b>	VLL is down for table index number
<b>Explanation</b>	Sent when PW traps are generated if the VLL is down for one index
<b>Message Level</b>	Informational
<b>Message</b>	VLL is up for table index number
<b>Explanation</b>	Sent when PW traps are generated if VLL is up for one index
<b>Message Level</b>	Informational
<b>Message</b>	VLLs are down for table indexes number through number
<b>Explanation</b>	Sent when PW traps are generated if the VLLs represented by sequential entries in the database are down
<b>Message Level</b>	Informational
<b>Message</b>	VLLs are up for table indexes number through number
<b>Explanation</b>	Sent when PW traps are generate dif VLLs represented by sequential entries in the database are up
<b>Message Level</b>	Informational
<b>Message</b>	VRF Port slot-port added to VRF name with updated port count number
<b>Explanation</b>	Sent when an MPLS L3 VPN trap is generated if the state of an interface within the VRF changed from down to up.
<b>Message Level</b>	Informational
<b>Message</b>	VRF Port slot-port deleted from VRF name with updated port count number
<b>Explanation</b>	Sent when an MPLS L3 VPN trap is generated if the state of an interface within the VRF changed from down to up.
<b>Message Level</b>	Informational
<b>Message</b>	MPLS Deleting VLL name (ID vc-id ) at {tagged I untagged} port portnum with peer IPv4 address ip
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	MPLS LSP lspname switches to new active path pathame
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	MPLS LSP lspname using path pathname is down
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	MPLS LSP lspname using path pathname is up
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLL is down for table index n
<b>Explanation</b>	
<b>Message Level</b>	Notification

<b>Message</b>	MPLS VLL is up for table index n
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLLs are down for table indexes n through m
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLLs are up for table indexes n through m
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS [ID id ] peer ip is down
<b>Explanation</b>	Sent when a single VPLS peer is transitioning to a down state
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS [ID id ] peer ip is up
<b>Explanation</b>	Sent when a single VPLS peer is transitioning to an up state
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS name (ID id ) endpoint ip-address is down
<b>Explanation</b>	Sent when a single VPLS endpoint is transitioning to a down state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS name (ID id ) endpoint ip-address is up
<b>Explanation</b>	Sent when a single VPLS endpoint is transitioning to an up state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS for instance indices list n through m are up
<b>Explanation</b>	Sent when multiple VPLS instances are transitioning to an up state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS for instance indices list n through m are down
<b>Explanation</b>	Sent when multiple VPLS instances are transitioning to a down state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS peer ip associated with VC ID n is up
<b>Explanation</b>	Sent when a single VPLS peer is transitioning to an up state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS peer ip associated with VC ID n is down
<b>Explanation</b>	Sent when a single VPLS peer is transitioning to a down state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS peer ip associated with instances n - m list is down
<b>Explanation</b>	Sent when multiple VPLS instances associated with a peer are transitioning to a down state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPLS peer ip associated with instances n - m list is up
<b>Explanation</b>	Sent when multiple VPLS instances associated with a peer are transitioning to an up state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VPL endpoint slot / port associated with instance indices list is down
<b>Explanation</b>	Sent when multiple VPLS instances associated with an endpoint is transitioning to a down state.
<b>Message Level</b>	Notification

<b>Message</b>	MPLS VPL endpoint slot / port associated with instance indices list is up
<b>Explanation</b>	Sent when multiple VPLS instances associated with an endpoint is transitioning to an up state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLL-Local name is down
<b>Explanation</b>	Sent when a single VLL-Local instance is transitioning to a down state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLL-Local name is up
<b>Explanation</b>	Sent when a single VLL-Local instance is transitioning to an up state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLL-Local for instance indices list n through m are up
<b>Explanation</b>	Sent when multiple VLL-Local instances are transitioning to an up state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLL-Local for instance indices list n through m are down
<b>Explanation</b>	Sent when multiple VLL-Local instances are transitioning to a down state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLL name (ID id is down
<b>Explanation</b>	Sent when a single VLL peer is transitioning to a down state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLL name (ID id is up
<b>Explanation</b>	Sent when a single VLL peer is transitioning to an up state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLL for instance indices list n through m are up
<b>Explanation</b>	Sent when multiple VLL instances are transitioning to an up state.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS VLL for instance indices list n through m are down
<b>Explanation</b>	Sent when multiple VLL instances are transitioning to a down state.
<b>Message Level</b>	Notification

## Syslog messages VRF

<b>Message</b>	VRF Port portnum added to VRF name with updated port count n
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	VRF Port portnum deleted from VRF name with updated port count n
<b>Explanation</b>	
<b>Message Level</b>	Notification
<b>Message</b>	VRF vrf_name has been configured as management VRF.
<b>Explanation</b>	Indicates that the specified VRF  has been configured as a  management VRF.
<b>Message Level</b>	Informational
<b>Message</b>	VRF vrf_name has been un- configured as management VRF.

**Explanation** Indicates that the specified VRF has been removed as a management VRF.

**Message Level** Informational

## Syslog messages

**Message** Authentication Enabled on portnum

**Explanation** The multi-device port authentication feature was enabled on the on the specified *portnum*.

**Message Level** Notification

**Message** Authenticaion Disabled on portnum

**Explanation** The multi-device port authentication feature was disabled on the on the specified *portnum*.

**Message Level** Notification

## Syslog messages BFD

**Message** BFD Session UP for NBR neighbor-ID on port

**Explanation** The BFD session is UP with the neighbor specified by the *neighbor-ID* on the port specified by the *port* variable.

**Message Level** Notification

**Message** BFD Session DOWN for NBR neighbor-ID on port Reason Neighbor Signaled Session Down

**Explanation** The BFD session with the neighbor specified by the *neighbor-ID* on the port specified by the *port* variable is Down because the BFD neighbor has signaled the session to be down.

**Message Level** Notification

**Message** BFD Session DOWN for NBR neighbor-ID on port Reason Administratively Down

**Explanation** The BFD session with the neighbor specified by the *neighbor-ID* on the port specified by the *port* variable is Down for Administrative reasons.

**Message Level** Notification

## Syslog messages Optics

**Message** Transceiver type checking has been disabled!

**Explanation** The transceiver type checking feature has been disabled. The device will continue to report incompatible transceivers through syslog messages and but will not shutdown a port that contains one.

**Message Level** Notification

**Message** Session DOWN for LSP lsp-name Reason Administratively Down

**Explanation** The BFD session for the LSP specified by the *lsp-name* is Down for Administrative reasons.

**Message Level** Notification

**Message** Session Up for LSP lsp-name

**Explanation** The BFD session for the LSP specified by the *lsp-name* is Up.

**Message Level** Notification

**Message** Session DOWN for RSVP session session-id Reason Administratively Down

**Explanation** The BFD session for the RSVP session specified by the *session-id* is Down for Administrative reasons.

	The form of the <i>session-id</i> displayed isIPv4 tunnel endpoint or tunnel ID or extended tunnel ID.For example 10.22.22.2/3/11/11/11/1
<b>Message Level</b>	Notification
<b>Message</b>	Session UP for RSVP session <i>session-id</i>
<b>Explanation</b>	The BFD session for the RSVP session specified by the <i>session-id</i> is Up.
	The form of the <i>session-id</i> displayed isIPv4 tunnel endpoint or tunnel ID or extended tunnel ID.For example 10.22.22.2/3/11/11/11/1
<b>Message Level</b>	Notification
<b>Message</b>	Transceiver type checking has been enabled!
<b>Explanation</b>	The transceiver type checking feature has been re-enabled. The feature is enabled by default and does not send the message under normal circumstances. However, if it is disabled and then re-enabled the device will send this message.
<b>Message Level</b>	Notification
<b>Message</b>	Optic is not Brocade qualified ( <i>port</i> ) Type <i>type-description</i> Vendor <i>vendor-name</i> , Version <i>version-num</i> Part# <i>part-no</i> , Serial# <i>serial-no</i>
<b>Explanation</b>	The optic module installed in the Interface module at the port specified by the <i>port</i> variable is not Brocade qualified although the port is still operational. The Type, Vendor, Version, Part#, and Serial # of the optic module is provided.
<b>Message Level</b>	Warning
<b>Message</b>	Optic is not Brocade qualified, optical monitoring is not supported ( <i>port</i> ) Type <i>type-description</i> Vendor <i>vendor-name</i> , Version <i>version-num</i> Part# <i>part-no</i> , Serial# <i>serial-no</i>
<b>Explanation</b>	The optic module installed in the Interface module at the port specified by the <i>port</i> variable is not Brocade qualified and will not be able to be monitored using the Optical Monitoring function. The Type, Vendor, Version, Part#, and Serial # of the optic module is provided.
<b>Message Level</b>	Alert
<b>Message</b>	Optic is not capable of optical monitoring ( <i>port</i> ) Type <i>type-description</i> Vendor <i>vendor-name</i> , Version <i>version-num</i> Part# <i>part-no</i> , Serial# <i>serial-no</i>
<b>Explanation</b>	The optic module installed in the Interface module at the port specified by the <i>port</i> variable is not able to be monitored using the Optical Monitoring function. The Type, Vendor, Version, Part#, and Serial # of the optic module is provided.
<b>Message Level</b>	Alert
<b>Message</b>	Incompatible optical trans-receiver detected on port <i>n</i>
<b>Explanation</b>	Indicates that in incompatible XFP or SFP has been installed in the port specified. A port with an incompatible optical module installed are shut down.
<b>Message Level</b>	Alert

## Syslog messages LDP

<b>Message</b>	MPLS LDP path vector limit mismatch for session <i>lSrId</i> <i>labelSpaceId</i> (value <i>local</i> <i>vector limit</i> ) with peer <i>lSrId</i> <i>labelSpaceId</i> (value <i>peer</i> <i>vector limit</i> )
<b>Explanation</b>	This notification is generated when the value of the LDP path vector limit value from the peer does not match that of the entity.
<b>Message Level</b>	Notification
<b>Message</b>	MPLS LDP entity <i>session</i> <i>lSrId</i> <i>labelSpaceId</i> with peer <i>lSrId</i> <i>labelSpaceId</i> is up

**Explanation** This notification is sent when the value of 'mplsLdpSessionState' enters the 'operational(5)' state.  
**Message Level** Notification

**Message** MPL LDP entity session lsrId labelSpaceId with peer lsrId labelSpaceId is down  
**Explanation** This notification is sent when the value of 'mplsLdpSessionState' leaves the 'operational(5)' state.  
**Message Level** Notification

## Syslog messages DHCP

**Message** DHCPD: No DHCP service available on the network.  
**Explanation** The DHCP OFFER message is not received within 16 seconds of starting the DHCP address configuration phase.  
**Message Level** Warning

**Message** DHCPD: Failed to renew DHCP lease on port 1/1 with IP address 10.1.1.1 mask 255.255.255.0

**Explanation** The DHCP lease cannot be renewed.  
**Message Level** Warning

**Message** DHCPD: Failed to configure IP address on port 1/1; with IP address 10.1.1.1, mask 255.255.255.0

**Explanation** The IP address cannot be configured without a reason.  
**Message Level** Warning

**Message** Failed to download image file image name  
**Explanation** The image file cannot be downloaded.  
**Message Level** Warning

**Message** DHCPD: Failed to download configuration file image name  
**Explanation** The configuration files cannot be downloaded.  
**Message Level** Warning

## Syslog messages DHCPv6

**Message** DHCPv6: Maximum allowed 60000 delegated prefixes learned.  
**Explanation** The delegated prefixes' limit has reached the maximum value at the system level.  
**Message Level** Warning

**Message** DHCPv6: Write to flash file to save delegated prefixes information failed.  
**Explanation** Saving the delegated prefixes to flash file failed.  
**Message Level** Warning

**Message** DHCPv6: Maximum allowed 20000 delegated prefixes learned on interface ve 100.  
**Explanation** The delegated prefixes' limit has reached the maximum value at the interface level.  
**Message Level** Warning

## Syslog messages data integrity protection

**Message** NP CSRAM has 4 error events, exceeding configured threshold for interfaces 1/1 to 1/24.

<b>Explanation</b>	A user sees this message when the CSRAM error events exceeds the configured threshold parameter for the specified port range.
<b>Message Level</b>	Informational
<b>Message</b>	NP LPM has 4 error events, exceeding configured threshold for interfaces 1/1 to 1/24.
<b>Explanation</b>	A user receives this message when the LPM memory error events exceeds the configured threshold parameter for the specified port range.
<b>Message Level</b>	Informational
<b>Message</b>	NP ingress buffer has 11 error events, exceeding configured threshold for interfaces 1/1 to 1/24.
<b>Explanation</b>	A user receives this message when the NP ingress buffer error events exceeds the configured threshold for the specified port range.
<b>Message Level</b>	Informational
<b>Message</b>	NP egress buffer has 11 events, exceeding configured threshold for interfaces 1/1 to 1/24.
<b>Explanation</b>	A user receives this message when the NP egress buffer error events exceeds the configured threshold for the specified port range.
<b>Message Level</b>	Informational

## Syslog messages TCAM In-field soft repair

<b>Message</b>	<code>SYSLOG: &lt;14&gt;Jul 23 11:02:41 sys-np-mac-224 IFSR: Soft Error at TCAM index 0x0002211a of PPCR 1</code>
<b>Explanation</b>	Indicates the TCAM In-Field Soft Repair (IFSR) memory parity error is detected at the specified TCAM index for the Port Per Packet Processor (PPCR) 1.
<b>Message Level</b>	Error
<b>Message</b>	<code>SYSLOG: &lt;14&gt;Jul 23 11:02:41 sys-np-mac-224 IFSR: Soft Repair at TCAM index 0x00002fe9 of PPCR 1</code>
<b>Explanation</b>	Indicates the IFSR error entry is repaired at the specified TCAM index for the PPCR 1.
<b>Message Level</b>	Informational
<b>Message</b>	<code>SYSLOG: &lt;14&gt;Jul 23 11:02:41 sys-np-mac-224 IFSR: Soft Repair failed at TCAM index 0x00002fe9 of PPCR 1</code>
<b>Explanation</b>	Indicates the IFSR error entry failed to repair in Non-NetRoute mode at the specified TCAM index for the PPCR 1.
<b>Message Level</b>	Informational
<b>Message</b>	<code>SYSLOG: &lt;14&gt;Jul 23 11:02:41 sys-np-mac-224 IFSR: Soft Repair failed on PPCR 1</code>
<b>Explanation</b>	Indicates the IFSR error entry failed to repair in NetRoute mode at the specified PPCR 1.
<b>Message Level</b>	Informational
<b>Message</b>	<code>SYSLOG: &lt;14&gt;Jul 23 11:02:41 sys-np-mac-224 IFSR: Error FIFO Overflow on PPCR 1</code>
<b>Explanation</b>	Indicates that within the KBP FIFO, TCAM indices error entries are high and an FIFO overflow of entries occurred for the PPCR 1. Some error entries may have dropped.
<b>Message Level</b>	Informational

## Syslog messages NSR

<b>Message</b>	<code>NSR: Successfully notified RTM6 that OSPF6 switchover complete</code>
----------------	---

<b>Explanation</b>	OSPFv3 completes the restart process after switching over to the new master MP.
<b>Message Level</b>	Notification

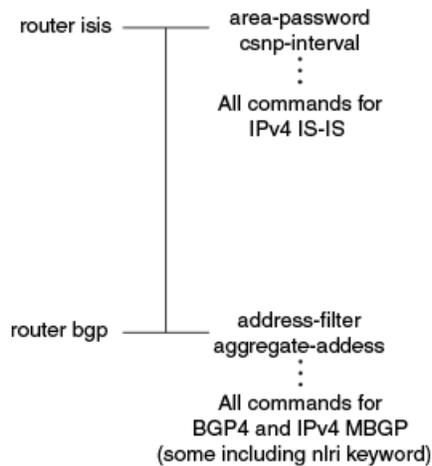


# Global and Address Family Configuration Levels

- Accessing the address family configuration level..... 328
- Backward compatibility for existing BGP4 and IPv4 IS-IS configurations..... 329
- Global BGP4 commands and BGP4 unicast route commands..... 329

This appendix describes the restructured CLI for BGP and IS-IS on devices that support IPv6. In earlier versions of software, the CLI for BGP4 and IPv4 IS-IS is structured as shown in [Figure 15](#).

**FIGURE 15** Earlier structure of BGP4 and IPv4 IS-IS CLI



To configure BGP4 and IPv4 MBGP, enter the **router bgp** command, which takes you to the BGP router configuration level. At this level, you can access commands to configure all aspects of BGP4 and IPv4 MBGP, including commands that configure the protocol, and commands that configure unicast routes and multicast routes. (To configure aspects of multicast routes, specify the nlri keyword with a command.)

To configure IPv4 IS-IS, enter the **router isis** command, which takes you to the IS-IS device configuration level. At this level, you can access commands that allow you to configure all aspects of IPv4 IS-IS, including commands that configure the protocol, and commands that configure unicast routes.

In both cases, the device determines, for example, whether commands entered at the BGP device configuration level apply to BGP4, to BGP4 unicast routes, or to IPv4 MBGP routes.

The introduction of IPv6 required the restructuring of existing BGP4 and IPv4 IS-IS CLI for the following reasons:

- To accommodate the IPv6-related CLI.
- To simplify the configuration of BGP4 unicast and IPv4 MBGP routes.

The CLI includes two layers of CLI for BGP and IS-IS (refer to [Figure 16](#)):

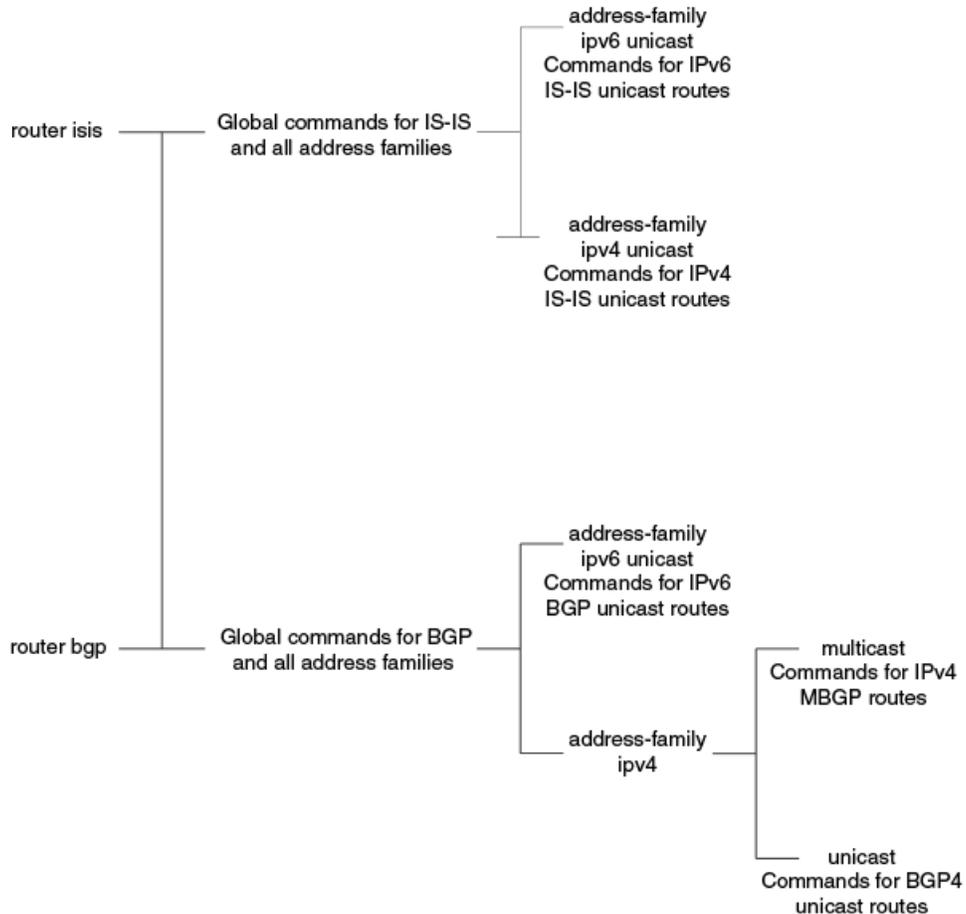
- A global layer to configure BGP and IS-IS protocols.
- Address families that separate the configuration of:

- IPv6 and IPv4
- Routing protocol

Sub-address families separate the configuration of:

- - Unicast routes
- Multicast routes

FIGURE 16 IPv4, BGP4+ and IS-IS CLI structures



## Accessing the address family configuration level

For example, to access the BGP4 multicast address family configuration level, enter the following command while at the global BGP configuration level.

```
device(config-bgp)# address-family ipv4 multicast
device(config-bgp-ipv4m)#
```

**Syntax:** address-family ipv4 unicast | ipv4 multicast | ipv6 unicast

The (config-bgp-ipv4m)# prompt indicates that you are at the IPv4 multicast address family configuration level. At this level, you can access commands that allow you to configure BGP4 multicast routes. The commands that you enter at this level apply to BGP4

multicast routes only. You can generate a configuration for BGP4 multicast routes that is separate and distinct from configurations for BGP4 unicast routes and BGP4+ unicast routes.

#### NOTE

Each address family configuration level gives you access to commands that apply to that address family only. To enable a feature in a particular address family, you must specify any associated commands for that feature in that address family.

To exit the BGP4 multicast address family configuration level, enter this command.

```
device(config-bgp-ipv4m) # exit-address-family
device(config-bgp) #
```

#### Syntax: exit-address-family

When you enter the **exit-address-family** command at an address family configuration level you return to the global IS-IS configuration level, or the BGP4 unicast address family configuration level, (the default BGP4 level). For backward compatibility, you can currently access commands related to BGP4 unicast routes at both global BGP4 configuration and BGP4 unicast address family configuration levels. Both levels are indicated by the (config-bgp)# prompt.

## Backward compatibility for existing BGP4 and IPv4 IS-IS configurations

When a device is upgraded to the current software version, the software automatically converts the existing BGP4 unicast and all IPv4 IS-IS configurations into the new address families. The software also automatically converts some of the IPv4 MBGP configuration into the new address family. Software conversion actions include:

- Leaves the global BGP4 and IPv4 IS-IS configurations as is.
- Converts the configuration for BGP4 unicast neighbors and routes into the BGP4 unicast address family.
- Converts the configuration for IPv4 IS-IS unicast routes into the IPv4 IS-IS unicast address family.
- Converts the configuration for IPv4 MBGP neighbors into IPv4 MBGP address family.

#### NOTE

The software does not convert all aspects of the IPv4 MBGP configuration. You must reconfigure the network routes, aggregate routes, redistribution of routes into IPv4 MBGP, and route map filters. Use the **show run** and **show ip bgp config** commands to check your IPv4 MBGP configuration.

Previously, IPv4 MBGP routes were configured using commands that included the *n/ri* keyword. The current software version does not support the *n/ri* keyword with IPv4 and IPv6 MBGP commands. You must now use the address families to configure all versions of BGP, IS-IS, and MBGP.

## Global BGP4 commands and BGP4 unicast route commands

A global BGP command configures the BGP routing protocol and applies to all IPv4 and IPv6 address families. You can access the global commands while at the global BGP configuration level.

A BGP4 unicast route command configures a BGP4 unicast route. For backward compatibility, you can access BGP4 unicast route commands at both global BGP4 configuration and BGP4 unicast address family configuration levels. To help you distinguish the global BGP4 commands from the BGP4 unicast route commands at the global BGP4 configuration level, this section lists global BGP commands:

- **address-filter**
- **always-compare-med**
- **as-path-filter**

- `as-path-ignore`
- `bgp-redistribute-internal`
- `cluster-id`
- `community-filter`
- `compare-routerid`
- `confederation identifier`
- `confederation peers`
- `default-local-preference`
- `distance`
- `enforce-first-as`
- `fast-external-falover`
- `ignore-invalid-confed-as-path`
- `local-as`
- `med-missing-as-worst`
- `timers`

The following global BGP commands are used to configure peer groups and neighbors:

- `neighbor ipv4-address | ipv6-address | peer-group-name description`
- `neighbor ipv4-address | ipv6-address | peer-group-name distribute-list acl_name in`
- `neighbor ipv4-address | ipv6-address | peer-group-name distribute-list acl_name out`
- `neighbor ipv4-address | ipv6-address | peer-group-name distribute-list in`
- `neighbor ipv4-address | ipv6-address | peer-group-name distribute-list out`
- `neighbor ipv4-address | ipv6-address | peer-group-name ebgp-multihop`
- `neighbor ipv4-address | ipv6-address | peer-group-name filter-list in`
- `neighbor ipv4-address | ipv6-address | peer-group-name filter-list out`
- `neighbor ipv4-address | ipv6-address | peer-group-name next-hop-self`
- `neighbor ipv4-address | ipv6-address | peer-group-name password`
- `neighbor ipv4-address | ipv6-address | peer-group-name peer-group`
- `neighbor ipv4-address | ipv6-address | peer-group-name remote-as`
- `neighbor ipv4-address | ipv6-address | peer-group-name remove-private-as`
- `neighbor ipv4-address | ipv6-address | peer-group-name shut_down`
- `neighbor ipv4-address | ipv6-address | peer-group-name soft-reconfiguration inbound`
- `neighbor ipv4-address | ipv6-address | peer-group-name timers`
- `neighbor ipv4-address | ipv6-address | peer-group-name update-source`

The following address family commands modify the behavior of BGP for a specific address family:

- `aggregate-address`
- `client-to-client-reflection`
- `dampening`
- `default-information-originate`
- `default-metric`

- **maximum-paths**
- **multipath**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* filter-list in** (applies to the IPv4 unicast address family only)
- **network**
- **next-hop-enable-default**
- **next-hop-recursion** (applies to the IPv4 unicast address family only)
- **readvertise** (applies to the IPv4 unicast address family only)
- **redistribute**
- **table-map**
- **update-time**

The following commands configure policies for neighbors or peer groups for a specific address family:

- **neighbor *ipv4-address / ipv6-address / peer-group-name* activate**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* capability orf prefixlist**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* default-originate**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* filter-list as-path-access-list in**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* filter-list as-path-access-lis out**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* maximum-prefix**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* prefix-list prefix\_list\_name in**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* prefix-list prefix\_list\_name out**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* route-map in**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* route-map out**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* route-reflector-client**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* send-community**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* unsuppress-map**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* weight**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* route-map**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* allowas-in**
- **neighbor *ipv4-address / ipv6-address / peer-group-name* send-label**

Currently, you can create a neighbor with an IPv4 or IPv6 address at the global BGP configuration or IPv4 unicast address family configuration level. For example, if you create a neighbor with an IPv4 address at this level, by default, the neighbor is enabled to exchange IPv4 unicast prefixes. However, this neighbor cannot exchange IPv4 multicast prefixes until you explicitly enable it to do so by entering the **neighbor *ipv4-address / peer-group-name* activate** command at the IPv4 multicast address family configuration level. Likewise, if you create a neighbor with an IPv6 address at this level, the neighbor will not exchange IPv6 unicast prefixes until you explicitly enable it to do so by entering the **neighbor *ipv6-address / peer-group-name* activate** command at the IPv6 unicast address family configuration level.

If you create a neighbor at the IPv4 multicast address family configuration or IPv6 unicast address family configuration levels, by default, the neighbor is enabled to exchange IPv4 multicast prefixes or IPv6 unicast prefixes, respectively. You do not need to explicitly enable the neighbor at either level.



# Commands That Require a Reload

Most CLI commands take effect as soon as you enter them. However, a small number of commands require a software reload to take effect. [Table 51](#) lists these commands.

To place a configuration change made by one of these commands into effect, you must save the change to the startup-config file, then reload the software. If you reload the software without saving the change to the startup-config file, the device does not make the change.

To reload the software, you must perform a warm start. To perform a warm start, do one of the following:

- Enter the **reload** command at the Privileged EXEC level of the CLI.
- Enter the **boot system** command at the Privileged EXEC level of the CLI.

**TABLE 51** Commands that require a software reload

Command	See ...
<b>cam-mode ip</b>	Foundry Direct Routing and CAM Partition Profiles for the NetIron XMR and the Brocade NetIron MLX Series chapter
<b>cam-mode ipvpn</b>	Foundry Direct Routing and CAM Partition Profiles for the NetIron XMR and the Brocade NetIron MLX Series chapter
<b>default-max-frame-size</b>	Foundry Direct Routing and CAM Partition Profiles for the NetIron XMR and the Brocade NetIron MLX Series chapter
<b>multicast-flooding</b>	Brocade NetIron Switching Configuration Guide
<b>system-max</b>	Foundry Direct Routing and CAM Partition Profiles for the NetIron XMR and the Brocade NetIron MLX Series chapter
<b>virtual-interface-mac</b>	Brocade NetIron Switching Configuration Guide
<b>vll-mtu-enforcement</b>	Brocade NetIron MPLS Configuration Guide



# NIAP-CCEVS

- NIAP-CCEVS certified Brocade equipment and Ironware releases..... 335
- Web management access to NIAP-CCEVS certified Brocade equipment..... 336
- Warning: local user password changes..... 336

Some devices have passed the Common Criteria (CC) certification testing. This testing is sponsored by the National Information Assurance Partnership (NIAP) - Common Criteria Evaluation and Validation Scheme (CCEVS). For more information regarding the NIAP-CCEVS certification process refer to the following link: <http://www.nap-ccevs.org/>

In an effort to maintain a proper level of security as it relates to access to network infrastructure resources, Brocade recommends that all Brocade hardware be installed within a secure location that is accessible by approved personnel only.

## NIAP-CCEVS certified Brocade equipment and Ironware releases

The following devices have been NIAP-CCEVS certified. The following IronWare software release must be used to remain compliant with this certification:

**TABLE 52** NIAP-CCEVS certified equipment and IronWare software releases

Brocade product	Brocade IronWare software version	Discussed in
Brocade XMR Family	3.8.00a	<i>Brocade NetIron Administration Guide</i>
Brocade MLX Family	3.8.00a	<i>Brocade NetIron Administration Guide</i>
BigIron RX Family	2.5.00b	<i>BigIron RX Series Configuration Guide</i>
FastIron SuperX/SX Family	4.1.00	<i>FastIron and TurboIron Configuration Guide</i>
FastIron Edge X Family	4.1.00	<i>FastIron and TurboIron Configuration Guide</i>
FastIron GS/LS Family	4.2.00a	<i>FastIron and TurboIron Configuration Guide</i>
FastIron Edge Switch Family	4.0.00a	<i>FastIron Security Guide</i>
ServerIron JetCore Family	11.0.00a	<i>ServerIron TrafficWorks Graphical User Interface</i> <i>ServerIron TrafficWorks Server Load Balancing Guide</i> <i>ServerIron TrafficWorks Advanced Server Load Balancing Guide</i> <i>ServerIron TrafficWorks Global Server Load Balancing Guide</i> <i>ServerIron TrafficWorks Security Guide</i> <i>ServerIron TrafficWorks Administration Guide</i> <i>ServerIron TrafficWorks Switching and Routing Guide</i> <i>ServerIron Firewall Load Balancing Guide</i>
ServerIron ADX Family	12.0.00	<i>ServerIron ADX TrafficWorks Graphical User Interface</i> <i>ServerIron ADX TrafficWorks Server Load Balancing Guide</i> <i>ServerIron ADX TrafficWorks Advanced Server Load Balancing Guide</i> <i>ServerIron ADX TrafficWorks Global Server Load Balancing Guide</i> <i>ServerIron ADX TrafficWorks Security Guide</i> <i>ServerIron ADX TrafficWorks Administration Guide</i> <i>ServerIron ADX TrafficWorks Switching and Routing Guide</i> <i>ServerIron ADX Firewall Load Balancing Guide</i>

## Web management access to NIAP-CCEVS certified Brocade equipment

All devices that are to remain in compliance with the NIAP-CCEVS certification must disable all remote access through the integrated Web management graphical user interface (GUI). In accordance with NIAP-CCEVS this functionality is considered a security risk and must be disabled.

Please refer to the Brocade Configuration Guides associated with each product in [NIAP-CCEVS certified Brocade equipment and Ironware releases](#) on page 335 for detailed instructions on how to disable the Web Management Interface feature.

## Warning: local user password changes

Please note that if existing usernames and passwords have been configured on a device with specific privilege levels (super-user, read-only, port-config) and if you attempt to change a user's password by executing the following command.

```
device(config)# user fdryreadonly password <value>
```

The privilege level of this particular user will be changed from its current value to "super-user". The "super-user" level username and password combination provides full access to the Brocade command line interface (CLI). To prevent this from occurring, use the following command.

```
device(config)# user fdryreadonly privilege <value> password <value>
```

# Acknowledgements

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- Cryptographic software..... 337
- OpenSSL license..... 337
- Cryptographic software..... 338

This appendix presents the acknowledgements for portions of code from various vendors that are included in the Brocade devices covered in this manual.

## Cryptographic software

### MPL 1.1

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# NP memory errors

The Sysmon NP memory error monitoring event monitors memory errors on interface modules. The following table lists the interface cards that support NP memory error monitoring and details the NP memory errors that are supported on each interface card.

The following interface cards support NP memory error monitoring:

- BR-MLX-10GX4-IPSEC
- BR-MLX-10GX20
- BR-MLX-10GX20-X2
- BR-MLX-10GX24
- BR-MLX-100GX2-CFP2
- BR-MLX-100GX2-CFP2-X2
- BR-MLX-100GX2-X(100G)
- BR-MLX-40GX4-X
- Gen-1
  - NI-MLX-10GX4
  - NI-XMR-10GX4
- Gen-1.1
  - BR-MLX-10GX4-X
  - BR-MLX-1GCX24-X
  - BR-MLX-1GFX24-X
- Gen-2
  - BR-MLX-10GX8-X
  - NI-MLX-10GX8-D
  - NI-MLX-10GX8-M

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards

Error	Description
<b>External memory errors</b>	
1	CAM1 Packet Error 0
2	CAM1 Packet Error 1
3	CAM3 Packet Error 0
4	CAM3 Packet Error 1
5	PRAM Word 0 Parity Error
6	PRAM Word 1 Parity Error
7	PRAM Word 2 Parity Error
8	PRAM Word 3 Parity Error
9	PRAM Word 4 Parity Error
10	PRAM Word 5 Parity Error
11	PRAM Word 6 Parity Error
12	PRAM Word 7 Parity Error

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
13	CAM2PRAM Word 0 Single Bit Parity Error
14	CAM2PRAM Word 1 Single Bit Parity Error
15	CAM2PRAM Word 2 Single Bit Parity Error
16	CAM2PRAM Word 3 Single Bit Parity Error
17	CAM2PRAM Word 0 Double Bit Parity Error
18	CAM2PRAM Word 1 Double Bit Parity Error
19	CAM2PRAM Word 2 Double Bit Parity Error
20	CAM2PRAM Word 3 Double Bit Parity Error
21	LBLRAM Word 0 Parity Error
22	LBLRAM Word 1 Parity Error
23	CAM1 Word 0 Parity Error
24	CAM1 Word 1 Parity Error
25	CAM1 GIO Parity Error
26	CAM1 PEO Parity Error
27	CAM1 Operation Error
28	CAM1 Result Bus Parity Error
29	CAM2 Word 0 Parity Error
30	CAM2 Word 1 Parity Error
31	CAM2 GIO Parity Error
32	CAM2 PEO Parity Error
33	CAM2 Operation Error
34	CAM2 Result Bus Parity Error
35	CAM3 Word 0 Parity Error
36	CAM3 Word 1 Parity Error
37	CAM3 GIO Parity Error
38	CAM3 PEO Parity Error
39	CAM3 Operation Error
40	CAM3 Result Bus Parity Error
<b>Internal memory errors</b>	
1	Interlaken CRC32 Error on lane 0
2	Interlaken CRC32 Error on lane 1
3	Interlaken CRC32 Error on lane 2
4	Interlaken CRC32 Error on lane 3
5	Interlaken CRC32 Error on lane 4
6	Interlaken CRC32 Error on lane 5
7	Interlaken CRC32 Error on lane 6
8	Interlaken CRC32 Error on lane 7
9	Interlaken CRC32 Error on lane 8
10	Interlaken CRC32 Error on lane 9
11	Interlaken CRC32 Error on lane 10

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
12	Interlaken CRC32 Error on lane 11
13	Interlaken CRC32 Error on lane 12
14	Interlaken CRC32 Error on lane 13
15	Interlaken CRC32 Error on lane 14
16	Interlaken CRC32 Error on lane 15
17	Interlaken CRC32 Error on lane 16
18	Interlaken CRC32 Error on lane 17
19	Interlaken CRC32 Error on lane 18
20	Interlaken CRC32 Error on lane 19
21	Interlaken CRC32 Error on lane 20
22	Interlaken CRC32 Error on lane 21
23	Interlaken CRC32 Error on lane 22
24	Interlaken CRC32 Error on lane 23
25	Interlaken CRC24 Error
26	Interlaken RG Overflow
27	Interlaken Core RDC Overflow
28	Interlaken Core Control FIFO Overflow
29	Interlaken Core Tx Underflow
30	Interlaken Core Tx Overflow
31	Interlaken Sync FIFO Rx Overflow
32	Interlaken Flow Control DIP Error
33	Tx Deframer MVLAN Flag FIFO Parity Error
34	Tx Deframer MVLAN control Packet FIFO Parity Error
35	Tx Deframer MVLAN replacement table Parity Error
36	Tx Deframer MVLAN start offset FIFO Parity Error
37	Tx Deframer MVLAN sop FIFO Parity Error
38	Tx Deframer MVLAN payload Data FIFO Parity Error
39	Tx Packet Edit Data FIFO Parity Error
40	Tx Packet Edit Next Hop Table Parity Error
41	ACL Data FIFO Parity Error
42	ACL Control FIFO Parity Error
43	ACL QoS Done FIFO Parity Error
44	ACL Port Number FIFO Parity Error
45	ACL Priority Encode Table Parity Error
46	ACL Tx VLAN Table Parity Error
47	Tx Priority Encode Table Lookup Result Parity Error
48	MAC2 Frame LSTD Parity Error
49	MAC2 Frame Data Parity Error
50	MAC2 Frame Control Parity Error
51	MAC1 Frame LSTD Parity Error

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
52	MAC1 Frame Data Parity Error
53	MAC1 Frame Control Parity Error
54	MAC0 Frame LSTD Parity Error
55	MAC0 Frame Data Parity Error
56	MAC0 Frame Control Parity Error
57	Tx Packet Edit Data FIFO Parity Error
58	Tx Packet Edit Control FIFO Parity Error
59	Tx Packet Edit Nhlk FIFO Parity Error
60	Tx Packet Edit Pipe LBLLe FIFO Parity Error
61	Start Offset Table CPU Read Parity Error
62	Replacement Table CPU Read Parity Error
63	Next Hop Table CPU Read Parity Error
64	Tx VLAN Table CPU Read Parity Error
65	Priority Encode Table CPU Read Parity Error
66	MAC9 Frame LSTD Parity Error
67	MAC9 Frame Data Parity Error
68	MAC9 Frame Control Parity Error
69	MAC8 Frame LSTD Parity Error
70	MAC8 Frame Data Parity Error
71	MAC8 Frame Control Parity Error
72	MAC7 Frame LSTD Parity Error
73	MAC7 Frame Data Parity Error
74	MAC7 Frame Control Parity Error
75	MAC6 Frame LSTD Parity Error
76	MAC6 Frame Data Parity Error
77	MAC6 Frame Control Parity Error
78	MAC5 Frame LSTD Parity Error
79	MAC5 Frame Data Parity Error
80	MAC5 Frame Control Parity Error
81	MAC4 Frame LSTD Parity Error
82	MAC4 Frame Data Parity Error
83	MAC4 Frame Control Parity Error
84	MAC3 Frame LSTD Parity Error
85	MAC3 Frame Data Parity Error
86	MAC3 Frame Control Parity Error
87	Rx MAC0 Data FIFO Read Parity Error
88	Rx MAC0 Flag FIFO Read Parity Error
89	Rx MAC1 Data FIFO Read Parity Error
90	Rx MAC1 Flag FIFO Read Parity Error
91	CAM Result Scheduler FIFO Overflow

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
92	Rx Port Pipeline HQoS Data Parity Error
93	Rx Port Pipeline Rx Data-in Parity Error
94	Rx Port Pipeline Rxctrl FIFO Read Data Parity Error
95	Rx Port Pipeline Read Rx QoS Id FIFO Parity Error
96	Rx Port Pipeline Rx portnum FIFO Parity Error
97	Rx Port Pipeline Rx QoS Done FIFO Parity Error
98	Rx Port Pipeline Rx Flag FIFO Parity Error
99	Rx Port Pipeline Rx Header FIFO Parity Error
100	Rx Port Pipeline PRAM Packet Id Mismatch
101	Rx Port Pipeline Data Path Packet Id Mismatch
102	EXM IP Address FIFO Overflow
103	CAM Result FIFO Parity Error
104	CAM Result FIFO Underflow
105	ECMP FIFO Underflow
106	LBL FIFO Underflow
107	Invalid CAM Result
108	CAM2PRAM CAM Intf Data FIFO Overflow
109	CAM2PRAM CAM Intf Count FIFO Overflow
110	LBLRAM SRVT0 Lookup FIFO Overflow
111	LBLRAM SRVT1 Lookup FIFO Overflow
112	Rx Service PRAM Result FIFO Parity Error
113	Rx Packet Header FIFO MISC RAM Parity Error
114	Rx Packet Header FIFO RAM3 Parity Error
115	Rx Packet Header FIFO RAM2 Parity Error
116	Rx Packet Header FIFO RAM1 Parity Error
117	CAM1 Lookup FIFO Valid Word FIFO Overflow
118	LBL Lookup FIFO Overflow
119	Packet Decode FIFO Parity Error
120	ECMP FIFO Overflow
121	LBL2 ECMP FIFO Overflow
122	Rx port Pipeline Rx QoS Id FIFO Overflow
123	Rx port Pipeline Rx Flag FIFO Overflow
124	Rx port Pipeline Rx Header FIFO Overflow
125	Rx CAM Result FIFO Parity Error
126	Rx CAM Result FIFO Underflow
127	Rx CAM Result FIFO Overflow
128	Rx Packet Decode FIFO Overflow
129	Rx Packet Decode FIFO Underflow
130	Rx topotos FIFO Parity Error
131	Rx topotos FIFO Underflow

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
132	Rx topotos FIFO Overflow
133	CAM1 Lookup Misc FIFO Overflow
134	CAM1 Lookup Data FIFO Overflow
135	CAM SCI FIFO Parity Error
136	CAM1 Response Packet FIFO1 Underflow
137	CAM1 Response Packet FIFO1 Overflow
138	CAM1 Response Packet FIFO2 Underflow
139	CAM1 Response Packet FIFO2 Overflow
140	CAM1 Response Packet FIFO3 Underflow
141	CAM1 Response Packet FIFO3 Overflow
142	CAM1 Response Packet FIFO4 Underflow
143	CAM1 Response Packet FIFO4 Overflow
144	CAM SCI FIFO Underflow
145	CAM SCI FIFO Overflow
146	CAM1 Lookup Misc FIFO Underflow
147	CAM1 Lookup Data FIFO Underflow
148	CAM1 Lookup Misc FIFO Parity Error
149	CAM1 Lookup Data FIFO Parity Error
150	CAM ILA Core FIFO Underflow
151	CAM ILA Core FIFO Overflow
152	EXM CPU2HashBucket rData Parity Error
153	EXM HW Search Hash Bucket rData Parity Error
154	EXM Hash Index Table Parity Error
155	EXM IP Address FIFO Underflow
156	EXM IP Address FIFO Parity Error
157	EXM VPN Id FIFO Underflow
158	EXM VPN Id FIFO Parity Error
159	CAM1 Lookup Misc FIFO Underflow
160	CAM1 Lookup Data FIFO Underflow
161	CAM2PRAM QDR Interface FIFO3 Parity Error
162	CAM2PRAM QDR Interface FIFO2 Parity Error
163	CAM2PRAM QDR Interface FIFO1 Parity Error
164	CAM2PRAM QDR Interface FIFO0 Parity Error
165	CAM2PRAM QDR Interface FIFO3 Underflow
166	CAM2PRAM QDR Interface FIFO2 Underflow
167	CAM2PRAM QDR Interface FIFO1 Underflow
168	CAM2PRAM QDR Interface FIFO0 Underflow
169	CAM2PRAM QDR Interface FIFO3 Overflow
170	CAM2PRAM QDR Interface FIFO2 Overflow
171	CAM2PRAM QDR Interface FIFO1 Overflow

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
172	CAM2PRAM QDR Interface FIFO0 Overflow
173	CAM2PRAM QDR Interface Read Request FIFO3 Parity Error
174	CAM2PRAM QDR Interface Read Request FIFO2 Parity Error
175	CAM2PRAM QDR Interface Read Request FIFO1 Parity Error
176	CAM2PRAM QDR Interface Read Request FIFO0 Parity Error
177	CAM2PRAM QDR Interface Read Request FIFO3 Underflow
178	CAM2PRAM QDR Interface Read Request FIFO2 Underflow
179	CAM2PRAM QDR Interface Read Request FIFO1 Underflow
180	CAM2PRAM QDR Interface Read Request FIFO0 Underflow
181	CAM2PRAM QDR Interface Read Request FIFO3 Overflow
182	CAM2PRAM QDR Interface Read Request FIFO2 Overflow
183	CAM2PRAM QDR Interface Read Request FIFO1 Overflow
184	CAM2PRAM QDR Interface Read Request FIFO0 Overflow
185	CAM2PRAM cpu FIFO Parity Error
186	CAM2PRAM CAM Interface Data FIFO Underflow
187	CAM2PRAM CAM Interface Count FIFO Underflow
188	CAM2PRAM Result FIFO0 Parity Error
189	CAM2PRAM Result FIFO1 Parity Error
190	CAM2PRAM Result FIFO2 Parity Error
191	CAM2PRAM Result FIFO3 Parity Error
192	CAM2PRAM Result FIFO4 Parity Error
193	CAM2PRAM Result FIFO5 Parity Error
194	CAM2PRAM Result FIFO0 Underflow
195	CAM2PRAM Result FIFO1 Underflow
196	CAM2PRAM Result FIFO2 Underflow
197	CAM2PRAM Result FIFO3 Underflow
198	CAM2PRAM Result FIFO4 Underflow
199	CAM2PRAM Result FIFO5 Underflow
200	CAM2PRAM Result FIFO0 Overflow
201	CAM2PRAM Result FIFO1 Overflow
202	CAM2PRAM Result FIFO2 Overflow
203	CAM2PRAM Result FIFO3 Overflow
204	CAM2PRAM Result FIFO4 Overflow
205	CAM2PRAM Result FIFO5 Overflow
206	CAM2PRAM Result Scheduler Underflow
207	CAM2PRAM Result Scheduler Overflow
208	PRAM CAM Interface Data FIFO0 Underflow
209	PRAM CAM Interface Data FIFO0 Overflow
210	PRAM CAM Interface Data FIFO1 Underflow
211	PRAM CAM Interface Data FIFO1 Overflow

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
212	PRAM CAM Interface Data FIFO2 Underflow
213	PRAM CAM Interface Data FIFO2 Overflow
214	PRAM CAM Interface Data FIFO3 Underflow
215	PRAM CAM Interface Data FIFO3 Overflow
216	PRAM Channel0 Data0 Multi bit Parity Error
217	PRAM Channel0 Data1 Multi bit Parity Error
218	PRAM Channel0 Data2 Multi bit Parity Error
219	PRAM Channel0 Data3 Multi bit Parity Error
220	PRAM Channel0 Data0 Single bit Parity Error
221	PRAM Channel0 Data1 Single bit Parity Error
222	PRAM Channel0 Data2 Single bit Parity Error
223	PRAM Channel0 Data3 Single bit Parity Error
224	PRAM Channel1 Data0 Multi bit Parity Error
225	PRAM Channel1 Data1 Multi bit Parity Error
226	PRAM Channel1 Data2 Multi bit Parity Error
227	PRAM Channel1 Data3 Multi bit Parity Error
228	PRAM Channel1 Data0 Single bit Parity Error
229	PRAM Channel1 Data1 Single bit Parity Error
230	PRAM Channel1 Data2 Single bit Parity Error
231	PRAM Channel1 Data3 Single bit Parity Error
232	PRAM Channel2 Data0 Multi bit Parity Error
233	PRAM Channel2 Data1 Multi bit Parity Error
234	PRAM Channel2 Data2 Multi bit Parity Error
235	PRAM Channel2 Data3 Multi bit Parity Error
236	PRAM Channel2 Data0 Single bit Parity Error
237	PRAM Channel2 Data1 Single bit Parity Error
238	PRAM Channel2 Data2 Single bit Parity Error
239	PRAM Channel2 Data3 Single bit Parity Error
240	PRAM Channel3 Data0 Multi bit Parity Error
241	PRAM Channel3 Data1 Multi bit Parity Error
242	PRAM Channel3 Data2 Multi bit Parity Error
243	PRAM Channel3 Data3 Multi bit Parity Error
244	PRAM Channel3 Data0 Single bit Parity Error
245	PRAM Channel3 Data1 Single bit Parity Error
246	PRAM Channel3 Data2 Single bit Parity Error
247	PRAM Channel3 Data3 Single bit Parity Error
248	CAM2Age L2 FIFO0 Underflow
249	CAM2Age L2 FIFO1 Underflow
250	CAM2Age ACL FIFO0 Underflow
251	CAM2Age ACL FIFO1 Underflow

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
252	CAM2Age L3 Underflow
253	L2 Aged FIFO Underflow
254	L2 Aged FIFO Overflow
255	L2 Aged FIFO Parity Error
256	L2 Aged mem Parity Error
257	L3 Aged FIFO Underflow
258	L3 Aged FIFO Overflow
259	L3 Aged FIFO Parity Error
260	L3 Aged Mem Parity Error
261	ACL Aged FIFO Underflow
262	ACL Aged FIFO Overflow
263	ACL Aged FIFO Parity Error
264	ACL Aged mem Parity Error
265	Rx QoS Id FIFO Underflow
266	Rx QoS Id FIFO Overflow
267	Rx Flag FIFO Underflow
268	Rx QoS Done FIFO Underflow
269	Rx QoS Done FIFO Overflow
270	Rx FID FIFO Underflow
271	CAM Lookup Misc FIFO Underflow
272	CAM Lookup Data FIFO Underflow
273	PRAM QDR Interface Read Request FIFO0 Parity Error
274	PRAM QDR Interface Read Request FIFO1 Parity Error
275	PRAM QDR Interface Read Request FIFO2 Parity Error
276	PRAM QDR Interface Read Request FIFO3 Parity Error
277	PRAM QDR Interface Read Request FIFO0 Underflow
278	PRAM QDR Interface Read Request FIFO1 Underflow
279	PRAM QDR Interface Read Request FIFO2 Underflow
280	PRAM QDR Interface Read Request FIFO3 Underflow
281	PRAM QDR Interface Read Request FIFO0 Overflow
282	PRAM QDR Interface Read Request FIFO1 Overflow
283	PRAM QDR Interface Read Request FIFO2 Overflow
284	PRAM QDR Interface Read Request FIFO3 Overflow
285	PRAM QDR Interface CPU Read FIFO Parity Error
286	PRAM Result FIFO0 Parity Error
287	PRAM Result FIFO1 Parity Error
288	PRAM Result FIFO2 Parity Error
289	PRAM Result FIFO3 Parity Error
290	PRAM Result FIFO4 Parity Error
291	PRAM Result FIFO5 Parity Error

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
292	PRAM Result FIFO0 Overflow
293	PRAM Result FIFO1 Overflow
294	PRAM Result FIFO2 Overflow
295	PRAM Result FIFO3 Overflow
296	PRAM Result FIFO4 Overflow
297	PRAM Result FIFO5 Overflow
298	CAM2Age L3 Overflow
299	CAM2Age L2 FIFO0 Overflow
300	CAM2Age L2 FIFO1 Overflow
301	CAM2Age ACL FIFO0 Overflow
302	CAM2Age ACL FIFO1 Overflow
303	CAM2PRAM Data FIFO Overflow
304	CAM2PRAM Count FIFO Overflow
305	CAM3 SCI FIFO Parity Error
306	CAM3 Response Packet FIFO1 Underflow
307	CAM3 Response Packet FIFO1 Overflow
308	CAM3 Response Packet FIFO2 Underflow
309	CAM3 Response Packet FIFO2 Overflow
310	CAM3 Response Packet FIFO3 Underflow
311	EXM VPN ID FIFO Overflow
312	CAM3 Response Packet FIFO3 Overflow
313	CAM3 Response Packet FIFO4 Underflow
314	CAM3 Response Packet FIFO4 Overflow
315	CAM3 SCI FIFO Underflow
316	CAM3 SCI FIFO Overflow
317	CAM3 Lookup Misc FIFO Underflow
318	CAM3 Lookup Data FIFO Underflow
319	CAM3 Lookup Misc FIFO Parity Error
320	CAM3 Lookup Data FIFO Parity Error
321	CAM3 ILA Core FIFO Underflow
322	CAM3 ILA Core FIFO Overflow
323	CAM3 ILA Core FIFO Parity Error
324	PCIe Cmd Read Data Parity Error
325	PCIe Rx DRAM FIFO Underflow
326	PCIe Rx Frame FIFO Underflow
327	CAM3 Lookup Misc FIFO Overflow
328	CAM3 Lookup Data FIFO Overflow
329	Service CAM Lookup Control FIFO Overflow
330	Service CAM Lookup Control FIFO Underflow
331	Service CAM Lookup FIFO Overflow

**TABLE 53** NP memory errors supported on BR-MLX-100GX2-CFP2, BR-MLX-10GX20, and BR-MLX-10GX4-IPSEC interface cards (continued)

Error	Description
332	Service CAM Lookup FIFO Underflow
333	eACL CAM Lookup FIFO0 Underflow
334	eACL CAM Lookup Control FIFO0 Underflow
335	eACL CAM Lookup FIFO1 Underflow
336	eACL CAM Lookup Control FIFO1 Underflow
337	CAM3 Result FIFO Underflow
338	CAM3 Result Data FIFO Underflow
339	CAM3 Result FIFO Parity Error
340	CAM3 Result Data FIFO Parity Error
341	CAM Result FIFO Overflow
342	CAM Result FIFO Underflow

**TABLE 54** NP memory errors supported on BR-MLX-40Gx4-X interface cards

Error	Description
<b>External memory errors</b>	
1	PRAM Word 0 Parity Error
2	PRAM Word 1 Parity Error
3	PRAM Word 2 Parity Error
4	PRAM Word 3 Parity Error
5	PRAM Word 4 Parity Error
6	PRAM Word 5 Parity Error
7	PRAM Word 6 Parity Error
8	PRAM Word 7 Parity Error
9	CAM2PRAM Word 0 Single Bit Parity Error
10	CAM2PRAM Word 1 Single Bit Parity Error
11	CAM2PRAM Word 2 Single Bit Parity Error
12	CAM2PRAM Word 3 Single Bit Parity Error
13	CAM2PRAM Word 0 Double Bit Parity Error
14	CAM2PRAM Word 1 Double Bit Parity Error
15	CAM2PRAM Word 2 Double Bit Parity Error
16	CAM2PRAM Word 3 Double Bit Parity Error
17	LBLRAM Word 0 Parity Error
18	LBLRAM Word 1 Parity Error
19	CAM1 Word 0 Parity Error
20	CAM1 Word 1 Parity Error
21	CAM1 GIO Parity Error
22	CAM1 PEO Parity Error
23	CAM1 Operation Error
24	CAM1 Result Bus Parity Error
25	CAM2 Word 0 Parity Error

**TABLE 54** NP memory errors supported on BR-MLX-40Gx4-X interface cards (continued)

Error	Description
26	CAM2 Word 1 Parity Error
27	CAM2 GIO Parity Error
28	CAM2 PEO Parity Error
29	CAM2 Operation Error
30	CAM2 Result Bus Parity Error
31	CAM3 Word 0 Parity Error
32	CAM3 Word 1 Parity Error
33	CAM3 GIO Parity Error
34	CAM3 PEO Parity Error
35	CAM3 Operation Error
36	CAM3 Result Bus Parity Error
<b>Internal memory errors</b>	
1	Tx Deframer MVLAN Flag FIFO Parity Error
2	Tx Deframer MVLAN control Packet FIFO Parity Error
3	Tx Deframer MVLAN replication table Parity Error
4	Tx Deframer MVLAN start offset FIFO Parity Error
5	Tx Deframer MVLAN sop FIFO Parity Error
6	Tx Deframer MVLAN payload Data FIFO Parity Error
7	Tx Packet Edit Data FIFO Parity Error
8	Tx Packet Edit Next Hop Table Parity Error
9	ACL PRAM Results FIFO Parity Error
10	ACL Data FIFO Parity Error
11	ACL Control FIFO Parity Error
12	ACL QoS Done FIFO Parity Error
13	ACL Port Number FIFO Parity Error
14	ACL Priority Encode Table Parity Error
15	ACL Tx VLAN Table Parity Error
16	Tx Priority Encode Table Lookup Result Parity Error
17	MAC0 Frame LSTD Parity Error
18	MAC0 Frame Data Parity Error
19	MAC0 Frame Control Parity Error
20	MAC1 Frame LSTD Parity Error
21	MAC1 Frame Data Parity Error
22	MAC1 Frame Control Parity Error
23	Tx Packet Edit Data FIFO Parity Error
24	Tx Packet Edit Control FIFO Parity Error
25	Tx Packet Edit nhlk FIFO Parity Error
26	Tx Packet Edit pipe LBLLe FIFO Parity Error
27	Start Offset Table CPU Read Parity Error
28	Replacement Table CPU Read Parity Error
29	Next Hop Table CPU Read Parity Error

**TABLE 54** NP memory errors supported on BR-MLX-40Gx4-X interface cards (continued)

Error	Description
30	Tx VLAN Table CPU Read Parity Error
31	Priority Encode Table CPU Read Parity Error
32	Rx MAC Data FIFO Read Parity Error
33	Rx MAC Flag FIFO Read Parity Error
34	Rx MAC Data FIFO Read Parity Error
35	Rx MAC Flag FIFO Read Parity Error
36	CAM Result Scheduler FIFO Overflow
37	CAM1 Lookup FIFO3 Overflow
38	CAM1 Lookup FIFO2 Overflow
39	CAM1 Lookup FIFO1 Overflow
40	CAM2 Lookup FIFO3 Overflow
41	CAM2 Lookup FIFO2 Overflow
42	CAM2 Lookup FIFO1 Overflow
43	Rx Port Pipeline HQoS Data Parity Error
44	Rx Port Pipeline Rx Data-in Parity Error
45	Rx Port Pipeline Rxctrl FIFO Read Data Parity Error
46	Rx Port Pipeline Read Rx QoS Id FIFO Parity Error
47	Rx Port Pipeline Rx portnum FIFO Parity Error
48	Rx Port Pipeline Rx QoS Done FIFO Parity Error
49	Rx Port Pipeline Rx Flag FIFO Parity Error
50	Rx Port Pipeline Rx Header FIFO Parity Error
51	Rx Port Pipeline PRAM Packet Id Mismatch
52	Rx Port Pipeline Data Path Packet Id Mismatch
53	EXM IP Address FIFO Overflow
54	Rx Service PRAM Result FIFO Parity Error
55	Rx Packet Header FIFO MISC RAM Parity Error
56	Rx Packet Header FIFO RAM3 Parity Error
57	Rx Packet Header FIFO RAM2 Parity Error
58	Rx Packet Header FIFO RAM1 Parity Error
59	Rx Packet Header FIFO Parity Error
60	LBL Lookup FIFO Overflow
61	Packet Decode FIFO Parity Error
62	ECMP FIFO Overflow
63	LBL2 ECMP FIFO Overflow
64	Rx port Pipeline Rx QoS Id FIFO Overflow
65	Rx port Pipeline Rx Flag FIFO Overflow
66	Rx port Pipeline Rx Header FIFO Overflow
67	Rx CAM Result FIFO Parity Error
68	Rx CAM Result FIFO Underflow
69	Rx CAM Result FIFO Overflow
70	Rx Packet Decode FIFO Overflow

**TABLE 54** NP memory errors supported on BR-MLX-40Gx4-X interface cards (continued)

Error	Description
71	Rx Packet Decode FIFO Underflow
72	Rx topotos FIFO Parity Error
73	Rx topotos FIFO Underflow
74	Rx topotos FIFO Overflow
75	CAM1 Lookup FIFO 1 Parity Error
76	CAM1 Lookup FIFO 2 Parity Error
77	CAM1 Lookup FIFO 3 Parity Error
78	CAM1 Asc FIFO Parity Error
79	CAM2 Lookup FIFO 1 Parity Error
80	CAM2 Lookup FIFO 2 Parity Error
81	CAM2 Lookup FIFO 3 Parity Error
82	CAM2 Asc FIFO Parity Error
83	LBLRAM srvt Lookup FIFO Underflow
84	LBLRAM extd Service rd Data Parity Error
85	LBLRAM LBL Lookup FIFO Underflow
86	LBLRAM srvp Lookup FIFO Overflow
87	LBLRAM srvp Lookup FIFO Underflow
88	LBLRAM Read Request FIFO Overflow
89	LBLRAM Read Request FIFO Underflow
90	LBLRAM extd Service Read FIFO Overflow
91	LBLRAM extd Service Read FIFO Underflow
92	Service Table Lookup FIFO rd Data Parity Error
93	CAM Result Scheduler FIFO Underflow
94	CAM1 Result FIFO Overflow
95	CAM1 Result FIFO Underflow
96	CAM2 Result FIFO Overflow
97	CAM2 Result FIFO Underflow
98	Label Result FIFO Overflow
99	Label Result FIFO Underflow
100	LBL hold FIFO Underflow
101	LBL hold FIFO Overflow
102	ECMP FIFO Underflow
103	LBL Result sync FIFO Underflow
104	LBL Result sync FIFO Overflow
105	LBL2ECMP FIFO Underflow
106	EXM CPU2HashBucket rData Parity Error
107	EXM HW Search Hash Bucket rData Parity Error
108	EXM Hash Index Table Parity Error
109	EXM IP Address FIFO Underflow
110	EXM IP Address FIFO Parity Error
111	EXM VPN Id FIFO Underflow

**TABLE 54** NP memory errors supported on BR-MLX-40Gx4-X interface cards (continued)

Error	Description
112	EXM VPN Id FIFO Parity Error
113	CAM2PRAM QDR Interface FIFO3 Parity Error
114	CAM2PRAM QDR Interface FIFO2 Parity Error
115	CAM2PRAM QDR Interface FIFO1 Parity Error
116	CAM2PRAM QDR Interface FIFO0 Parity Error
117	CAM2PRAM QDR Interface FIFO3 Underflow
118	CAM2PRAM QDR Interface FIFO2 Underflow
119	CAM2PRAM QDR Interface FIFO1 Underflow
120	CAM2PRAM QDR Interface FIFO0 Underflow
121	CAM2PRAM QDR Interface FIFO3 Overflow
122	CAM2PRAM QDR Interface FIFO2 Overflow
123	CAM2PRAM QDR Interface FIFO1 Overflow
124	CAM2PRAM QDR Interface FIFO0 Overflow
125	CAM2PRAM QDR Interface Read Request FIFO3 Parity Error
126	CAM2PRAM QDR Interface Read Request FIFO2 Parity Error
127	CAM2PRAM QDR Interface Read Request FIFO1 Parity Error
128	CAM2PRAM QDR Interface Read Request FIFO0 Parity Error
129	CAM2PRAM QDR Interface Read Request FIFO3 Underflow
130	CAM2PRAM QDR Interface Read Request FIFO2 Underflow
131	CAM2PRAM QDR Interface Read Request FIFO1 Underflow
132	CAM2PRAM QDR Interface Read Request FIFO0 Underflow
133	CAM2PRAM QDR Interface Read Request FIFO3 Overflow
134	CAM2PRAM QDR Interface Read Request FIFO2 Overflow
135	CAM2PRAM QDR Interface Read Request FIFO1 Overflow
136	CAM2PRAM QDR Interface Read Request FIFO0 Overflow
137	CAM2PRAM cpu FIFO Parity Error
138	CAM2PRAM CAM Interface Data FIFO Underflow
139	CAM2PRAM CAM Interface Count FIFO Underflow
140	CAM2PRAM Result FIFO0 Parity Error
141	CAM2PRAM Result FIFO1 Parity Error
142	CAM2PRAM Result FIFO2 Parity Error
143	CAM2PRAM Result FIFO3 Parity Error
144	CAM2PRAM Result FIFO4 Parity Error
145	CAM2PRAM Result FIFO5 Parity Error
146	CAM2PRAM Result FIFO0 Underflow
147	CAM2PRAM Result FIFO1 Underflow
148	CAM2PRAM Result FIFO2 Underflow
149	CAM2PRAM Result FIFO3 Underflow
150	CAM2PRAM Result FIFO4 Underflow
151	CAM2PRAM Result FIFO5 Underflow
152	CAM2PRAM Result FIFO0 Overflow

**TABLE 54** NP memory errors supported on BR-MLX-40Gx4-X interface cards (continued)

Error	Description
153	CAM2PRAM Result FIFO1 Overflow
154	CAM2PRAM Result FIFO2 Overflow
155	CAM2PRAM Result FIFO3 Overflow
156	CAM2PRAM Result FIFO4 Overflow
157	CAM2PRAM Result FIFO5 Overflow
158	CAM2PRAM Result Scheduler Underflow
159	CAM2PRAM Result Scheduler Overflow
160	PRAM CAM Interface Data FIFO0 Underflow
161	PRAM CAM Interface Data FIFO0 Overflow
162	PRAM CAM Interface Data FIFO1 Underflow
163	PRAM CAM Interface Data FIFO1 Overflow
164	PRAM CAM Interface Data FIFO2 Underflow
165	PRAM CAM Interface Data FIFO2 Overflow
166	PRAM CAM Interface Data FIFO3 Underflow
167	PRAM CAM Interface Data FIFO3 Overflow
168	PRAM Channel0 Data0 Multi bit Parity Error
169	PRAM Channel0 Data1 Multi bit Parity Error
170	PRAM Channel0 Data2 Multi bit Parity Error
171	PRAM Channel0 Data3 Multi bit Parity Error
172	PRAM Channel0 Data0 Single bit Parity Error
173	PRAM Channel0 Data1 Single bit Parity Error
174	PRAM Channel0 Data2 Single bit Parity Error
175	PRAM Channel0 Data3 Single bit Parity Error
176	PRAM Channel1 Data0 Multi bit Parity Error
177	PRAM Channel1 Data1 Multi bit Parity Error
178	PRAM Channel1 Data2 Multi bit Parity Error
179	PRAM Channel1 Data3 Multi bit Parity Error
180	PRAM Channel1 Data0 Single bit Parity Error
181	PRAM Channel1 Data1 Single bit Parity Error
182	PRAM Channel1 Data2 Single bit Parity Error
183	PRAM Channel1 Data3 Single bit Parity Error
184	PRAM Channel2 Data0 Multi bit Parity Error
185	PRAM Channel2 Data1 Multi bit Parity Error
186	PRAM Channel2 Data2 Multi bit Parity Error
187	PRAM Channel2 Data3 Multi bit Parity Error
188	PRAM Channel2 Data0 Single bit Parity Error
189	PRAM Channel2 Data1 Single bit Parity Error
190	PRAM Channel2 Data2 Single bit Parity Error
191	PRAM Channel2 Data3 Single bit Parity Error
192	PRAM Channel3 Data0 Multi bit Parity Error
193	PRAM Channel3 Data1 Multi bit Parity Error

**TABLE 54** NP memory errors supported on BR-MLX-40Gx4-X interface cards (continued)

Error	Description
194	PRAM Channel3 Data2 Multi bit Parity Error
195	PRAM Channel3 Data3 Multi bit Parity Error
196	PRAM Channel3 Data0 Single bit Parity Error
197	PRAM Channel3 Data1 Single bit Parity Error
198	PRAM Channel3 Data2 Single bit Parity Error
199	PRAM Channel3 Data3 Single bit Parity Error
200	CAM2Age L2 FIFO0 Underflow
201	CAM2Age L2 FIFO1 Underflow
202	CAM2Age ACL FIFO0 Underflow
203	CAM2Age ACL FIFO1 Underflow
204	CAM2Age L3 Underflow
205	L2 Aged FIFO Underflow
206	L2 Aged FIFO Overflow
207	L2 Aged FIFO Parity Error
208	L2 Aged mem Parity Error
209	L3 Aged FIFO Underflow
210	L3 Aged FIFO Overflow
211	L3 Aged FIFO Parity Error
212	L3 Aged Mem Parity Error
213	ACL Aged FIFO Underflow
214	ACL Aged FIFO Overflow
215	ACL Aged FIFO Parity Error
216	ACL Aged mem Parity Error
217	Rx QoS Id FIFO Underflow
218	Rx QoS Id FIFO Overflow
219	Rx Flag FIFO Underflow
220	Rx QoS Done FIFO Underflow
221	Rx QoS Done FIFO Overflow
222	PRAM QDR Interface Read Request FIFO0 Parity Error
223	PRAM QDR Interface Read Request FIFO1 Parity Error
224	PRAM QDR Interface Read Request FIFO2 Parity Error
225	PRAM QDR Interface Read Request FIFO3 Parity Error
226	PRAM QDR Interface Read Request FIFO0 Underflow
227	PRAM QDR Interface Read Request FIFO1 Underflow
228	PRAM QDR Interface Read Request FIFO2 Underflow
229	PRAM QDR Interface Read Request FIFO3 Underflow
230	PRAM QDR Interface Read Request FIFO0 Overflow
231	PRAM QDR Interface Read Request FIFO1 Overflow
232	PRAM QDR Interface Read Request FIFO2 Overflow
233	PRAM QDR Interface Read Request FIFO3 Overflow
234	PRAM QDR Interface CPU Read FIFO Parity Error

**TABLE 54** NP memory errors supported on BR-MLX-40Gx4-X interface cards (continued)

Error	Description
235	PRAM Result FIFO0 Parity Error
236	PRAM Result FIFO1 Parity Error
237	PRAM Result FIFO2 Parity Error
238	PRAM Result FIFO3 Parity Error
239	PRAM Result FIFO4 Parity Error
240	PRAM Result FIFO5 Parity Error
241	PRAM Result FIFO0 Overflow
242	PRAM Result FIFO1 Overflow
243	PRAM Result FIFO2 Overflow
244	PRAM Result FIFO3 Overflow
245	PRAM Result FIFO4 Overflow
246	PRAM Result FIFO5 Overflow
247	CAM2Age L3 Overflow
248	CAM2Age L2 FIFO0 Overflow
249	CAM2Age L2 FIFO1 Overflow
250	CAM2Age ACL FIFO0 Overflow
251	CAM2Age ACL FIFO1 Overflow
252	CAM2PRAM Data FIFO Overflow
253	CAM2PRAM Count FIFO Overflow
254	CAM1 Lookup FIFO1 Underflow
255	CAM1 Lookup FIFO2 Underflow
256	CAM1 Lookup FIFO3 Underflow
257	CAM2 Lookup FIFO1 Underflow
258	CAM2 Lookup FIFO2 Underflow
259	CAM2 Lookup FIFO3 Underflow
260	CAM1 Asc FIFO Underflow
261	CAM1 Asc FIFO Overflow
262	CAM2 Asc FIFO Underflow
263	CAM2 Asc FIFO Overflow
264	EXM VPN Id FIFO Overflow
265	CAM3 Lookup FIFO1 Underflow
266	CAM3 Lookup FIFO2 Underflow
267	CAM3 Lookup FIFO3 Underflow
268	CAM3 Asc FIFO Underflow
269	CAM3 Asc FIFO Overflow
270	CAM3 Lookup FIFO1 Parity Error
271	CAM3 Lookup FIFO2 Parity Error
272	CAM3 Lookup FIFO3 Parity Error
273	CAM3 Asc FIFO Parity Error
274	PCIe Cmd Read Data Parity Error
275	PCIe Rx DRAM FIFO Underflow

**TABLE 54** NP memory errors supported on BR-MLX-40Gx4-X interface cards (continued)

Error	Description
276	PCIe Rx Frame FIFO Underflow
277	CAM3 Lookup FIFO1 Overflow
278	CAM3 Lookup FIFO2 Overflow
279	CAM3 Lookup FIFO3 Overflow
280	Service CAM Block Mux FIFO Overflow
281	Service CAM Block Mux FIFO Underflow
282	eACL CAM Block Mux FIFO1 Overflow
283	eACL CAM Block Mux FIFO1 Underflow
284	eACL CAM Block Mux FIFO2 Overflow
285	eACL CAM Block Mux FIFO2 Underflow
286	Service CAM Result FIFO Overflow
287	Service CAM Result FIFO Underflow
288	eACL CAM Result FIFO Overflow
289	eACL CAM Result FIFO Underflow
290	eACL CAM Block Mux FIFO2 Parity Error
291	eACL CAM Block Mux FIFO1 Parity Error
292	Service CAM Block Mux FIFO Parity Error
293	CAM3 Service Result FIFO Parity Error
294	CAM3 eACL Result FIFO Parity Error

**TABLE 55** NP memory errors supported on BR-MLX-10Gx24 interface cards

Error	Description
<b>External memory errors</b>	
1	ISL TCAM Parity Error
2	ISL PRAM ECC Single Error
3	ISL BKT Memory ECC Single Error
4	ISL Mask Memory ECC Single Error
5	ISL Index Memory ECC Single Error
6	ISL PRAM ECC Double Error
7	ISL BKT Memory ECC Double Error
8	ISL Mask Memory ECC Double Error
9	ISL Index Memory ECC Double Error
<b>Internal memory errors</b>	
	<b>IPT</b>
1	IPT Topology Table Memory Un-Correctable ECC Error
2	IPT Topology Table Memory Correctable ECC Error
3	IPT DSCP Table Memory Un-Correctable ECC Error
4	IPT DSCP Table Memory Correctable ECC Error
5	IPT PCP Table Memory Un-Correctable ECC Error
6	IPT PCP Table Memory Correctable ECC Error
7	IPT EXP Table Memory Un-Correctable ECC Error

**TABLE 55** NP memory errors supported on BR-MLX-10Gx24 interface cards (continued)

Error	Description
8	IPT EXP Table Memory Correctable ECC Error
9	IPT Byte count Table Memory Parity Error
10	IPT Framee count Table Memory Parity Error
	<b>EFE</b>
11	EFE Frame Control Parity Error
12	EFE Frame Data Parity Error
13	EFE HW NextHop Table Lookup 1bit Parity Error
14	EFE HW NextHop Table Lookup 2bit Parity Error
	<b>PIB</b>
15	PIB Tx Channel 0 FIFO DMA Parity Error
16	PIB Tx Channel 1 FIFO DMA Parity Error
17	PIB Tx Channel 2 FIFO DMA Parity Error
18	PIB Tx Channel 3 FIFO DMA Parity Error
19	PIB Tx Keep Alive FIFO DMA Parity Error
20	PIB Tx Keep Alive Sequence Id Parity Error
21	PIB Tx Keep Alive Scheduler Parity Error
22	PIB Tx Keep Alive Descriptor Parity Error
23	PIB RA IO Read Parity Error
24	PIB RA IO Write Parity Error
25	PIB Tx Channel 0 PCIe Read Parity Error
26	PIB Tx Channel 1 PCIe Read Parity Error
27	PIB Tx Channel 2 PCIe Read Parity Error
28	PIB Tx Channel 3 PCIe Read Parity Error
29	PIB Keep Alive Tx Channel PCIe Read Parity Error
30	PIB IOR PCIe Read Parity Error
31	PIB IOW PCIe Read Parity Error
32	PIB IO PCIe Write Parity Error
	<b>ICC</b>
33	ICC ACL CAM Request FIFO Overflow
34	ICC L2 CAM Request FIFO Overflow
35	ICC L3 CAM Request FIFO Overflow
36	ICC ACL CAM result FIFO Overflow
37	ICC L2 CAM result FIFO Overflow
38	ICC L3 CAM result FIFO Overflow
39	ICC ACL CAM Request FIFO Parity Error
40	ICC L2 CAM Request FIFO Parity Error
41	ICC L3 CAM Request FIFO Parity Error
42	ICC ACL CAM result FIFO Parity Error
43	ICC L2 CAM result FIFO Parity Error
44	ICC L3 CAM result FIFO Parity Error
45	ICC L2 CAM result interface Parity Error

**TABLE 55** NP memory errors supported on BR-MLX-10Gx24 interface cards (continued)

Error	Description
46	ICC L3 CAM result interface Parity Error
47	ICC L2 CAM result Pipeline fatal Errors
48	ICC L3 CAM result Pipeline fatal Errors
49	ICC passthrough FIFO (hash,labels) Overflow
50	ICC passthrough FIFO read Parity Error
51	ICC ACL CAM read Parity Error
	<b>ERA</b>
52	ERA RPC Credit update err
53	ERA Tx PRAM HW Read 1bit err
54	ERA Tx PRAM HW Read 2bit err
55	ERA Tx PRAM refresh err
56	ERA Tx VLAN Table HW Read 1bit err
57	ERA Tx VLAN Table HW Read 2bit err
58	ERA Tx VLAN Table refresh err
59	ERA RPC RMRAM ECC serr
60	ERA RPC RMRAM ECC merr
61	ERA RPC CNTRAM ECC serr
62	ERA RPC CNTRAM ECC merr
63	ERA RPC IRRAM ECC serr
64	ERA RPC IRRAM ECC merr
65	ERA RPC BSRAM ECC serr
66	ERA RPC BSRAM ECC merr
67	ERA RPC ACRAM ECC serr
68	ERA RPC ACRAM ECC merr
69	ERA Priet 1bit err
70	ERA Priet 2bit err
71	ERA TCAM Scrub Parity Error
72	ERA Tx Packet Data FIFO Parity Error
73	ERA Tx Packet Control Info Parity Error
74	ERA RPC FIFO Overflow
	<b>RPP</b>
75	RPF FIFO Overflow
76	RHF NullFIFO Overflow
77	LEP FIFO Overflow
78	RCF Status FIFO Overflow
79	CCM Status FIFO Overflow
80	CCM Status FIFO undrflow
81	Rx Header FIFO Parity Error
82	CCM Status FIFO Parity Error
83	CCM Session Table Read Uncorrectible ECC Error
84	CCM Session Table Read Correctible ECC Error

**TABLE 55** NP memory errors supported on BR-MLX-10Gx24 interface cards (continued)

Error	Description
85	CCM Hash Table Read Uncorrectable ECC Error
86	CCM Hash Table Read Correctable ECC Error
87	CCM Hash Bucket Read Uncorrectable ECC Error
88	CCM Hash Bucket Read Correctable ECC Error
89	BFD Session Table Read Uncorrectable ECC Error
90	BFD Session Table Read Correctable ECC Error
91	BFD Session Rx Count Statistics Read Parity Error
	<b>TPP</b>
92	Transmit Packet FIFO Read Parity Error
93	TPP Statistics Parity Error
94	Write Command Reply Packet Parity Error
95	Read Command Reply Packet Parity Error
	<b>IFE</b>
96	RPC ACRAM Table Memory Un-Correctable ECC Error
97	RPC accumulator Table Memory Correctable ECC Error
98	RPC Max Burst size Table Memory Un-Correctable ECC Error
99	RPC Max Burst size Table Memory Correctable ECC Error
100	RPC Credit Increment Table Memory Un-Correctable ECC Error
101	RPC Credit Increment Table Memory Correctable ECC Error
102	RPC Remap Table Memory Un-Correctable ECC Error
103	RPC Remap Table Memory Correctable ECC Error
104	RPC Count Table Memory Un-Correctable ECC Error
105	RPC Count Table Memory Correctable ECC Error
106	Rx Port Pipeline QOS done FIFO Parity Error
107	Rx Port Pipeline Flag FIFO Parity Error
108	Rx Port Pipeline Header FIFO Parity Error
109	Port Number FIFO UnCorrectable ECC Error
110	Port Number FIFO Correctable ECC Error
111	Rx Control iNpT FIFO UnCorrectable ECC Error
112	Rx Control iNpT FIFO Correctable ECC Error
113	Rx Port Pipeline FIFO Error
114	Rx Port Pipeline iNpT QOS ID FIFO Parity Error
115	Per port priority indexed counter Memory Parity Error

**TABLE 56** NP memory errors supported on BR-MLX-100Gx2-X(100G) interface cards

Error	Description
<b>External memory errors</b>	
1	LBLRAM Parity Errors
2	Age RAM 1 Parity Errors
3	Age RAM 2 Parity Errors
4	CAM1 Interface Parity Errors

**TABLE 56** NP memory errors supported on BR-MLX-100Gx2-X(100G) interface cards (continued)

Error	Description
5	CAM2 Interface Parity Errors
6	CAM3 Interface Parity Errors
7	TXCAM Interface Parity Error
<b>Internal memory errors</b>	
1	Multicast VLAN flag FIFO Parity
2	Multicast VLAN cPacket FIFO Parity
3	Multicast VLAN sfsTable Parity
4	Multicast VLAN repTable Parity
5	Multicast VLAN sfs FIFO Parity
6	Multicast VLAN sop FIFO Parity
7	Multicast VLAN pld FIFO Parity
8	Packet Edit Data FIFO Parity
9	Packet Edit sop FIFO Parity
10	Packet Edit merge FIFO Parity
11	Nexthoptable lkup Data Parity
12	ACL PRAM Results FIFO Parity
13	ACL feed FIFO Parity
14	ACL Data FIFO Parity
15	ACL ctrl FIFO Parity
16	ACL qosdone Parity
17	ACL portnum Parity
18	ACL priet Parity
19	Tx vlan Result Parity
20	Framer ctrl FIFO Parity
21	Framer Data FIFO Parity
22	Packet Edit Data FIFO rdData Parity
23	Packet Edit ctrl FIFO rdData Parity
24	Packet Edit nhlk FIFO rdData Parity
25	Packet Edit lble FIFO rdData Parity
26	CPU2startofs Read Data Parity
27	CPU2replace Read Data Parity
28	CPU2gentable nhtable Read Data Parity
29	CPU2gentable Txvlan Read Data Parity
30	CPU priet Read Data Parity
31	Rx MAC Data FIFO Parity Status
32	Rx MAC Flag FIFO Parity Status
33	CAM1 Result Data FIFO Parity Status
34	CAM2 Result Data FIFO Parity Status
35	CAM3 Result Data FIFO Parity Status
36	CAM Result Scheduler FIFO Parity Status
37	CAM1 PacketID Mismatch

**TABLE 56** NP memory errors supported on BR-MLX-100Gx2-X(100G) interface cards (continued)

Error	Description
38	CAM2 PacketID Mismatch
39	CAM3 PacketID Mismatch
40	CAM Result FIFO Parity Status
41	Label PRAM Result Scheduler FIFO Parity Status
42	Service PRAM Result FIFO Parity Status
43	Rx Packethdr Result FIFO Parity Status
44	Rx Packet ID Mismatch
45	Rx Control FIFO Parity Status
46	Rx Data FIFO Parity Status
47	Ageram1 FIFO 1 Parity Status
48	Ageram1 FIFO 2 Parity Status
49	Ageram2 FIFO 1 Parity Status
50	Ageram1 Aging Entry FIFO Parity Status
51	Ageram2 Aging Entry FIFO Parity Status
52	Rx Data FIFO Mismatch
53	Service PRAM Result FIFO Parity Status
54	Packet Header Misc Parity Status
55	Packet Header 2 Parity Status
56	Packet Header 1 Parity Status
57	Packet Header 0 Parity Status
58	Service CAM Lookup FIFO Parity Status
59	CAM1 ASC FIFO Parity Status
60	CAM1 Lookup FIFO-1 Parity Status
61	CAM1 Lookup FIFO-2 Parity Status
62	CAM2 ASC FIFO Parity Status
63	CAM2 Lookup FIFO-1 Parity Status
64	CAM2 Lookup FIFO-2 Parity Status
65	CAM3 ASC FIFO Parity Status
66	CAM3 Lookup FIFO-1 Parity Status
67	CAM3 Lookup FIFO-2 Parity Status
68	PRAM Result FIFO Parity
69	Trunk adjusted header Parity
70	Packet Tablerd Parity
71	Service PRAM Result FIFO Parity Status
72	Packet Header Misc Parity Status
73	Packet Header 2 Parity Status
74	Packet Header 1 Parity Status
75	Packet Header 0 Parity Status
76	Rx Packetdecode FIFO Parity
77	Rx topotos FIFO Parity
78	Eval0 trunk group Table Parity

**TABLE 56** NP memory errors supported on BR-MLX-100Gx2-X(100G) interface cards (continued)

Error	Description
79	Eval1 trunk group Table Parity
80	Eval2 trunk group Table Parity
81	Eval3 trunk group Table Parity
82	Eval4 trunk group Table Parity
83	Eval5 trunk group Table Parity
84	Merged CAM Result FIFO0 Parity
85	Merged CAM Result FIFO1 Parity
86	Merged PRAM Result FIFO0 Parity
87	Merged PRAM Result FIFO1 Parity
88	Ored 7 ram m p Result Parity
89	Rx Data in Parity
90	Rxctrl FIFO Read Data Parity
91	Read Rx qosid FIFO Parity
92	Rx portnum FIFO Parity
93	Rx qosdone FIFO Parity
94	Rx flag FIFO Parity
95	Rx header FIFO Parity
96	HQoS Table Parity
97	PRAM1 ECMP FIFO rd Parity
98	PRAM1 Read Request FIFO Parity
99	PRAM1 CPU rd FIFO Parity
100	PRAM2 Read Request FIFO Parity
101	PRAM2 CPU rd FIFO Parity
102	PRAM3 Read Request FIFO Parity
103	PRAM3 CPU rd FIFO Parity
104	CAM2PRAM1 Read Request FIFO Parity
105	CAM2PRAM1 ECMP FIFO rdData Parity
106	CAM2PRAM1 CPU FIFO rdData Parity
107	CAM2PRAM1 mw FIFO rd Parity
108	CAM2PRAM2 Read Request FIFO Parity
109	CAM2PRAM2 ECMP FIFO rdData Parity
110	CAM2PRAM2 CPU FIFO rdData Parity
111	CAM2PRAM2 mw FIFO rd Parity
112	CAM2PRAM3 Read Request FIFO Parity
113	CAM2PRAM3 ECMP FIFO rdData Parity
114	CAM2PRAM3 CPU FIFO rdData Parity
115	CAM2PRAM3 mw FIFO rd Parity
116	CAM Result FIFO Parity
117	Rx MAC Data FIFO Parity Status
118	Rx MAC Flag FIFO Parity Status

**TABLE 57** NP memory errors supported on Gen-1 and Gen-1.1 interface cards

Internal memory errors	
1	Rx Data FIFO Pointer Mismatch
2	Rx Control FIFO Pointer Mismatch
3	CAM1 ASC FIFO Mismatch
4	CAM2 ASC FIFO Mismatch
5	CAM3 ASC FIFO Mismatch

**TABLE 58** NP memory errors supported on Gen-2 interface cards

Error	Description
<b>External memory errors</b>	
1	PRAM Word 0 Parity Error
2	PRAM Word 1 Parity Error
3	PRAM Word 2 Parity Error
4	PRAM Word 3 Parity Error
5	PRAM Word 4 Parity Error
6	PRAM Word 5 Parity Error
7	PRAM Word 6 Parity Error
8	PRAM Word 7 Parity Error
9	CAM2PRAM Word 0 Parity Error
10	CAM2PRAM Word 1 Parity Error
11	CAM2PRAM Word 2 Parity Error
12	CAM2PRAM Word 3 Parity Error
13	LBLRAM Word 0 Parity Error
14	LBLRAM Word 1 Parity Error
15	LBLRAM Word 2 Parity Error
16	LBLRAM Word 3 Parity Error
17	CAM1 Word 0 Parity Error
18	CAM1 Word 1 Parity Error
19	CAM1 GIO Parity Error
20	CAM1 PEO Parity Error
21	CAM1 Operation Error
22	CAM1 Dbase Parity Error
23	CAM2 Word 0 Parity Error
24	CAM2 Word 1 Parity Error
25	CAM2 GIO Parity Error
26	CAM2 PEO Parity Error
27	CAM2 Operation Error
28	CAM2 Dbase Parity Error
29	CAM3 Word 0 Parity Error
30	CAM3 Word 1 Parity Error
31	CAM3 GIO Parity Error
32	CAM3 PEO Parity Error

**TABLE 58** NP memory errors supported on Gen-2 interface cards (continued)

Error	Description
33	CAM3 Operation Error
34	CAM3 Dbase Parity Error
<b>Internal memory errors</b>	
1	Tx ACL PRAM Results FIFO Parity Error
2	Tx VLAN Result Parity Error
3	Tx Frame Control Parity Error
4	Tx Frame Data Parity Error
5	Tx NextHop Table lookup Data Parity Error
6	Stats Data Parity Error
7	Spix Multicast VLAN Replace rData Parity Error
8	Rx Dispatch QoS Done FIFO Parity Error
9	Rx Dispatch Flag FIFO Parity Error
10	Rx Dispatch Header FIFO Parity Error
11	Rx Dispatch Port Number FIFO Parity Error
12	Rx Dispatch Dpath Cpath Packet Id Tag Parity Error
13	Rx Dispatch PRAM Decode Packet Id Tag Parity Error
14	Rx Dispatch Control Path Parity Error
15	Rx MAC0 Data FIFO Parity Error
16	Rx MAC1 Data FIFO Parity Error
17	Rx MAC2 Data FIFO Parity Error
18	Rx MAC3 Data FIFO Parity Error
19	Rx MAC0 ctrl FIFO Parity Error
20	Rx MAC1 ctrl FIFO Parity Error
21	Rx MAC2 ctrl FIFO Parity Error
22	Rx MAC3 ctrl FIFO Parity Error
23	SPIO Multicast VLAN SOP FIFO Parity Error
24	SPIO Multicast VLAN SFS FIFO Parity Error
25	SPIO Multicast VLAN Replication Table Parity Error
26	SPIO Multicast VLAN Cpkt FIFO Parity Error
27	SPIO Multicast VLAN Flag FIFO Parity Error
28	SPI1 Multicast VLAN SOP FIFO Parity Error
29	SPI1 Multicast VLAN SFS FIFO Parity Error
30	SPI1 Multicast VLAN Replication Table Parity Error
31	SPI1 Multicast VLAN Cpkt FIFO Parity Error
32	SPI1 Multicast VLAN Flag FIFO Parity Error
33	SPI2 Multicast VLAN SOP FIFO Parity Error
34	SPI2 Multicast VLAN SFS FIFO Parity Error
35	SPI2 Multicast VLAN Replication Table Parity Error
36	SPI2 Multicast VLAN Cpkt FIFO Parity Error
37	SPI2 Multicast VLAN Flag FIFO Parity Error
38	SPI3 Multicast VLAN SOP FIFO Parity Error

**TABLE 58** NP memory errors supported on Gen-2 interface cards (continued)

Error	Description
39	SPI3 Multicast VLAN SFS FIFO Parity Error
40	SPI3 Multicast VLAN Replication Table Parity Error
41	SPI3 Multicast VLAN Cpkt FIFO Parity Error
42	SPI3 Multicast VLAN Flag FIFO Parity Error
43	Agezero Read Data Parity Error
44	CAM3 Async FIFO rbus Parity Error
45	CAM3 SyncFIFO rdData Lo Parity Error
46	CAM3 SyncFIFO rdData Hi Parity Error
47	CAM3 Lookup FIFO Parity Error
48	CAM2 Async FIFO rbus Parity Error
49	CAM2 SyncFIFO rdData Lo Parity Error
50	CAM2 SyncFIFO rdData Hi Parity Error
51	CAM2 Lookup FIFO Parity Error
52	CAM1 Async FIFO rbus Parity Error
53	CAM1 SyncFIFO rdData lo Parity Error
54	CAM1 SyncFIFO rdData hi Parity Error
55	CAM1 Lookup FIFO Parity Error
56	Eval0 Trunk group Table Parity Error
57	Eval1 Trunk group Table Parity Error
58	LBLPRAM Result Scheduler FIFO Parity Error
59	PRAM Result Scheduler FIFO Parity Error
60	Rx topos FIFO Parity Error
61	Aged FIFO Read Data Parity Error
62	Cpu2replace rdData Parity Error
63	Rxctrl FIFO Read Data Parity Error
64	Config Read Data Parity Error
65	Cmd Read Data Parity Error
66	Cmpl Data Parity Error
67	Rx pktdecode FIFO Parity Error
68	Topo Table Read Packet Parity Error
69	Exp Table Read Packet Parity Error
70	PCP Table Read Packet Parity Error
71	DSCP Table Read Packet Parity Error
72	PRAM Result FIFO0 Parity Error
73	PRAM Result FIFO1 Parity Error
74	PRAM Result FIFO2 Parity Error
75	PRAM Result FIFO3 Parity Error
76	Rx Packet Header Service PRAM FIFO Parity Error
77	Rx Packet Header Misc FIFO Parity Error
78	Rx Packet Header2 FIFO Parity Error
79	Rx Packet Header1 FIFO Parity Error

**TABLE 58** NP memory errors supported on Gen-2 interface cards (continued)

Error	Description
80	Rx Packet Header0 FIFO Parity Error
81	Packet Table Read Parity Error
82	NextHop Table Read Data Parity Error
83	TxVLAN Read Data Parity Error
84	Label Lookup FIFO Overflow
85	LBLRAM Read Request FIFO Parity Error
86	LBLRAM Txp lkupFIFO Parity Error
87	LBLRAM LBL lkupFIFO Parity Error
88	LBLRAM cpu FIFO rdData Parity Error
89	PRAM ecmp FIFO rd Parity Error
90	PRAM Read Request FIFO Parity Error
91	PRAM cpu rdFIFO Parity Error
92	Rx CAMResult FIFO Parity Error
93	CAM2PRAM mwFIFO Parity Error
94	CAM2PRAM Read Request FIFO Parity Error
95	CAM2PRAM ecmp FIFO rdData Parity Error
96	CAM2PRAM cpu FIFO rdData Parity Error
97	sCAM Result ReadData Parity Error
98	mCAM Result ReadData Parity Error
99	LBLlkup Lookup FIFO Underflow
100	Txplkup Lookup FIFO Underflow
101	Txplkup Lookup FIFO Overflow
102	LBLRAM Read Request FIFO Underflow
103	LBLRAM Read Request FIFO Overflow
104	MAC0 Frame ctrl Parity Error
105	MAC0 Frame Data Parity Error
106	MAC1 Frame ctrl Parity Error
107	MAC1 Frame Data Parity Error
108	MAC2 Frame ctrl Parity Error
109	MAC2 Frame Data Parity Error
110	MAC3 Frame ctrl Parity Error
111	MAC3 Frame Data Parity Error
112	Sp0 Tx Frame ctrl Parity Error
113	Sp0 Tx Frame Data Parity Error
114	Sp1 Tx Frame ctrl Parity Error
115	Sp1 Tx Frame Data Parity Error
116	Sp2 Tx Frame ctrl Parity Error
117	Sp2 Tx Frame Data Parity Error
118	Sp3 Tx Frame ctrl Parity Error
119	Sp3 Tx Frame Data Parity Error



# Joint Interoperability Test Command

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## JITC overview

The Joint Interoperability Test Command (JITC) mode on a device is compliant with the standards established by JITC, a United States military organization that oversees testing of national security systems and information technology systems for hardware, software and components. Some services include developmental, operational, and validation testing.

The JITC mode implemented on a device enforces default behavior for some features to ensure strict JITC certification compliance.

## AES-CTR encryption mode support for SSH

The Advanced Encryption Standard - Cipher Block Chaining (AES-CBC) encryption mode for Secure Shell (SSH) is vulnerable to certain plain-text attacks. JITC mandates that AES-CBC mode be disabled, and only AES-CTR mode be used. The JITC mode of operation implements this requirement in both SSH client and server modes.

In the JITC mode, by default, the AES-CBC encryption mode for SSH is disabled and the AES-CTR (Counter) encryption mode is enabled. To enable the JITC mode, use the **jitc enable** command. The **ip ssh encryption disable-aes-cbc** command that disables the AES-CBC mode can be seen in the running configuration. The encryption algorithms such as aes256-ctr, aes192-ctr, or aes128-ctr are enabled and the CBC mode ciphers are removed. The AES-CTR encryption mode for SSH is available in JITC and non-JITC mode.

The following table lists encryption algorithm keys in different operation modes in the preferred order by the sender.

**TABLE 59** SSH ciphers with JITC support

Mode	Ciphers supported (listed in order of precedence)
Standard mode	<i>aes256-ctr, aes192-ctr, aes128-ctr, aes256-cbc, aes192-cbc, aes128-cbc, 3des-cbc</i>
Standard mode with the <b>ip ssh encryption aes-only</b> command enabled	<i>aes256-ctr, aes192-ctr, aes128-ctr, aes256-cbc, aes192-cbc, aes128-cbc</i>
JITC mode with the <b>ip ssh encryption aes-only</b> command and <b>ip ssh encryption disable-aes-cbc</b> command enabled.	<i>aes256-ctr, aes192-ctr, aes128-ctr</i>

The AES-CBC mode can be re-enabled by issuing the **no ip ssh encryption disable-aes-cbc** command, which will bring back the pre-existing CBC ciphers (aes256-cbc, aes192-cbc, aes128-cbc) along with the CTR ciphers.

### NOTE

The AES-CTR mode must be configured both on the client and server sides to establish an SSH connection.

## SHA1 authentication support for NTP

In the JITC mode, the symmetric key scheme supported for cryptographic authentication of messages uses the SHA1 keyed hash algorithm instead of the MD5 authentication scheme. The MD5 authentication for Network Time Protocol (NTP) is disabled by default in the JITC mode, using the **disable authentication md5** command. The **disable authentication md5** command is displayed in the running configuration. The SHA1 authentication scheme is available to define the authentication key for NTP. SHA1 authentication must be enabled manually using the **authentication-key** command with the *key-id sha1 key-string* options. The SHA1 authentication configuration is available in JITC and non-JITC mode.

**NOTE**

Brocade does not recommend re-enabling the MD5 authentication in JITC mode using the **no disable authentication md5** command.